

Current barriers threatening income generation from community-based forest management in the Brazilian Amazon

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Abstract: Community-based forest management (CBFM) is seen as an alternative to protect forests and at the same time to provide income for smallholders. Since the mid-1990s, the number of CBFM projects has rapidly increased in the Brazilian Amazon although most of them still face several difficulties despite significant public support. Five CBFM projects, located in the states of Pará (eastern Amazon) and Acre (western Amazon) were analysed between 2008 and 2010. These cases highlight some main barriers threatening CBFM long-term financial viability with effects on cash income received by communities from timber harvesting. Moreover, despite external – national and international – financial support as well as technical assistance, timber harvesting only accounts for limited cash income for smallholders, even though forest covers 80% of their landholding. The disparity suggests that it is necessary to invest in research-development activities to support other land uses, such as sustainable cattle ranching and agriculture, as part of household livelihood strategies on the 20% of the total landholding that can legally be deforested. Market access for timber is very uncertain and smallholder communities often do not succeed in selling their timber at remunerative prices. Minimum remunerative public prices and support for timber marketing need to be provided to make CBFM a truly economic alternative. The complex and cumbersome legal framework results in relatively high transaction costs for permit approval. Thus, more simple and flexible procedures are required to enhance smallholder involvement in legal forest management for commercial purposes. Finally, the timber potential in smallholder forest reserves is largely unknown. Given the large initial fixed cost for formulating, submitting, and implementing a collective forest management plan, a better assessment of such potential through systematic inventories is needed.

Keywords: Brazilian Amazon, community-based forest management, tropical timber

3.1 Introduction

Based on evidence from five cases studies, this chapter assesses the contribution to income generation of sustainable forest management (SFM) for commercial timber production by communities in the Brazilian Amazon. It discusses the several barriers threatening the financial viability of community-based forest management (CBFM) and some proposals to overcome them. The Brazilian Amazon has been chosen because, according to official estimates (SFB 2009), at least 40 million ha of forests are held

by several types of smallholder settlements and communities that could potentially be managed through CBFM initiatives, contributing significantly to the expansion of SFM and an increase in smallholders' income in Brazil.

The expectations from CBFM – defined here as collective forest management involving several households or communities that is undertaken for commercial purposes – are significant given the current worldwide trend towards the recognition of local tenure rights in lands often covered by forests (White and Martin 2002). Since the mid-1990s, the attempts

to implement sustainable CBFM have increased, in part due to the efforts of international donors and environmental NGOs. However, only a few tropical countries have conditions that enable their effective development (Bray et al. 2003).

Several studies have explored some of the conditions that enable or prevent successful outcomes for CBFM projects (Scherr et al. 2003, Bray et al. 2006, Molnar et al. 2007, Donovan et al. 2008, Louman et al. 2008, Medina and Pokorny 2012, Pacheco et al. 2008, Porro et al. 2008, Cronkleton et al. 2011, Humphries et al. 2012, Radachowsky et al. 2012). In Central America, particularly Mexico and Guatemala, many success stories are reported (Bray et al. 2006, Taylor et al. 2008, Cronkleton et al. 2011). However, even in these countries, the on-going initiatives face many difficulties. Main challenges are related to organisational capacity and access to markets, affected by regulatory frameworks that in many countries disadvantage CBFM projects and greatly reduce their potential profitability. For example, from the experiences in 12 community forest concessions in the Maya Biosphere Reserve (Guatemala), Radachowsky et al. (2012) show that forest management, has provided significant income and social benefits to almost all community members in some of the concessions but that some of the concessions failed. They also show that market fluctuations had important impacts on concession revenues, partially offset by increased product diversification. In Africa and Asia, several case studies suggest that the household incomes derived from CBFM are limited with respect to total income (Mahanty et al. 2009), and are often too low to have an impact on household assets (Schreckenber and Luttrell 2009).

In the Brazilian Amazon, according to the Brazilian Forest Code, 50% to 80%⁽¹⁾ of all landholdings must be conserved as forest, where only sustainable management of timber and non-timber forest products is allowed. In some states, the existing demand for timber may only be met in the future with an expansion of CBFM or small-scale SFM (Sablayrolles et al. 2013). However, currently, smallholders in the Amazon tend to sell timber to loggers and intermediaries both legally, often through acquiring cutting authorisations aimed at converting forests to croplands, and illegally, which is likely the greatest portion, in order to obtain immediate cash (Pacheco 2012). Some authors claim that SFM of legal smallholder forest reserves could support equitable development on forest frontiers (Amacher et al. 2009). This assumption is also shared by national and international networks supporting CBFM.

