Prioritising support for locally controlled forest enterprises

Duncan Macqueen (ed.), Emmanuelle Andaya, Samuêl Begaa, Mario Bringas, Martin Greijmans, Tony Hill, Shoana Humphries, Barthelemy Kabore, Thibault Ledecq, Tabin Lissendja, Alphonse Maindo, Amalia Maling, David McGrath, Simon Milledge, Femy Pinto, Nguyen Quang Tan, Elvis Tangem, Stella Schons and Bhishma Subedi

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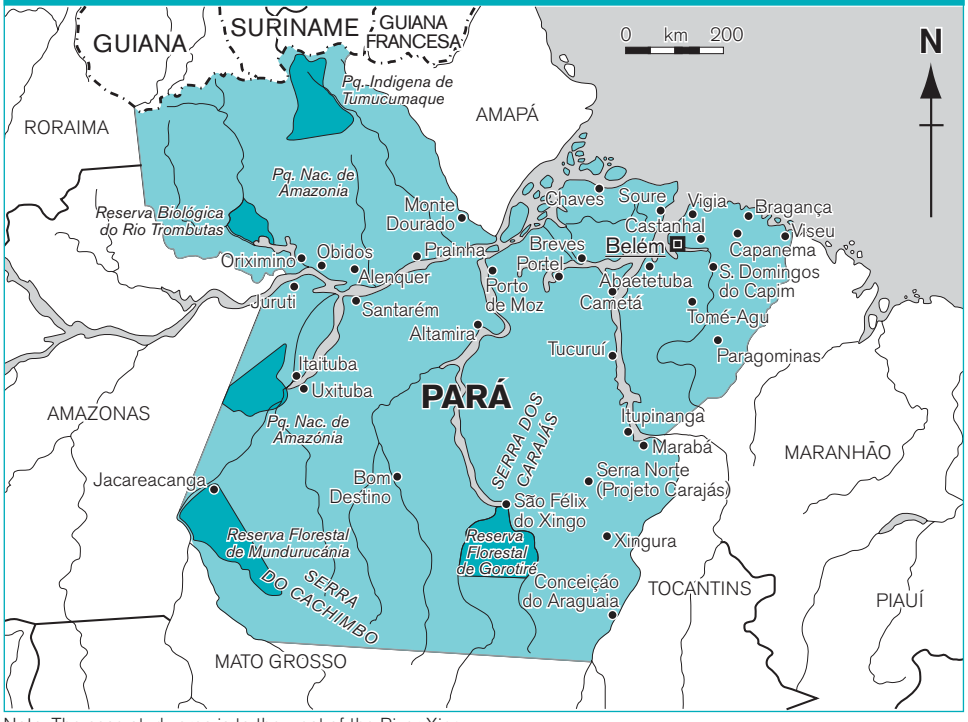
Assessment of locally controlled forest enterprise subsectors in the Brazilian Amazon

Shoana Humphries, Stella Schons and David McGrath

3.1 Introduction

The focus of this case study is the Brazilian Amazon region and specifically western Pará state, a major region of smallholder settlement that is representative of conditions throughout the Amazon (Figure 6). The predominant vegetation type is evergreen tropical forest, which covers approximately 63 per cent of the region (Pereira *et al*., 2010). There are also significant areas of savannah, especially in the state of Roraima in the far north. The Brazilian Amazon region is under increasingly intense pressure for land clearing; as of 2009, an estimated 18 per cent of the Amazon forest biome had been cleared and a comparable area had been degraded by a combination of extensive logging and forest fires associated with agricultural clearing (Pereira *et al*., 2010).

Figure 6. Pará state, Brazil



Note: The case study area is to the west of the River Xingu.

The population of the Brazilian Amazon region increased substantially during the two rubber booms in the late 19th century and early 20th century, respectively (Weinstein, 1983; Barham and Coomes, 1994; Dean, 1987). The booms brought substantial wealth to a few families but often extreme poverty to rubber workers, who were lured to the Amazon but discouraged from growing food for subsistence. In the 1970s, concerns over sovereignty and economic development drove large-scale infrastructure development and the provision of incentives to cattle ranchers – whose efforts to evict forest families often escalated into conflict. The resulting social movement convinced the Brazilian government to create areas that formally recognised the rights of traditional peoples (Allegretti, 1990, 1994).

Today, the total population in the Brazilian Amazon region is 15.9 million people, and it is surprisingly urban, with only 26 per cent living in rural zones. The poverty rate is relatively high, at 32.5 per cent (compared with the national average of 21.4 per cent) (IPEA, 2013). The rural population consists of three main groups:

- indigenous peoples, most of whom live in designated indigenous territories and continue to practice traditional forest-based subsistence activities;
- traditional peoples of mixed African, European and indigenous descent, many of whom moved to the region in the late 19th/early 20th centuries during the two rubber booms (called *serengueiros* or 'rubber-tappers') or are descendants of escaped slaves (called *quilombolos*); and
- migrants (first- or second-generation) from other regions of Brazil, whose families benefited from government incentives (including land reform) to develop the region, which started in the 1970s and continues today – these include families with small and large landholdings.

Land reform has provided migrants with access to land (2,039 settlements based on 100-hectare family plots) and more secure tenure for traditional and indigenous peoples (these comprise many models, including extractive reserves). Table 3 shows current land tenure in the Legal Amazon, an area established by law encompassing all seven states of the North Region (Acre, Amapa, Amazonas, Pará, Rôndonia, Roraima and Tocantins) as well as part of Mato Grosso and most of Maranhão (in this book, the terms 'Brazilian Amazon region' and 'Legal Amazon' are used synonymously).

The focus of this case study is on traditional peoples, reliant on shifting cultivation and fishing, hunting, small animal raising, and the extraction of NTFPs such as rubber, Brazil nuts and resins; and smallholder migrants, whose income is usually derived predominantly from livestock, often related to forest clearance. However, with the economic decline of the extractive economy and the increasing regulation of markets for NTFPs (described below), traditional peoples, even those in sustainable-use conservation units, are turning to timber extraction and livestock, with the potential to increase the historically low deforestation rate in such areas (INPE, 2013). Despite falls in deforestation rates in the Amazon since 2005, several researchers have noted that the rate at which colonist settlements are growing has remained stable or even increased (Brandão and Souza, 2006; Peres and Schneider, 2011). Small producers need assistance to help them overcome the many challenges posed by these changes.

Table 3. Land tenure in the Legal Amazon

State	Area ('000km²)	Public land					Private lands (%)	Areas under dispute (devolved and private) (%)
		Protected areas (%)			Special areas (%)			
		Indigenous lands	Conservation units		Rural settlements	*Quilombola* communities and military lands		
			Integrated protection	Sustainable use				
Acre	152.6	15.9	10.6	23.6	11.6	0	22.80	15.50
Amapa	142.8	8.3	33.3	28.8	7.8	0	6.10	15.70
Amazonas	1570.7	27.3	7.8	15.8	2.2	0.1	2.30	44.50
Maranhão	249.6	8.7	5.4	12	3.7	0.1	39.10	31.00
Mato Grosso	903.4	15.2	3.3	1.3	4.8	0	52.90	22.30
Pará	1247.7	22.77	10.1	22.2	6	1.9	18.00	19.10
Rôndonia	237.6	21	9.3	12.4	17	0.1	35.10	5.10
Roraima	224.3	46.3	4.7	7.3	4	2.7	7.60	27.50
Tocantins	277.6	9.2	3.7	8.5	2	0	51.50	23.20
Total (i.e. Legal Amazon)	5006.3	21.7	8	14.2	5.6	0.6	22.70	27.00

Source: Based on data compiled from different sources by Pereira *et al.*, 2010

Productive activities occur on private, indigenous, public (for example, extractive reserves) and other special-category (such as quilombola) lands. Family farms, as defined by Brazilian law[1], account for 84.4 per cent of all agricultural establishments in Brazil, with the remainder being managed by commercial interests or other types of agricultural producers (Table 4). In the Brazilian Amazon region, family producers accounted for 86.8 per cent of the total agricultural establishments in 2006 but represented only 30.5 per cent of the total agricultural area (tables 4 and 5).

Table 4. Number of agricultural establishments, 2006

	Family producer	Other producer	Total
Brazil	4.37 million (84.4%)	800 million (15.6%)	5.17 million
Amazon region	413,101 (86.8%)	62,674 (13.2%)	475,775

Source: IBGE, 2007a

Table 5. Area of agricultural establishments (ha), 2006

	Family producer	Other producer	Total
Brazil	80,250,453 (24.3%)	249,690,940 (75.7%)	329,941,393
Amazon region	16,647,328 (30.5%)	38,139,968 (69.6%)	54,787,296

Source: IBGE, 2007a

Other types of producers involved in agro-extractive production that did not qualify in the government census as family agricultural establishments include small and medium-sized producers on private or public land who either exceeded size limits or received more income from extractive products, such as brazil nut or timber, than agricultural products. An example of an 'other producer' is one who lives in sustainable-use conservation units, a public-land category in which families typically have individual holdings of 200-400 hectares of mostly forest and generate much of their income from NTFPs.

The main subsectors of forest enterprises in Brazil are:

- timber products harvested for sale as logs for the finished wood products industry, or as charcoal and firewood;
- NTFPs for food, fibre, oils, resins and other uses; and
- agroforestry products for food and other uses.

It is difficult to know exactly how many of the 400,000 family farmers and 62,000 other producers are using or selling timber and agroforestry products and NTFPs. It is safe to assume, however, that most family farms, all families in sustainable-use conservation units, and many other producers use and sell a variety of timber products and NTFPs.

1. Family agriculture (agricultura familiar) is defined in Law No. 11.326 of 24 July 2006 as having the following characteristics: fall below a maximum size limit; rely predominantly on family members (versus hired labourers) for farm labour; farm enterprise-related income is the predominant source of family income; and the farm or farm-related business is managed by the family (IBGE, 2007a).

The Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatistica – IBGE) estimated that 64,967 producers sold at least one NTFP and 4,750 producers sold timber products in 2006 (IBGE, 2007b). Production systems typically involve a variety of agricultural, agroforestry and forest products (timber and non-timber), as well as livestock and small animals. Products are used for consumption as well as sold for income. The 2006 agricultural and livestock census (IBGE, 2007a) found that family producers in the Amazon use almost equal areas (approximately 41-43 per cent) for pasture and forest/agroforestry, followed by 12 per cent for crops and 3.5 per cent for other uses (Table 6). Family producers in the Amazon had a greater proportion of their land under forest cover than did Brazilian family producers in general, although the proportion was still well below the legal minimum requirement for forest retention on private land in the Amazon of 80 per cent.

Table 6. Land-use distribution within agricultural establishments as a percentage of total area for family and other types of agro-extractive producers in the Brazilian Amazon region and Brazil overall

Land use	Amazon region		Brazil	
	Family producer	Other producer	Family producer	Other producer
Pasture	42.97	50.75	45	49
Forest and agroforestry	41.34	40.41	28	28
Crops	12.17	5.68	22	17
Other uses	3.51	3.15	5	6

Source: IBGE, 2007a

In 2006, agricultural producers in Brazil generated a total of 114 billion reais (R$) from vegetative (plant-based) production, including agricultural, agroforestry and forestry products (IBGE, 2007b), which was 65 per cent of the total value of agricultural production. The total production value for producers in the family producer category was R$61.9 billion, of which 62 per cent was from vegetative production (IBGE, 2007a). In the Brazilian Amazon region, the value derived by family farmers from vegetative products accounted for 70 per cent of their total income, including temporary crops (45 per cent), permanent crops (15 per cent), natural forest products (7 per cent) and planted forest products (2 per cent) (IBGE, 2007c,d; IBGE, 2012a,d).

For the Brazilian Amazon region, IBGE (2012a,d) estimated that, in 2011, the total value of forest production for all producers (in both natural and planted forests) was R$2.3 billion for timber and R$385 million for non-timber products, for a total of R$2.7 billion. For Brazil as a whole, three-quarters of the value of forest production derived from plantation sources, but in the Amazon, natural forests provided 84.3 per cent (R$2.3 billion) of the total value (IBGE 2012a,d). The most important timber product in the region was logs (R$1.7 billion), which constituted 65.7 per cent of national log production (IBGE, 2012a,d). The production of charcoal and firewood was relatively small compared with other parts of the country, with the exception of Pará state, which was the fourth-largest producer of charcoal nationally in 2011 (IBGE, 2012a,d). The most important NTFPs in terms of value

in the Brazilian Amazon region in 2011 were açaí (R$291 million) and Brazil nut (R$65 million), and these also ranked among the top NTFPs nationally (IBGE, 2012a,d).

Below, we analyse the three main timber products and, faced with over 30 commercial NTFP and agroforestry species, we provide details on two NTFPs and two agroforestry products that are experiencing marked increased demand and/or production in the region. We use data generated by the annual survey of the production of extractive resources to provide time series analysis of production volume estimates, and data from the agricultural and livestock census to provide a more detailed description of agro-extractive activities by family and non-family producers. Other sources of data used, which were usually inconsistent with the IBGE data, include recent studies relying more heavily on field visits and interviews by Imazon, the Brazilian Forest Service (Serviço Florestal Brasileiro – SFB) and the Amazon Environmental Research Institute (Instituto de Pesquisas Ambientais da Amazônia – IPAM). We also interviewed IPAM staff with expertise in forest enterprises in the Brazilian Amazon region.

3.2 Assessment of market prospects for subsectors

Our case study focuses on a few products within each subsector and, geographically, on western Pará.

1. Timber products

Timber is the most valuable forest product category in Brazil and the Amazon region. SFB (2013) described two main organisational models in the timber industry. For the production of cellulose, paper, veneer, plywood and fibreboard, production is dominated by a small group of very large, vertically integrated companies. In contrast, for the production of sawnwood (for example, lumber and other dimensional wood products), plywood and furniture, a large number of locally controlled enterprises are involved (see also May *et al*., 2003). Pereira (2011) identified 2,227 such timber-processing operations, comprising all kind of operations, from sawmills to plywood-makers, and only 29 per cent of the timber they used was from land they owned or leased. Small agricultural producers are an important source of timber for the rest of the industry.

Small agricultural producers in the Brazilian Amazon region have two main options for selling timber legally. Most commonly, they obtain a licence each year to clear a portion of their land for agriculture or pasture, until the total cleared area reaches the 20 per cent maximum (compliance with this maximum is increasing due to incentives and/or fear of fines). Most of the 4,750 timber producers identified by IBGE in its 2006 census sold their timber in this way (IBGE, 2007b,e). The other option for small producers is to apply for an environmental licence and submit a forest management plan and related documentation to sell timber from their legal forest reserves. This can be done as an individual (family) or a community (through an association). Few pursue this option, however, due to the expense of submitting a forest management plan and the bureaucratic delays associated with it (Pinto *et al*., 2011).

In a 2009-2010 study, Pinto *et al*. (2011) found 902 family-owned or community-based forest enterprises producing timber in five Amazonian states, of which 86 per cent were family-owned and 14 per cent were community-based. Amazonas state had the most community and family initiatives for timber (89.9 per cent), followed by Pará (5.3 per cent), Acre (2.5 per cent), Rôndonia (1.8 per cent) and Amapá (0.4 per cent) (Pinto *et al*., 2011). In most states, the community-based and family timber producers were concentrated in a few municipalities, where government programmes and/or sources of assistance were most active; the exception was Amazonas state, where the initiatives were more dispersed (Pinto *et al*., 2011). While the number of family or community-based timber producers was low in 2009-10, it represented marked progress since the 1990s, when community forestry initiatives for timber began in the region. In the 1990s, 218 community forest management plans were submitted and only eight were approved; but in 2003-2005, 837 plans were submitted and 815 were approved (Amaral Neto *et al*., 2008).

Sales of timber from deforested areas are usually managed through informal agreements between loggers and individual families and associations but the families and associations usually receive very little of the value. When timber is sold from legal forest reserves, agreements are often more formal, and there is greater variety – in terms of scale and complexity – in the production model employed. In some cases, communities sell standing trees to logging companies. In others, the communities fell the trees and either cut them into boards using portable sawmills or chainsaws or hire operators to remove the trees to a permanent sawmill, where community members then saw the trees. Some communities also make finished products, such as the Oficinas Caboclas initiative supported by IPAM in Santarém, Pará (IPAM, no date). There is a considerable range in the scale of such operations: a small association may manage a total area of less than 20 hectares, but a larger one might manage 1,000 hectares or more. (see Humphries, 2010).

In 2009, the Amazon timber industry harvested 14.2 million m^3 of commercial logs. Seventy two per cent of this was transformed into 5.8 million m^3 of processed wood in the form of low-value sawnwood products, such as joists, rafters and boards; 15 per cent was used for solid wood products, for example, furniture and doors; and 13 per cent was used for laminates or plywood (Pereira *et al*., 2010). The total estimated value of production in 2009 was R$4.94 billion (Pereira *et al*., 2010).

The proportion of production from planted forests in the Amazon is: 6.3 per cent of charcoal, 9 per cent of firewood, 2 per cent of logs for paper and cellulose, and 4.3 per cent of logs for other uses (IBGE, 2012b). Nonetheless, as agricultural producers increasingly come under pressure to reforest their land to comply with minimum forest-cover requirements,[2] the area and value of production from planted forests and/or tree species may increase. The contribution of planted products to total timber production value in the region was around 10 per cent for the last 10 years, increasing to 15 per cent in 2010 and 2011.