Public incentives to promote CBFM in Brazil started in the mid-1990s. The Promanejo Programme (Programme to Support Sustainable Forest Management in the Amazon), as a component of the PPG-7 (Pilot Programme to Conserve the Brazilian Rainforest), supported several so-called Promissory Initiatives. Between 1997 and 2007, 11 CBFM initiatives in four Brazilian States (Acre, Amazonas, Rondônia, and Pará) were supported. According to official data, there were 127 timber CBFM projects submitted to environmental public agencies in the Amazon in 2010, 48 in Pará, 36 in Amazonas, 23 in Acre, 16 in Rondônia, and in Amapa. However, most of them were not yet approved: only 53 plans were active in 2010 (Pinto et al. 2011). In the states of Acre and Amazonas, CBFM plan formulation and submission have been financially supported by public and NGO funds (World Wildlife Fund, WWF; International Union for Conservation of Nature, IUCN, etc.). In the state of Pará, many CBFM plans in agricultural settlements have been submitted through partnerships between private timber companies and communities (Amaral Neto et al. 2011). Outside PPG7, another significant institutional factor has been the creation of new settlement models, such as Extractives Reserves (Portuguese acronym RESEX), Agro-Extractives settlements (Portuguese acronym PAE), or Sustainable Development settlements (Portuguese acronym PDS), in regions still having large continuous forested areas and a clear potential for CBFM. These models clarified land and resources rights for the communities. More recently (2010), a federal program to support family- and community-based SFM was established⁽²⁾

Brazilian CBFM projects still face many barriers. For example, Hajjar et al. (2011) analysed three case studies in the Brazilian Amazon in 2008. The challenges faced by the cases assessed are similar. Besides the financial requirements, the long and bureaucratic process for obtaining the required legal documents is a hindrance to many communities. Undertaking forestry operations is also costly. A community can decide whether to harvest timber on its own or to contract a timber company. Both schemes have advantages and disadvantages. In the case of harvesting by the community, the building and maintenance of physical infrastructure is very costly. Usually, by the time external financial support comes to an end, timber sales have decreased. In the second case, building a partnership with a timber company helps to overcome these difficulties but decreases the potential economic return for the community. According to Hajjar et al. (2011), none

⁽¹⁾ When the landholding is located in a consolidated area for agricultural purposes, as defined by the state's Ecological-Economic Zoning plan, the share is 50%.

⁽²⁾ <http://www.florestal.gov.br/florestas-comunitarias/programa-federal-de-manejo-florestal-comunitario-e-familiar/programa-federal-de-manejo-florestal-comunitario-e-familiar>.

of the three cases succeeded in developing into a self-sufficient community enterprise, independent from the support of an external agent, an issue also raised by Medina et al. (2009).

Medina et al. (2009) suggest that without subsidies, few initiatives in the Brazilian Amazon can cover their operational costs without difficulties. Moreover, attempts to enhance profit margins by using appropriate technologies that comply with legal requirements often involve high costs and are not always successful (Pokorny and Johnson 2008, Drigo et al. 2010).

Understanding monetary costs and benefits is central to developing equitable benefit sharing arrangements and assessing whether the net benefits gained from timber harvesting under CBFM are sufficient to encourage community's long-term commitment to SFM for commercial purposes. Only a few studies have focused on assessing this specific issue. Recently, Humphries et al. (2012) conducted a financial analysis of three CBFM projects based on the results of one-year assessment of their operations. Two out of the three achieved profitable annual harvests but their financial viability remained fragile, and all of them needed new subsidies or access to credit in order to cover fixed costs of salaries. Unlike other available studies, the authors included the cost of technical assistance and concluded that subsidising technical assistance may boost CBFM financial viability. Improving access to low-interest loans is recommended in order to decrease dependence on buyer financing. Investing in wood processing does not necessarily appear as the best option for small-scale CBFM financial viability but may translate into greater employment and larger salaries. The main limitations of the study are that the results were based on a one-year assessment and, as pointed out by the authors themselves, costs and benefits may vary greatly from one year to another. Moreover, the authors do not detail and extensively discuss the cash-income level that communities may expect from CBFM in the largest portion of their landholdings.