2. Recent revisions to the Forest Code have relaxed the requirement to maintain 80 per cent forest cover, but a minimum coverage may be required for landholders to access credit or other incentive programmes.

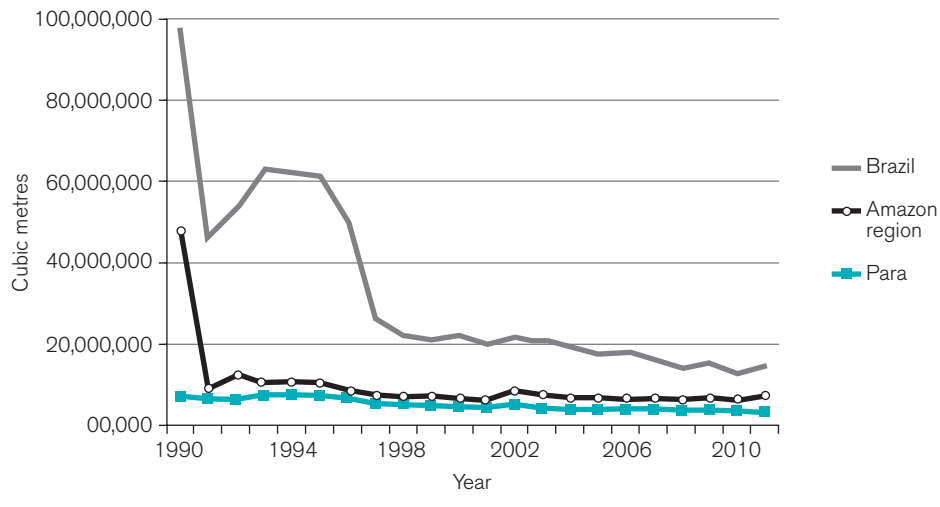
Logs. The consumption of logs by the forest industry in the Legal Amazon decreased from 28.3 million m^3 in 1998 to 24.5 million m^3 in 2004 and 14.2 million m^3 in 2009 (SFB and Imazon, 2010). The three main likely reasons for this significant drop were: the substitution of alternative products for tropical wood, for example in construction and the furniture industry increased control of deforestation and illegal timber; and the 2008 global financial crisis (SFB and Imazon, 2010).

The Brazilian Amazon region is the main source of natural forest logs in Brazil. By state, the top three producers of natural forest logs in 2009 were Pará, Mato Grosso and Rôndonia, while Acre was the fifth-largest producer and its production increased by ten per cent in 2009 compared with the previous year (Figure 7) (SFB and Imazon, 2010). Most log production from plantations takes place in southern Brazil.

Sawnwood. The majority of logs harvested in the Brazilian Amazon region are transformed into sawnwood (lumber and other roughsawn products). In the period 1998 to 2009, the range in proportion of processed wood products was as follows: 63-72 per cent sawnwood; 13-21 per cent veneer or plywood; and 11-15 per cent processed wood (wood that has been further processed and is ready to be a part of a finished product, but is not a finished product yet) (SFB and IMAZON, 2010).

Charcoal and firewood. The production of charcoal and firewood is steadily decreasing in the Brazilian Amazon region as the main source of these products changes from natural to planted forests (figures 8 and 9). Within the region, Pará is the most significant producer of charcoal, although its production has fallen significantly in the last ten years. Previously, a main source of demand was the pig-iron industry in Carajás, but that demand fell significantly after 2003 due to rising awareness of the environmental impacts of charcoal-related wood extraction from natural forests, a government crackdown on illegal

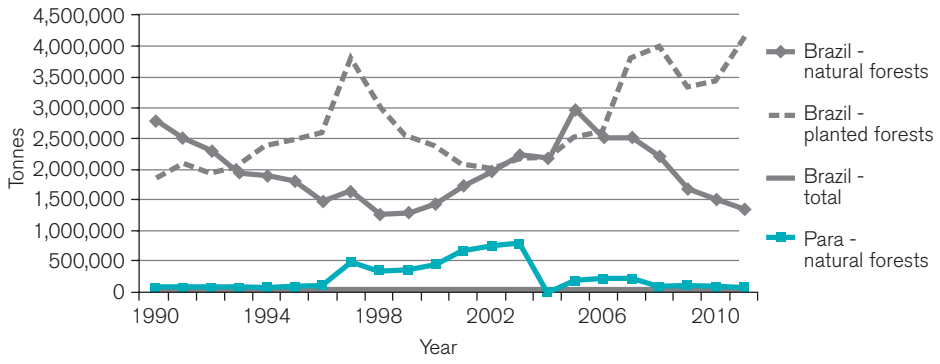
Figure 7. Log production in Brazil, 1990-2011 (m^3)



charcoal producers, and the 2008 global financial crisis. Pará has also been the historical leader in firewood production in the Brazilian Amazon region, and (in contrast to charcoal) it continues to supply around five per cent of firewood in the national market.

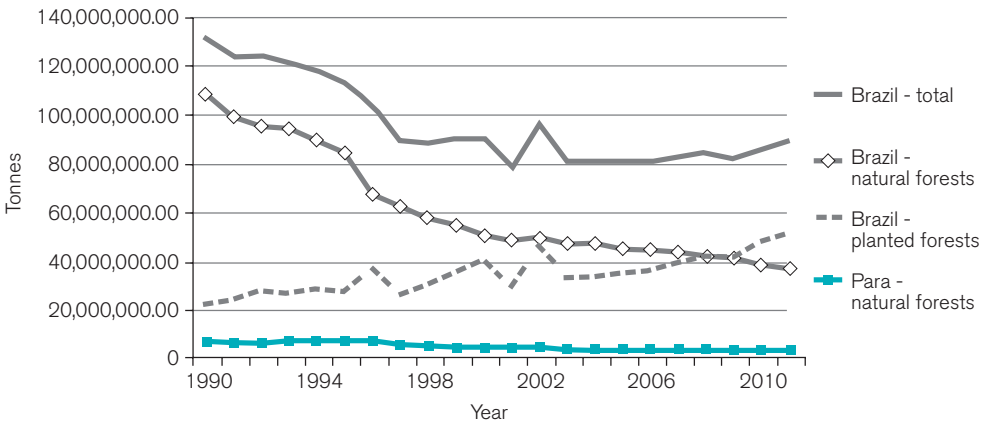
Market prospects. The majority of processed wood harvested in the Brazilian Amazon region is consumed within Brazil: domestic consumption has been between 65 and 86 per cent of total production since 1998. The percentage of processed wood products that were exported increased from 14 per cent in 1998 to 36 per cent in 2004, due to increased demand in European, North American and Asian markets. They declined to 21

Figure 8. Charcoal production in Brazil, 1990-2010 (tonnes)



Source: IBGE, 2012b

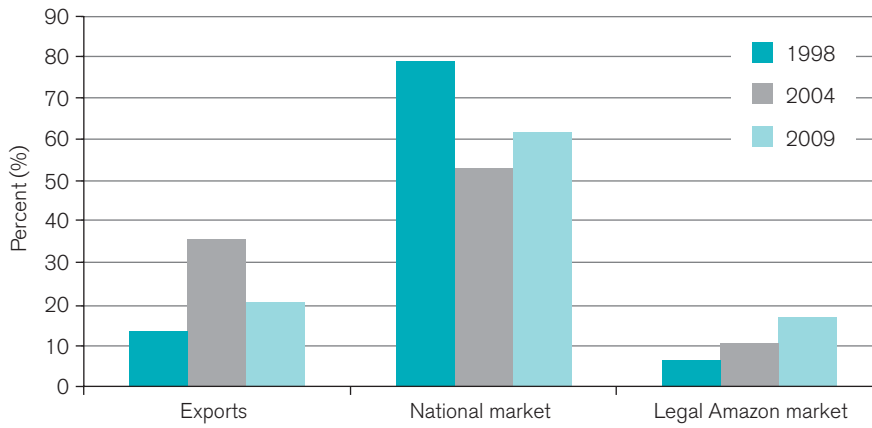
Figure 9. Charcoal production in Brazil, 1990-2010 (tonnes)



Source: IBGE, 2012b

per cent in 2008 due to the global financial crisis and a stronger Brazilian currency (Figure 10) (SFB and Imazon, 2010). The state of São Paulo is the biggest domestic market (SFB and Imazon, 2010).

Figure 10. Markets for processed wood from the Legal Amazon in 1998, 2004 and 2009



Source: SFB and Imazon, 2010

Government policies and practices designed to regulate the timber industry present both challenges and opportunities for family and community producers of timber products. Many state and federal programmes have helped family and community producers in their efforts to extract timber from legal reserves by providing free technical assistance, purchasing equipment, providing training and helping to find buyers for products (Amaral Neto *et al*., 2008). It remains to be seen, however, if such operations will be viable when support programmes end. The federal government has also decentralised responsibilities for approving documentation to the states, and state governments are simplifying procedures for environmental licensing and the approval of management plans for small and community producers, which has helped boost the number of family and community plans submitted and approved.

The small size of many family and community operations and the limited volumes of commercial species result in poor economies of scale, meaning high costs per unit of production compared with larger operations. Many family and community operations are in isolated locations, resulting in high transport costs and poor access to markets and market information. Such operations not only have to compete with larger companies, which have better economies of scale, but also with illegal operations, which Pinto *et al*. (2011) estimated produced 36 per cent of the total volume of logs in the market in 2009. Illegal producers do not face the same costs or regulations and the large volume of cheap products they place on the market drives down prices.

Despite these challenges, Humphries *et al*. (2012) found that community-based forest enterprises in which families come together for timber production can be financially viable by sharing costs, for example, for documentation, technical assistance and machinery; and collaborating within and across associations to consolidate wood volumes, negotiate prices with buyers (Macqueen *et al*, 2005), and obtain certification for responsible forest management – although many communities are too isolated to receive market benefits for certified products (Molnar *et al*., 2007 and Wiersum *et al*, 2011). Forming partnerships with forest product companies is also an important strategy by which smallholders can overcome some of their challenges, especially those related to documentation and access to capital and markets. The timber industry will remain largely dependent on small-scale farmers for its supply until the new forestry concession system is fully implemented, a situation that presents both challenges and opportunities.

Policies that help drive demand for timber products from small producers include: the My House My Life Programme (*Programa O Minha Casa Minha Vida*), a federal programme that provides credit for the building of houses in rural and urban areas, for which the construction timber is bought locally (Adriana Margutti, personal communication); Acre's significant state investments to encourage timber product companies committed to buying from community producers; and the establishment by the Acre government of a flooring factory close to communities that are producing legal and Forest Stewardship Council-certified timber (Anonymous, 2006). Other initiatives the authors have heard about include municipalities buying wood and wooden furniture for schools from local small and community producers.

Recent changes to Brazil's forest-related policies may have significant impacts on community and family forest producers. In 2006, a national forestry policy was passed that was designed to concentrate commercial forestry in state and national forests. Few concessions have been granted to date (SFB, 2013), so it is unclear if these new sources of timber will reduce pressure on colonist forests, or conversely, reduce opportunities for small and community timber producers to access markets. In addition, in 2012 the Forest Code was revised to loosen requirements for maintaining forest reserves on smallholder lots; 80 per cent forest cover should still be maintained, but farmers and ranchers who cleared areas prior to 2008 will not be penalised if they do not meet this threshold. The impacts of these changes on smallholders are not yet known.

Although the climate of the Amazon may be changing as a result of global warming, timber production is likely to remain quite robust. Major droughts in 2005 and 2010 have thinned forests but the decline in timber volumes was small: less than five per cent of forest biomass died as a result of those droughts, equating to about one tree per hectare.

2. NTFPs for food and other uses

NTFPs are 'biological materials, other than timber, which are extracted from forests for human use' (de Beer and McDermott, 1989). Although the economic importance of rubber for the livelihoods of agro-extractive families has fallen dramatically, the harvest of other NTFPs in natural forests, together with fishing and subsistence agriculture, are still major sources of subsistence and income for people in the Amazon (Rueda, no date).

In its annual survey on the production of extractive resources, IBGE collects data on 33 NTFPs organised into eight categories: food such as fruits and nuts; aromatic, medicinal, toxic and dyes; rubber; waxes; fibres; non-elastic gums; oils; and tanning products. The monitored NTFPs are a small fraction of the complete set of identified NTFPs in the Brazilian Amazon, however (Shanley *et al*., 2008). For some NTFPs, best management practices are being developed to help improve sustainability and labour safety for example, Melo *et al*., 2011, although challenges in disseminating these practices and purchasing recommended equipment make adoption a slow process.

Pinto *et al*. (2011) found 325 cases of small producers selling at least one of seven NTFPs in the previous five years in the six states they examined. These producers all belonged to some type of formal or informal organisation for either production or access to land, and either acted individually or as part of a group according to different opportunities (14 of the producers also sold timber). Pinto *et al*. (2011) acknowledged that NTFP producers are difficult to identify because they do not have to have an environmental licence to harvest NTFPs; their estimates, therefore, are probably too low. By comparison, IBGE (2007b) showed that there were 64,967 producers of at least one NTFP in the same six states in 2006, although this included a range of 33 NTFPs. In our experience, families with forest on their properties always at least use NTFPs to meet some of their subsistence needs.

Our calculations based on IBGE's 2006 agriculture and livestock census (IBGE, 2007b) indicate that NTFP production values represent only 0.8 per cent of the income generated by the rural sector in Brazil and 2.7 per cent of that in the Brazilian Amazon. In the Amazon, food (including açaí and other fruits) is by far the most important NTFP category; almost 250,000 tonnes of edible NTFPs were produced in 2011, 60 per cent more than in 1994 and two per cent less than in 2010. Fibre extraction is the second most important NTFP: just over 2,500 tonnes were harvested in 2011, 60 per cent more than in 1994 and 32 per cent less than in 2010 (IBGE, 2012a).

In a recent workshop in Pará, the fruit trees, natural forest products, food products and other types of agricultural products shown in Table 7 were identified as the highest-priority cultivated products for the three subregions that comprise western Pará. Based on these findings, IPAM implemented studies on açaí, andiroba oil, banana and manioc flour in 2012.

In the following sections we provide information on two NTFPs that have received a lot of attention recently in western Pará: açai and andiroba.

Açaí. Açaí is a palm that occurs in the Amazon, especially along estuaries, in Brazil, Colombia, Ecuador, Guyana, Suriname and Venezuela (Nogueira, 2006; Carmelio, 2010). In Brazil, Pará is the main distribution centre for açaí products (Nogueira, 2006; Carmelio, 2010; Cunha, 2006). There are at least ten açaí species, but the two most common ones are *Euterpe oleracea*, which is mainly found in várzea areas of the eastern Amazon, and *Euterpe precatória*, which is more common in the western Amazon in both floodplain (*várzea*) and upland (*terra firme*) ecosystems (Pinto *et al*., 2010).

Table 7. Priority family agriculture production products for the three subregions of western Pará

Production system	Subregion		
	Tapajós and BR-163 areas	Baixo Amazonas area	Transamazônica and Xingu areas
Orchards/ agroforestry	Banana, cocoa, cupuaçu and açaí (agroforestry systems and organic orcharding)	Pineapple, açaí, banana, cocoa, passion fruit and cupuaçu	Cocoa in agroforestry systems, organic cocoa, conventional cocoa and açaí
Extractive products	Extraction for the production of oils – Brazil nut, babaçu and andiroba, production of babaçu mesocarp flour and other products	Extraction for the production of oils – Brazil nut, babaçu and andiroba; timber and latex	Extraction for the production of oils
Food security	Manioc, horticulture, beekeeping, cattle raising and small animal ranching	Manioc, beekeeping, seed production and cattle raising	Manioc, seed production, horticulture, cattle raising, and small and medium animal ranching
Other production systems	Curauá fibre extraction and handicrafts	Aquaculture, fishing, handicrafts, curauá and jute fibre extraction	Aquaculture and fishing

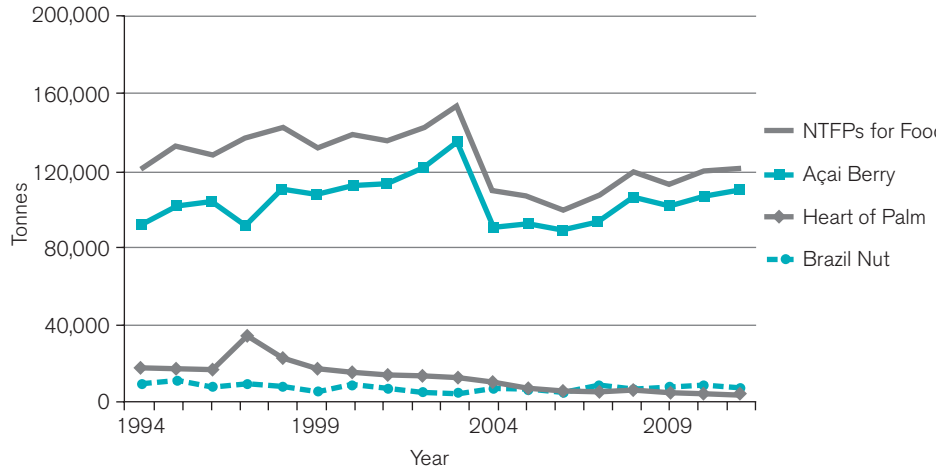
Source: Relatório II Ciclo de Debates Estratégicos, Projeto BR163 Sustentável: Florestas Desenvolvimento e Participação.