Our paper sets out to complete the issue through a detailed analysis of the annual cost and cash income provided by CBFM in the Brazilian Amazon. It is now quite obvious that without external financial support CBFM in this region will probably not generate reasonable profits, and may sometimes be unprofitable. Consequently, the following analysis does not aim at revising the estimation of CBFM financial viability by including some overlooked variables such as technical assistance that communities do not directly pay. Rather, we aim at assessing what level of additional income communities achieved through subsidised CBFM initiatives. Based on the data, we then discuss some of the existing subsidised costs. Three of the CBFM initiatives presented were followed during both the development and exploitation phases. This

enabled to expand the perspective regarding the current economic results, and the barriers that threaten the financial viability of these initiatives and to present some proposals for overcoming them.

Section 3.2 presents the case studies selected and the economic assessment methodology. Sections 3.3 and 3.4 detail and discuss the cost and benefit of each CBFM initiative. Finally, a short conclusion synthesises the main lessons learned and the proposals to support communities expecting additional incomes from CBFM for timber production.

3.2 Study site and methods

3.2.1 Case study selection

This paper focused on five CBFM initiatives, three located in the state of Pará in the eastern Brazilian Amazon and two in the state of Acre in the western Brazilian Amazon (Table II 3.1). Four out of the five cases constitute official smallholder settlement projects established by the National Land Reform Institute (Portuguese acronym INCRA), and one is located within a national forest (Portuguese acronym FLONAS). The cases selected represent different forest management models and illustrate the diversity of CBFM initiatives in the Brazilian Amazon. The selected case studies are introduced below.

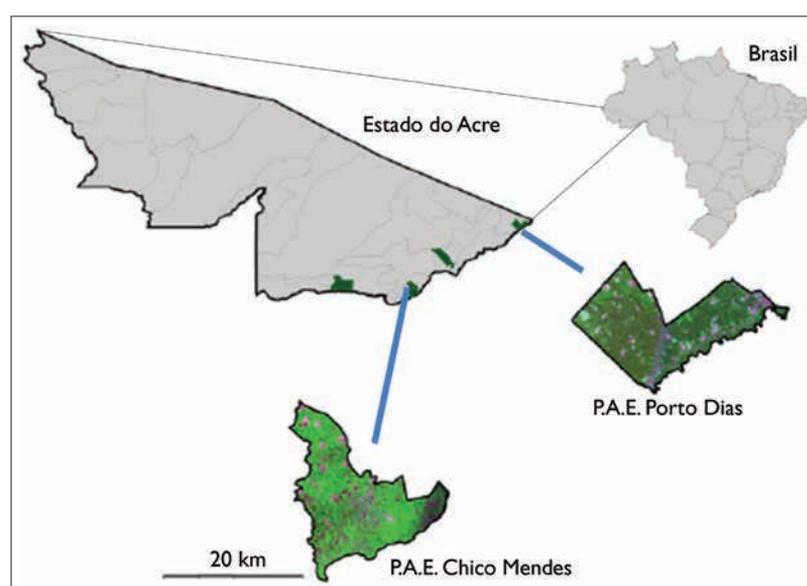
The state of Acre was a pioneer in promoting CBFM, so the oldest projects are found in this state. The Porto Dias and Chico Mendes Associations were pioneers in implementing forest management plans. Their members live in settlement models called *Projetos de Assentamento Agro-Extrativistas* (PAE) (Figure II 3.1). In 2007, they joined a cooperative called *Cooperfloresta* that today manages all CBFM projects in Acre.

According to official data, about 160 families live in these two settlements in Acre. Two types of families are found: traditional rubber tappers and former landless farmers from different regions in Brazil. The two settlements cover relatively large areas: the Porto Dias settlement covers 24 349 ha while the Chico Mendes settlement covers 24 098 ha. Each family holds about 300 ha of land, but they do not have private property rights over the land. The area belongs to the federal government. The tenure rights, which are held collectively by the families belonging to the settlement, are defined through a contract between the settler association and INCRA.

Family incomes depend mainly on rubber tapping and Brazil nut extraction. Agriculture is mostly for subsistence. Cattle-ranching is a secondary income source. When the CBFM initiatives were launched in 1996, rubber tappers were experiencing a significant drop in income from Brazil nuts as well as a decline in rubber prices that shrunk cash income from forest-

Table II 3.1 Main features of the analysed CBFM initiatives.