The açaí palm tree has many uses, ranging from sheltering material to handicrafts, but it is traditionally cultivated for its nutritious food products (açaí juice and palm heart – Pinto *et al*., 2010). Palm heart was more commonly harvested until the beginning of the 1990s, when concern grew over the consequences of removing the whole palm and the Brazilian government established harvesting controls (Cunha, 2006). Thereafter, the extraction of açaí berry juice became more common. The marketing of the berry's energy-inducing properties in the early 2000s led to increased demand in markets in Brazil and abroad (Cunha, 2006).

The harvesting of açaí berries by families using traditional skills is now a main source of income in the Amazon River estuary region and may represent as much as 80 per cent of the income of many riverine families (Carmelio, 2010; Cunha, 2006; Homma, 2006). The berries are sold mainly to intermediaries and usually transported by river in the Amazon estuary, or by road in the Transamazon and BR163 regions, to bigger markets. For local consumption, women often extract the juice using artisanal machinery. For commercial consumption, the berries are sold to processing facilities that either freeze or freeze-dry the juice.

Pará is the largest açaí berry producer in Brazil, producing over 109,000 tonnes in 2011 (IBGE, 2012b; Figure 11). Most of the açaí consumed in the Santarém area is from *açaizais* (areas where the palm is found naturally). However, some farmers are starting to plant the palm tree in monocultural and agroforestry systems focusing on both the local market, which is not yet fully supplied, and international markets (SEBRAE, 2012). The common perception among researchers in the region consulted for this report is that domestic demand and international demand in the United States and Europe far outweigh supply, and demand is expected to continue to grow. This is prompting concern that the price of the fruit could become prohibitive for rural populations (Figure 12). In fact, real prices[3] for açaí (fruit) paid to producers in Pará have increased by 250 per cent since 1994, including 200 per cent in the last decade and 10 per cent between 2010 to 2011 (IBGE, 2012a,b). It is not clear what impact this will have on residents who purchase açaí for consumption.

Figure 11. NTFP extraction for food (main products), Pará

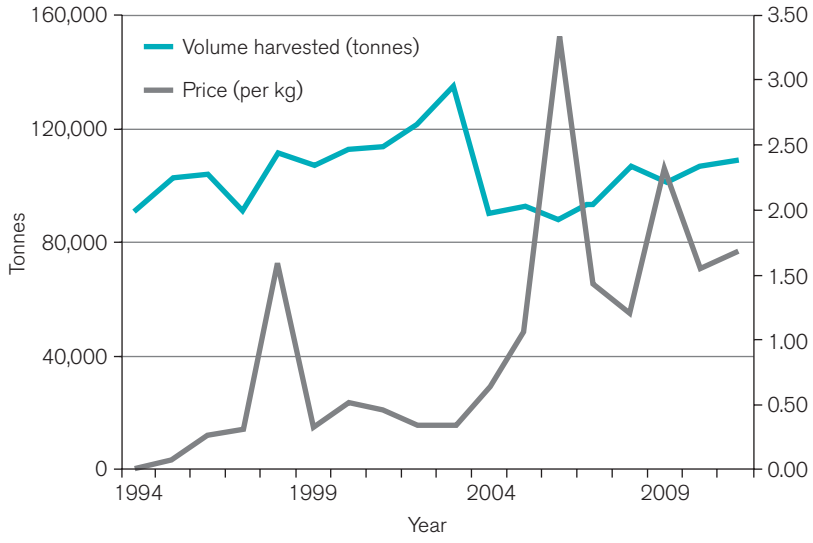


Source: IBGE 2012a, b

Andiroba (Carapa guianensis). Andiroba is a tree that can reach up to 55m in height. It occurs in tropical forests in South and Central America and Africa, mainly along river margins and on floodplains, as well as in upland areas (Klimas *et al*., 2007; Maués, 2008; Menezes, 2005; Shanley and Medina, 1998). Its main product is the oil extracted from its seeds; this oil has long been used by indigenous peoples in the Amazon as an insect repellent, and (together with *urucum*) for making tattoos. Based on its antiseptic, anti-inflammatory and antipyretic properties (Menezes, 2005), andiroba oil is commonly used for medicinal purposes, including to treat skin problems, hematomas, muscular pain, scratches and skin lesions, and rheumatism (Shanley and Medina, 1998; Boufleuer, 2001; Shanley and Swingland, 2002; Klimas *et al*., 2008; dos Santos and Guerra, 2010). Because of its medicinal and repellent properties, andiroba oil has been used widely by both domestic and international cosmetic, pharmaceutical and candle industries (Menezes, 2005), and it has also been used as biodiesel (Guedes *et al*., 2008).

3. Prices are adjusted for inflation to 2011 values.

Figure 12. Açaí production and prices in Pará



Source: IBGE 2012a,b

Men usually collect the andiroba seeds in the forest and women extract the oil using simple mechanical presses. Producers usually sell the oil to local end-consumers or intermediaries, although some also sell directly to regional markets, either to end-consumers there or to vendors. Producers receive up to 40 per cent more if they sell directly to end-consumers (both local and regional) than if they sell to intermediaries (Schons and Costa, 2012d). The average consumption of andiroba oil in the vicinity of the Transamazon Highway in Pará is less than one litre per family per year, and income from andiroba oil sales varies from family to family; for example, some families sell as few as one or two litres per year and others sell more than 100 litres (Schons and Costa, 2012d). Many families store the oil for when they need cash. In the Santarém region, producers were paid R$18-30 per litre in 2012 (Schons and Costa, 2012d).

3. Agroforestry

The term 'agroforestry system' is generally used to refer to land-use systems in which forest species are associated with agricultural and/or animal species, but it does not have a universal definition (Farrel and Altieri, 2012). IBGE (2007a) defined an agroforestry system as a type of land use in which forest species are combined with agricultural crops and/or ranching, simultaneously or in temporal sequence, and which interact economically and ecologically.

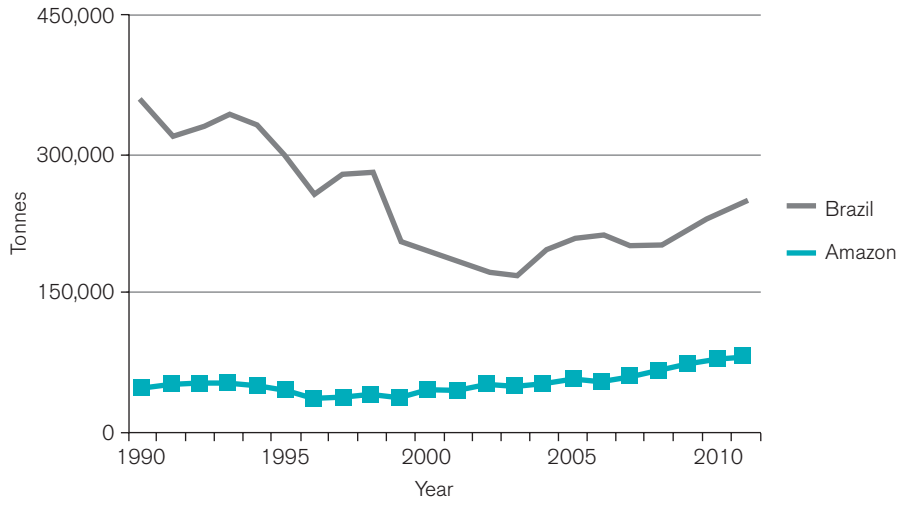
IBGE's 2006 agriculture and livestock census (IBGE, 2007f) found that 2.86 per cent of the area of family farms in the Amazon was used for agroforestry, and in Pará the area was 3.97 per cent. Agroforestry systems have been used in the region for two main reasons: (i) increased perceived demand for timber and NTFPs that adapt well to agroforestry systems (such as andiroba, cumaru and cupuaçu); and (ii) the need to recover degraded and (mainly)

deforested land to comply with the 80 per cent legal forest reserve rule. A recent banana supply-chain study by IPAM in the Transamazon Highway region in Pará indicated that a transition in agroforestry is occurring away from intercropped cultivation systems based on cocoa and banana, where banana is planted to provide shade for cocoa seedlings, towards other species with the aim of increasing land productivity. For example, small producers are increasingly planting açaí in either monocultures or agroforestry systems. Market supply chains vary greatly for agroforestry products, depending on demand. Products may be taken to local markets (for example, bananas) or sold to intermediaries, where they may eventually end up in international markets (such as cocoa).

There are strong arguments for actively promoting agroforestry systems in the region, but there are also some risks in doing so. Homma (2012) proposed the active domestication of NTFPs with greatest commercial success and their production on cleared or degraded lands, simultaneously increasing forest cover, generating jobs and reducing pressure on natural forests. But small producers who shift their labour and resources to intensively producing a smaller variety of products may be more vulnerable to market downturns, and their crops may be more susceptible to pests and diseases because of the high density of only a few species. IPAM recommends improving agroforestry systems as part of diverse agro-extractive production systems.

Nevertheless, we focus here on cocoa and banana production because cocoa has been an important agroforestry product for many years and its production as part of banana-cocoa agroforestry systems is increasingly being used in western Pará. IBGE (2012c) estimated that the national production of cocoa and banana was 248,000 tonnes and 7.3 million tonnes, respectively, in 2011 (figures 13 and 14). Cocoa production fell in

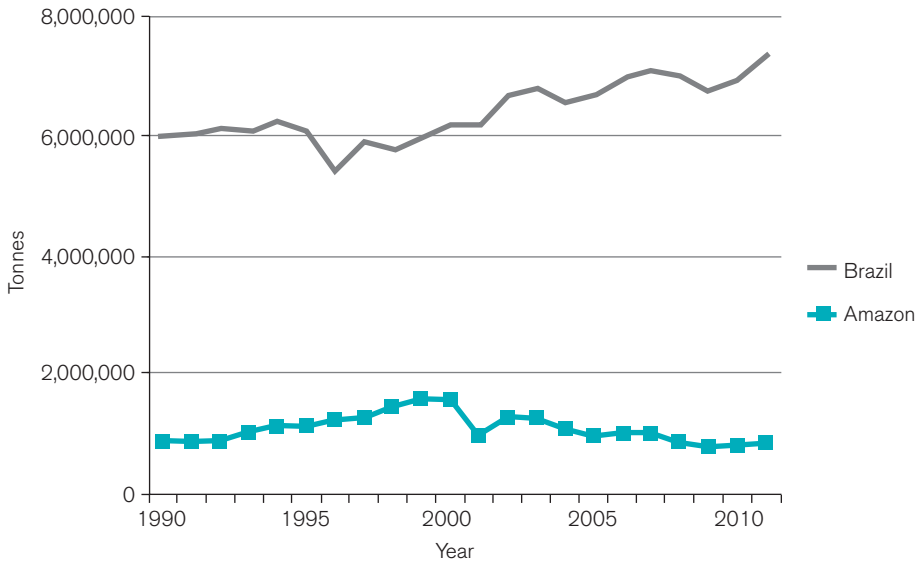
Figure 13. Cocoa production in Brazil and the Brazilian Amazon region (tonnes)



Source: IBGE, 2012c

Brazil from 1994 to 2003, due largely to problems with a disease called witch's broom, but has been increasing since then, except for a small dip in 2006 and 2007. In contrast, banana production has grown since 1990, when it was about six million tonnes. In the Amazon region, cocoa production grew somewhat between 1990 and 2011, while banana production has been relatively stable at around one million tonnes. Mecilândia, in the Transamazon Highway region in Pará, is now considered the Brazilian capital of cocoa.

Figure 14. Banana production in Brazil and the Brazilian Amazon region (tonnes)



Source: IBGE, 2012c

Banana. Banana is an important product for food security and income in tropical areas worldwide (Borges and Souza, 2004). It is on the list of the most consumed foods in Brazil (CONSEA, 2010), and IBGE (2009) estimated that family farmers in Brazil consume as food about 12 per cent (rising to 45 per cent in the Amazon Region) of the bananas they produce. According to IBGE´s research on family income (IBGE, 2009), the per capita consumption of bananas in the Amazon was 2.87kg per year in urban areas and 2.28kg per year in rural areas. A recent IPAM study, however, estimated a per capita annual consumption of 43kg/year for a group in Santarém and 92kg for a group in Altamira (Schons and Costa, 2012a).

Family farms are the major producers of bananas in Brazil (SEBRAE/ESPM, 2008; Christante, 2011). They produce 63 per cent of total production value nationally and 67 per cent in the Amazon region (IBGE, 2007b). Bananas account for 23 per cent of the total value of family agriculture permanent crop production in Brazil and 15.7 per cent in the Amazon (IBGE, 2007b). Schons and Costa (2012a) found that farmers in the Transamazon

Highway region of Pará who cultivated the crop mainly to provide shade for cocoa, sold their bananas in local markets, even though the quality was not considered very high.

Cocoa. The cocoa tree has been cultivated since pre-colonial times and is native to the Amazon region. More intensive cultivation began in the Amazon region in 1965 when the Executive Board of the Cocoa Crop Plan was transformed into a federal agency and expanded to various Amazonian states. The National Programme for the Expansion of Cocoa Cultivation, known as PROCACAU, helped consolidate production in the Amazon (Silva and Pinto, 2009). Cocoa trees may be planted in agroforestry systems, and these areas may be registered as legal reserves to help farmers comply with the Forest Code (Calvi *et al*., 2010). In a Federal University of Pará study in the region, 70 per cent of the people surveyed used forest species for shading in cocoa-based agroforestry systems. The species used were mahogany (21 per cent of survey respondents), ipê (9.7 per cent), andiroba (8.3 per cent), African mahogany (7.6 per cent), Spanish cedar (6.6 per cent), tatajuba (5.5 per cent), açaí (4.1 per cent), and Brazil nut (3.4 per cent), among others (Calvi *et al*., 2010).

Cocoa accounts for 2.17 per cent of the total value of permanent crops grown on family farms nationally and 6.51 per cent of that value in the Brazilian Amazon region. About 40 percent of the national cocoa crop is grown on family farms and about 51 per cent is grown in the Amazon region. The Transamazon Highway region of Pará, where cocoa is the main agricultural activity, is that state's biggest cocoa producer (Calvi *et al*., 2010).

Market prospects. Given the increasing tendency to domesticate NTFPs and shift their production from natural forests to agroforestry systems, here we discuss the NTFP and agroforestry subsectors together. Again, we highlight issues around the production of and markets for açaí, andiroba, cocoa and banana.

Many forest and agroforestry fruits have been in increasing demand in recent years, driven both by state policies and commercial industries. While many NTFPs produced in Brazil are consumed in local markets as raw fruits, an increasing amount is being processed locally or regionally and then sold in national and international markets. This is especially true for açaí, which may be sold in liquid form as a juice (*vinho*) or either frozen or freeze-dried, and also for andiroba oil.

Consumers appear to value these products because: of their health benefits; they contribute to forest conservation; and/or they boost local economic development. In Brazil, experts estimate that the market for cosmetic products using natural materials grew by about seven per cent in 2012, an increase attributed to consumer perceptions of the health advantages of these products compared with cosmetics containing synthetic products, as well as perceptions about the role of these products in environmental conservation (Bio Brazil Fair, 2012). Such perceptions have been significant in the demand for açaí, which is marketed as an energy supplement in many international markets and increasingly within Brazil, as well as for andiroba oil, which is used in many cosmetic products.

For cocoa and banana, domestic demand is greater than supply. Brazil is a net importer of cocoa, and its domestic production has had many problems with pests (which are now under control). Barriers posed by documentation requirements and a lack of infrastructure have limited the extent to which Amazonian banana producers have been able to market their products in southern Brazil, where demand is high (SEBRAE/ESPM, 2008).

Despite growing demand for natural products, including andiroba oil and açaí, local producers face many challenges in seizing the opportunity this represents. Challenges encompass:

- **Quality.** Extraction processes require a lot of care, especially if artisanal, so that the product is not contaminated. In recent years, chagas disease has been linked to açaí production processes, and the quality of andiroba oil is also greatly affected by the method of extraction. On the basis of interviews with a series of companies who buy andiroba, copaíba and Brazil nut oil, Enriquez (2007) found that the quality of the oil was the main obstacle that companies encountered in buying these products, although it could be overcome with training.
- **Scale.** Labour limitations and the slow, low-yield extraction process can make it difficult for producers to meet demand.
- **Supply of the natural resource**. In the case of andiroba, the trees do not produce seeds all year round, which affects communities´ ability to meet contractual commitments. This limitation is encouraging small producers to plant açaí and andiroba, as well as other species.

Overall, such challenges limit the ability of communities to capture value from their forest products and reinforce their dependence on intermediaries.

The federal government has adopted policies that could have important positive impacts on demand for NTFPs and agroforestry products and thereby stimulate production. Two such policies are aimed at purchasing food from family producers: the Food Procurement Programme (Programa de Aquisição de Alimentos – PAA) and the national school meals programme (Programa Nacional de Alimentação Escolar – PNAE). The PAA commenced in 2003 with the dual objectives of strengthening family agriculture and reducing hunger in the country. Under it, agricultural produce is bought from small landholders (including rural settlements and traditional peoples), individually or organised in groups, to build up strategic inventories of food to be distributed to families in need. The value of produce sold by family varies between R$4,000 and R$8,000 per year, depending on the purchase modality (MDA, 2012). Under PNAE, municipal governments are required to buy at least 30 per cent of the food provided in schools from family farms. From July 2012, each family can sell up to R$20,000 worth of produce to the government. Farmers may sell to both programmes; products sold include Brazil nut and derivates, babaçu derivates, and açaí.