	Chico Mendes	CANOR	Porto Dias	Virola Jatobá	Coomflona
State	Acre	Pará	Acre	Pará	Pará
Land tenure	Concession	Individual	Concession	Concession	Concession in national forest
Number of households	45	6	12	183	180
Area (ha)	12 200	364	3 100	23 000	32 000
Annually harvested area (ha)	500	74	120	500–1000	500–1000
Logging intensity (m ³ /ha)	10	15	10	16	12
Harvesting method	Partnership logging company in 2009	CBFM mechanised	CBFM mechanised harvesting; transport sub-contracted	Partnership logging company	CBFM mechanised

**Figure II 3.1 Localisation of Acre case studies.**

based activities. In order to counterbalance the risk of cattle-ranching expansion, NGOs started to promote and support forest timber management inside extractive reserves and PAE.

The history of CBFM in Acre can be divided into two periods: before and after the foundation of Cooperfloresta. During the first period (between 2000 and 2006), the forest producers in the Porto Dias and Chico Mendes settlements were supported by the Centro de Trabalhadores da Amazônia (CTA), a local NGO, and WWF. They provided initial support in the preparation of forest management plans and certification. The objective was to prepare community members to perform all forestry activities: settlers were trained on subjects ranging from logging to selling processed timber. Afterwards, the Porto Dias As-

sociation purchased an old-fashioned sawmill while the Chico Mendes settlers tried instead to contract out to external sawmills. However, this operational model did not survive. Facing difficulties in negotiating their contracts, the settler associations joined the Group of Forest Producers of Acre (GPFAC), an action sponsored by WWF. The aim of the informal organisation was to find buyers and act as middleman in contracts to sell timber from the CBFM areas in Acre. In 2007, this informal group was dissolved, and a single cooperative (Cooperfloresta) was established to assist existing CBFM projects in the different phases of forest management.

The foundation of Cooperfloresta constituted a new phase in the development of CBFM initiatives in Acre. Since 2007, the cooperative has been in charge

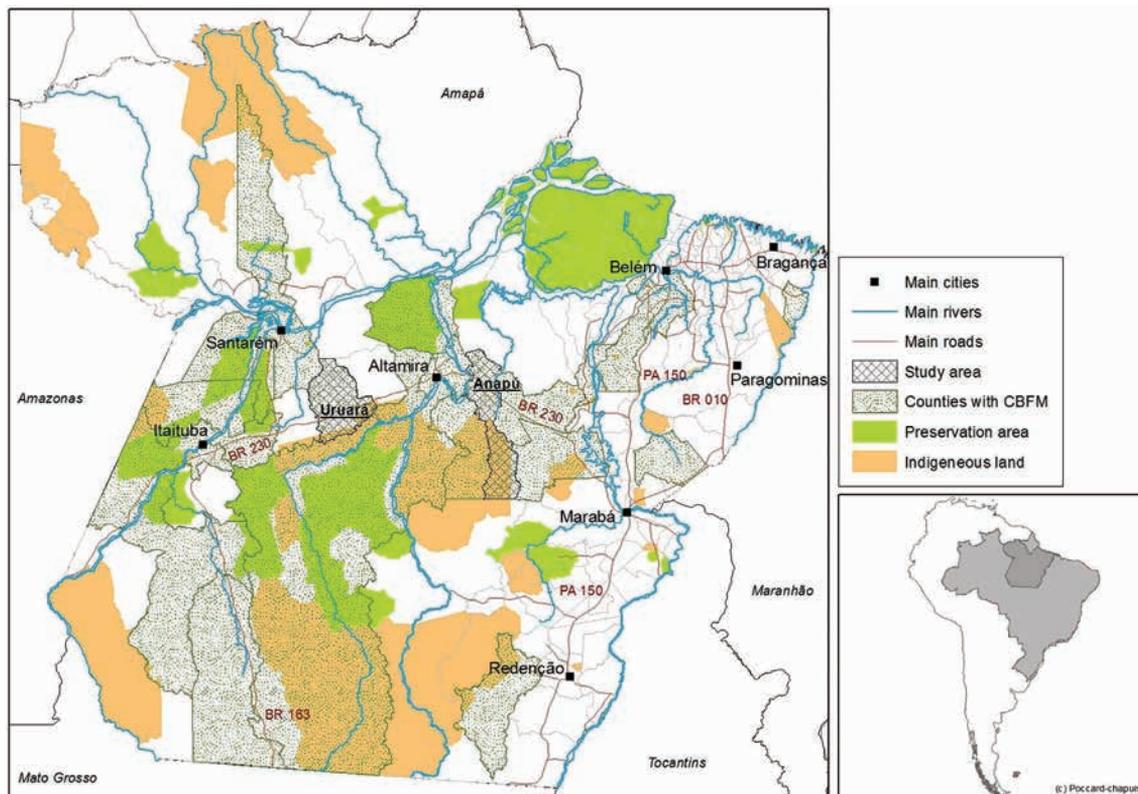


Figure II 3.2 Localisation of Para case studies.

of planning, monitoring, transporting, sawing, and trading all the timber production originated in all the CBFM projects of the state. Nonetheless, the production models have changed significantly over time based on decisions from the associations and negotiations with timber companies, which act as partners. Until 2008, the community members were still in charge of certain forestry activities, such as cutting trees, but some other services were already contracted out, such as transportation. Since 2009, both associations decided to subcontract a timber company to carry out timber harvesting and transport.

In Pará, the Agro-Extractivist Cooperative of Novos Rumos (CANOR) is a cooperative of smallholders, settled at the beginning of the 1970s in the municipality of Uruará in the Transamazon region (Figure II 3.2). These smallholders hold plots that average 100 ha, for which they are entitled to have individual tenure rights, though many have not yet received a formal title. The Brazilian Forest Law requires that these smallholders maintain 80% of their plots as legal forest reserves. However, they can extract the timber and non-timber forest products of these reserves under an approved forest management plan. On the remaining 20% of the land cattle ranching is the main income source, but farmers also produce corn and rice. Slash-and-burn practices are common. CANOR's members intended initially to

saw all the timber from their landholdings, so they acquired a Lucas Mill sawmill with public funds from the Ministry of Agrarian Development (Portuguese acronym MDA). For transporting the sawn wood out of the forest, they decided to combine the use of animal traction with tractors. Sawn wood had to be transported to buyers in rented trucks since the original idea was to sell all the sawn timber on local and regional markets.

However, CANOR's members had to reconsider these initial plans due to several factors. First, the forest management plan submitted in 2004 to the state environmental agency was only approved in 2008. From that year onward, with the technical support of the Floresta and Agricultura (Floagri) Project (Sist et al. 2010), they decided to shift to a more prudent scenario and to harvest 15 instead of 29 m³/ha. Furthermore, they abandoned partially the idea of selling all the timber as sawn wood: only the three most valued species were to be sawn after negotiating a subcontract with an industrial sawmill.

The second case in Pará is the Virola Jatobá Association initiative. The Virola Jatobá is a special category of settlement known as PDS, located in the municipality of Anapu in the Transamazon region (Figure II 3.2). The settlement was created in 2003 and covers 29 000 ha. The legal forest reserve (23 000 ha or 80% of the settlement) is a continuous area that is accessed collectively. The remaining

area is divided into individual plots averaging 30 ha each, where farmers can raise cattle and grow crops. The available official data lists 183 families living in this settlement. But, according to NGOs and settlers, many families have already abandoned their plots and some new families have arrived to occupy these plots without official permission. The settlers do not have individual land titles since the association signs a concession contract with the government. The contract guarantees long-term user rights over land and forests under specific rules. Another distinctive feature is that with the support of several local entities (i.e. the Rural Union, the Pastoral Land Commission, NGOs), the association has invested in building a community-enterprise partnership. In 2007, it signed a contract with a tropical wood flooring firm, located in Belém, the capital of the state. The contract length was initially agreed on for 15 years (2008–2023). During this period, the firm is in charge of all production activities and supports all logging costs. The price per cubic metre for each species was previously negotiated between the enterprise and the association. The Virola Jatobá Association, with the assistance of its sponsors, negotiated some other social and economic clauses to enhance benefits to the community. One of the contract clauses states that the enterprise has to employ some community members. The firm must also maintain the internal settlement roads.