The federal government has also had a minimum price policy for agricultural products since 1966. In 2008 it expanded the programme to include NTFPs, or 'sociobiodiversity products' (this subprogramme is known as PPGM-Bio), through which the government defines minimum prices for some products. If the producer is unable to sell the product for the minimum price, the government will pay the difference between the 'official price'

and the actual selling price. As of August 2012, the policy had benefited 29,970 families (including 5,753 families in 2011) with expenditure of nearly R$7 billion in 11 states, five of them in the Amazon region (MDA, 2012).

Another example of government helping to drive NTFP demand is in the purchase of condoms manufactured using natural latex in Acre. A federal and state government-supported company is purchasing natural liquid latex from 750 agro-extractivist families in several reserves (Veras, 2012). The latex is used to make condoms, which are then purchased by the government for distribution within Brazil as part of AIDS awareness programmes. The company pays 1.78 times more than the normal market price for latex and is also the second-largest employer in the small town of Xapuri.

At the same time, government control measures make it very difficult for small producers to sell agro-extractive products in processed forms and in more formal markets. The documentation required to sell fruit and fruit derivatives in Brazil varies depending on the fruit in question and the buyer. To take advantage of the government procurement programmes described above, producers must provide documentation that they qualify as a 'family agriculturalist' (this document is known as a DAP – *declaração de aptidão*). To receive a DAP, producers must apply to the National Institute of Colonization and Land Reform (Instituto Nacional de Colonização e Reforma Agrária – INCRA) and present documentation of their tenure or use rights to their land. This requirement poses two main challenges. First, very few producers in the Brazilian Amazon region have documentation of their tenure. Second, INCRA has very limited capacity to respond to the quantity of applications for DAPs, either directly or through contracted agents in rural areas. In addition, if a producer wants to sell a derivative product, such as açaí juice or andiroba oil, they must present an inspection seal (*sello de inspeção*). For sales within the state, this can be issued by the state ministry of agriculture, but for sales to other states or to export markets, the seal must be issued by the federal Ministry of Agriculture. These requirements present real barriers for innovation and income generation, especially for women, who are usually engaged in primary processing.

In addition, since 2001, Brazil has had in place specific legislation (known as *Medida Provisória* 2.186) for the use of what are called 'biodiversity products', under which payments to traditional communities may need to be paid for the use of their traditional knowledge and genetic resources. The law establishes an institution to enforce rules around the use of such products. Starting in 2010, the Brazilian Institute of Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis – IBAMA) has been issuing fines to companies and research institutions for not complying with the legislation, even though its requirements are not well understood. This creates uncertainty in the use of some NTFPs as production inputs in industry and may lead companies to seek alternatives.

Forest-based production systems in the Amazon are likely to be more resilient to climate change than conventional production systems that not only contribute to drier conditions but are also vulnerable to the increased frequency of droughts that may occur as more areas are cleared. Also, to the extent that forest-based production systems meet the income and subsistence needs of smallholder households, they reduce the reliance of those households on shifting cultivation for annual crops and the need to clear forest to raise cattle, activities which lead to increased CO_2 emissions and disrupt hydrological processes.

3.3 Assessment of integrated impacts for each potential subsector

The following scale was used to rank each subsector: 5 = a positive contribution to the social foundation or environmental boundary is highly likely; 4 = a positive contribution is moderately likely; 3 = there is likely to be no effect, or the social foundation or environmental boundary is not applicable in this subsector; 2 = a positive contribution is unlikely, or there will be a small adverse effect; and 1 = a strong adverse effect is likely. Tables 8-13 present the scores of the subsectors against each criterion, and Table 14 summarises the assessment.

Table 8. Gender analysis: what is the likely contribution of each subsector to income-generating opportunities for women and thereby the likely impacts on household well-being (including any issues to do with reproductive health)?

Subsector/product	Score	Supporting information
Timber	1-2	In general, timber extraction and processing is a male activity, although there are some exceptions.
NTFPs – açaí/andiroba	3-5	The collection and transport of fruit is a male activity, but women often undertake local processing. The degree of local processing may be critical to opportunities for women to be involved.
Agroforestry – banana/cocoa	2-4	Both men and women can be involved in agricultural activities. Where products are processed locally, women may have opportunities for greater participation.

Scores: 5 = a positive contribution is highly likely; 4 = a positive contribution is moderately likely; 3 = there is likely to be no effect, or the social foundation or the environmental boundary is not applicable in this subsector; 2 = a positive contribution is unlikely, or there will be a small adverse effect; and 1 = a strong adverse effect is likely.

Table 9. Impacts on food security: what is the likely contribution of each subsector, either (i) directly to increased food security through the enhanced agricultural production of staple foods produced locally or (ii) indirectly through increased diversification income generation that affords households greater purchasing power to buy staple foods?

Subsector/product	Score	Supporting information
Timber	2-4	The effect is largely indirect. Timber can be the most valuable forest product on a smallholder's property. The income generated from sales can be used to purchase food and/or invest in food production or in other income-generating activities. However, if logging removes or negatively affects NTFP species, it can have negative direct impacts if the NTFPs are harvested, or negative indirect impacts if the NTFPs are food sources for game.
NTFPs for food – açaí	4	Açaí is an important part of local diets in the Amazon. It is likely that, in most cases, sustainable management can increase availability for both food and income. However, there is concern that rising prices will adversely affect the ability of the urban poor to purchase the fruit.
NTFPs for other uses – andiroba	4-5	The sale of andiroba is likely to have positive indirect effects by increasing income to purchase food.
Agroforestry – banana/cocoa	4-5	Banana is an important part of rural diets. Its sale is also likely to increase purchasing power.

Scores: 5 = a positive contribution is highly likely; 4 = a positive contribution is moderately likely; 3 = there is likely to be no effect, or the social foundation or the environmental boundary is not applicable in this subsector; 2 = a positive contribution is unlikely, or there will be a small adverse effect; and 1 = a strong adverse effect is likely.

Table 10. Impacts on energy security: what is the likely contribution of each subsector to the provision of household energy, either (i) directly where energy is the main business (such as firewood, charcoal or biogas) or (ii) indirectly where tree products or agricultural crop residues can be used to enhance energy security?

Subsector/product	Score	Supporting information
Timber	5	Sustainable forest management for timber can improve energy security by increasing the availability of firewood and charcoal and providing income to purchase alternative cooking fuels.
NTFPs – açaí/andiroba	3	Negligible impacts.
Agroforestry – banana/cocoa	3	Negligible impacts.

Scores: 5 = a positive contribution is highly likely; 4 = a positive contribution is moderately likely; 3 = there is likely to be no effect, or the social foundation or the environmental boundary is not applicable in this subsector; 2 = a positive contribution is unlikely, or there will be a small adverse effect; and 1 = a strong adverse effect is likely.

Table 11. Impacts on climate change mitigation and adaptation potential: what is the likely contribution of each subsector to carbon emissions reductions (including replacement of alternative emissions sources) and how important is it likely to be for adapting and building resilience to known future climate change scenarios?

Subsector/product	Score	Supporting information
Timber	4	While timber extraction leads to moderate increases in carbon emissions, sustainable management maintains healthy forests and mitigates the impacts of climate change, including by conserving hydrological processes.
NTFPs for food – açaí/andiroba	4	NTFP production generally increases carbon stocks and strengthens the resilience of household production systems to climate change.
Agroforestry – banana/cocoa	3-4	Agroforestry production systems accumulate more biomass and carbon stocks than agricultural crops and strengthen the resilience of household production systems to climate change.

Scores: 5 = a positive contribution is highly likely; 4 = a positive contribution is moderately likely; 3 = there is likely to be no effect, or the social foundation or the environmental boundary is not applicable in this subsector; 2 = a positive contribution is unlikely, or there will be a small adverse effect; and 1 = a strong adverse effect is likely.

Table 12. Impacts on biodiversity within actual system and on adjacent natural systems: what is the likely contribution of each subsector to biodiversity conservation? For example, to what extent does the subsector require the maintenance of biodiverse natural ecosystems or enhance the degree of agro-biodiversity through its operations?

Subsector/product	Score	Supporting information
Timber	4-5	Low-impact extraction may have minimal impacts on biodiversity. The forest canopy is maintained, so there is minimal environmental change in the forest interior. Some patchiness can enhance biodiversity.
NTFPs for food – açaí	2-3	There is concern that biodiversity might be lost as açaí is increasingly planted, especially when planted in monocultures. However, when it is planted in agroforestry systems, the negative impact on biodiversity is likely to be much smaller.
NTFPs for other uses – andiroba	2-3	Negligible impacts.
Agroforestry – banana/cocoa	2-3	Agroforestry systems are unlikely to have a significant effect on biodiversity. Much depends on the diversity of the agroforestry systems and the proximity of natural forest.

Scores: 5 = a positive contribution is highly likely; 4 = a positive contribution is moderately likely; 3 = there is likely to be no effect, or the social foundation or the environmental boundary is not applicable in this subsector; 2 = a positive contribution is unlikely, or there will be a small adverse effect; and 1 = a strong adverse effect is likely.

Table 13. Impacts on soil fertility and nitrogen inputs: what is the likely contribution of each subsector to the use of natural forest management or on-farm soil husbandry techniques that enhance long-term soil fertility without the excessive use of nitrogen fertilisers?

Subsector/product	Score	Supporting information
Timber	4-5	With low-impact extraction in sustainable forest management systems, the impact is expected to be negligible.
NTFPs for food – açaí	4-2	The harvesting of açaí is likely to have minimal negative effects on soil fertility but this could change if incentives or market pressures encourage farmers to plant pure stands.
NTFPs for other uses – andiroba	5	Andiroba agroforestry systems and natural forest management are very likely to enhance long-term soil fertility.
Agroforestry – banana/cocoa	2-3	Agroforestry systems of cocoa and banana are not likely to promote the use of fertilisers but could contribute to soil management that enhances long-term fertility.

Scores: 5 = a positive contribution is highly likely; 4 = a positive contribution is moderately likely; 3 = there is likely to be no effect, or the social foundation or the environmental boundary is not applicable in this subsector; 2 = a positive contribution is unlikely, or there will be a small adverse effect; and 1 = a strong adverse effect is likely.

Table 14. Summary of assessment of integrated impacts for each potential subsector

Impact criterion	Score		
	Timber products	NTFPs	Agroforestry
Gender	1-2	3-5	2-4
Food security	2-4	4-5	4-5
Energy security	5	2	2-4
Climate change mitigation and adaptation potential	4	4	3-4
Biodiversity	4-5	2-3	2-3
Soil fertility and nitrogen inputs	4-5	2-5	3-4
Total	20-25	17-24	16-24

Note: Impact criteria are described in the text.
Scores: 5 = a positive contribution is highly likely; 4 = a positive contribution is moderately likely; 3 = there is likely to be no effect, or the social foundation or environmental boundary is not applicable in this subsector; 2 = a positive contribution is unlikely, or there will be a small adverse effect; and 1 = a strong adverse effect is likely.

In summary, all potential subsectors – timber products, non-timber products, and agroforestry products – present important opportunities for cash income, which can strengthen food and energy security. Timber can be particularly valuable, especially when producers are adequately organised and informed of market price – and it can be an important source of capital for investment in other agro-extractive products. Açaí, cocoa and banana are important for food security, and andiroba is important for traditional medicine.

Typically, men are more involved than women in the extraction of forest products, whether it is trees or fruit. Women and men both participate in agroforestry production. When wood is processed locally, it is usually also by men with some exceptions, but women are usually involved in processing fruits, especially in the case of andiroba oil extraction and açaí *vinho* production. Reducing the bureaucracy around the sale of processed goods, and training in quality management, would help more producers, especially women, capture greater value from processing.

None of the products analysed in this chapter present great risks in terms of climate change, biodiversity or soil fertility. In fact, having a diversified production strategy that includes forests and agroforestry systems increases biodiversity, stabilises soils, helps mitigate climate change and increases the resilience of families who depend on the environment and on selling natural products for their livelihoods.

3.4 Assessment of support priorities

Families in the Amazon – both migrants and traditional families – derive their living from a mixture of timber products, NTFPs and agroforestry products. Demand for certain products in these subsectors is growing, and the 400,000 family farmers who live in the region are well positioned to take advantage of this demand, but they need support to formalise and strengthen their roles in supply chains.

The many challenges faced by small agro-extractive producers include violent and tragic disputes over land; regulations that push producers towards illegality; low soil fertility; and a lack of infrastructure. These producers desperately need documentation of land titles or usufruct use rights to help fight landgrabbing and to enable them to access certain markets and government programmes. In addition, they need: regulations that recognise smallholder realities; greater access to government services, especially technical and financial assistance, to help them invest in new production models (such as fire-free soil preparation methods and agroforestry systems); improved infrastructure for transporting products; and assistance to obtain better access to buyers and improved prices.

We recommend that support is provided for family and community producers whose products originate from responsible forest management and agroforestry and which support low-carbon socio-economic development and the conservation of the natural environment. Such support could focus on the:

- formation of associations and cooperatives for small-scale timber production by families and/or communities;
- primary processing for timber;
- installation of agroforestry systems for cacao, andiroba and açaí; and
- primary processing of andiroba and açaí.

Three main types of activities are recommended, as described below. Specific activities will depend on the specific opportunities and challenges faced by the families and communities involved.

- **Tailored training.** Demand for the products described in this chapter is growing among both public and private buyers in domestic markets and, for some products (especially açaí), in international markets. As production intensifies and becomes increasingly formalised (licensed), however, producers need training in best practices in production, harvesting, processing, packaging, sales and business management, including how to obtain licences and maintain other documentation.

- **Organisation for business.** One of the best ways to improve economies of scale is to organise producers into first-tier organisations (such as associations or cooperatives). Further organisation into second-tier groups (such as state-level or regional producer groups) would bring together first-tier organisations within and across regions. First-tier organisations can help members obtain access technical assistance and credit, facilitate training and help with legal documentation. First-tier and second-tier producer organisations are likely to be more effective than individual producers in communicating needs and requests to governments and civil-society organisations. Strategic partnerships with companies in relevant industries can also provide opportunities to overcome challenges and share risks. Notably, guidelines have been developed at the international level to help communities and companies or other third parties prepare for investment in community-based forest enterprises, and this guidance could be useful for Brazilian initiatives (Elson, 2012).

  Partnerships involving government, civil-society and academic organisations that work with producers are also important ways to increase learning and generate new approaches for responsible, climate-friendly production and marketing systems. IPAM currently works with two international networks focused on supporting producers, companies, universities, governments and civil-society groups that are working to shift states and other jurisdictions towards low-carbon agricultural and forest production models that support families.

- **Research.** Research can inform all aspects of responsible forest enterprise production, including by monitoring production and financial data and by investigating markets, production systems and impacts on families and the environment. A host of actors, such as families, cooperatives, technicians and scientists, can implement different aspects of this research, including data collection, entry and analysis, and the distribution of findings and other information.

To implement such activities, efforts are needed to engage the following main actors from inception: producers, including small families and community associations; buyers and processors of production (including small, medium-sized and large companies); government organisations, including regulatory and technical assistance agencies; civil society; and academic institutions. IPAM is planning a project in western Pará aimed at promoting the sustainable management of resources and the increased productivity of agro-extractive and livestock activities in rural land settlements. Specifically, it will involve 21 settlements covering a total area of 514,258 hectares and including 5,720 families.

Shea butter women's producer group, Burkina Faso.

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The small and medium forest enterprise sector is of major significance for livelihoods and yet these are largely invisible economies. Raising the sector's visibility such that its impacts can be better assessed, and then going on to explore how the positive links to sustainability, livelihoods and poverty reduction can be enhanced, is a major challenge.

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In a finite biosphere there is a limit to what a growing human population can do and still survive. A safe operating space between planetary boundaries at one extreme and the needs of the world's poorest people at the other. How to achieve this safe operating space is increasingly the focus of the post-2015 framework for sustainable development. Locally controlled forest enterprises have a substantial contribution to make if supported to produce food, fuel and fibre products in ways that improve local livelihoods and resilience in the face of increasing environmental and economic shocks. They offer an alternative approach to a green economy – 'making economic what is green' rather than 'greening what is economic'.

The sheer scale of locally controlled forest enterprises is at once an opportunity and a challenge. On one hand, these myriad and frequently informal enterprises often constitute the largest forest-based private sector. They have transformative potential at a landscape scale – as examples from places as disparate as China, Guatemala and Sweden readily attest. On the other hand, providing the organisational, technical and business support required to unleash this potential is a formidable challenge when they are spread across remote, and often impoverished, forest areas.

Lamentably, international aid for support to locally controlled forest enterprises is scarce. Prioritising those scarce resources therefore becomes crucial. Should particular forest subsectors receive priority support because of their disproportionately positive provision of public goods? Or is a mosaic of different forest subsectors necessary to deliver the full range of public goods – and if so, what particular types of support are most generically useful to sustain such a mosaic? This report draws together eight country studies from Nepal, Brazil, Burkina Faso, Vietnam, Mexico, Tanzania, Cambodia and the Democratic Republic of the Congo, that attempted to answer such questions. The answers matter because, at present, humanity is crashing through planetary boundaries while still failing to meet the needs of the world's poorest people.

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