The third case located in Pará has a particular history and is located in the Tapajos National Forest, in the Santarem municipality (Figure II 3.2). The forest management for timber production started in 1999 as a project supported by the International Tropical Timber Organization (ITTO) aimed at assessing whether industrial Reduced Impact Logging could be profitable. Some communities established around this project claimed that they could sustainably manage the forest. In 2001, the Promanejo programme proposed a CBFM plan. Finally in 2005, COOMFLONA, a cooperative with 180 members made up of local farmers was created to manage the CBFM project. The plan received support from the Brazilian Forest Service (Portuguese acronym SFB) and international funds (Fond Français pour l'Environnement Mondial FFEM) (Cruz et al. 2011). The model adopted is that most forestry operations are carried out by some cooperative members.

3.2.2 Economic assessment methodology

In Pará, the annual production costs supported by the communities, selling negotiations, and benefits obtained were monitored during 2007, 2008, and 2009 through two research-development projects

financed by international funds (European Fund and FFEM). In Acre, Cooperfloresta reports were used since this cooperative has been in charge of the forestry projects since 2007, thus registering annual costs and gross receipts. Moreover, in 2010 and 2011, additional interviews were carried out with association leaders in order to have a qualitative assessment of the ongoing projects.

The reported annual costs are solely those covered by the communities, i.e. those paid on an annual basis by the communities. The cost paid by development projects and public funds are not included because 1) it was not possible to get rigorous data for all the contribution from different sources and at different periods, and 2) the focus of the paper is on the estimation of cost covered by members of the communities and additional incomes generated by CBFM given such external supports – not to question the relevance of such supports. Since each plan has its own specificities and has benefited from different types of external support, it means that each cost category level must be cautiously compared. Moreover, in two case studies, timber was sold as standing trees and the harvesting cost of the timber company was not assessed since it was not supported by the community. The detailed production costs are thus only presented for three case studies and have been distributed among 1) administration, 2) preharvesting phase, covering license fees and procedures, inventory, and road/patio opening for the parcel to be harvested during the year, 3) harvesting phase covering equipment rentals or depreciation and labour costs for logging, skidding, cubage, and technical assistance, and 4) transport costs to the mill, again when supported by the community. Certification costs have been added when they were supported by the community.

Potential household income derived from each project comes from two main sources: 1) the net benefits of timber production (i.e. gross annual benefits from timber selling minus annual production costs supported by the community), and 2) salaries for community members involved in administration or forest management operations. The distribution of benefits among the community members depends on each scheme since in some cases, such as in Virola Jatobá or Chico Mendes, the benefits are not distributed but rather invested in collective goods. However, we decided to distribute the net benefits among all the families involved in order to fully discuss the potential cash income a family can expect from such a CBFM plan. As the data was collected in 2008, 2009, and 2010, we adjusted 2008 and 2009 values with the observed IPC (Consumer Price Index) up to 2010 (5.9% between 2009 and 2010 and 10% between 2008 and 2010) in order to correct for inflation. For all the calculations, the following exchange rate was used: USD 1/BRL 1.72 in 2010.

Table II 3.2 Production costs supported by the communities in COOMFLONA, Porto Dias, and CANOR (USD).

	COOMFLONA 2008*	CANOR 2008*	Porto Dias 2010
Administration	130 038	10 552	31 758
Preharvesting	78 324	2 974	12 149
Harvesting	85 637	8 476	70 965
Skidding	74 378	6 044	
Transport	85 695	39 067	34 813
Certification			4 585
Association			2 846
Total	379 694	61 069	157 116
m ³ harvested	7 843	1 048	1 326
Cost/m ³	48	58	119

* cost in 2008 adjusted by the inflation rate between 2008 and 2010 (10%)

3.3 Results

3.3.1 Production costs

Table II 3.2 shows that the total production cost covered by the communities varied from USD 48/m³ harvested up to USD 119/m³. Two main reasons explain such a large variation. The Porto Dias community subcontracted a timber company for log harvesting and transport. The negotiation was not favourable for the harvesting phase since the firm quoted USD 53 983 to harvest, or almost USD 41/m³, whereas the cost was only USD 18/m³ and USD 11/m³, respectively, in the COOMFLONA and CANOR cases (harvesting cost and trail opening). Moreover, technical assistance supplied by Cooperfloresta during the exploitation phase was included, as it was charged by the cooperative, whereas such assistance was financed through external funds in the other two cases. For CANOR and COOMFLONA, skidding was the largest share of the production costs. Skidders were rented in both cases and the rental rate alone amounted to 70% of the skidding costs.

The significant variations found in the share of preharvesting costs were only linked to the fact that, for COOMFLONA, they covered trail and patio opening, inventorying, and the formulation and submission of the annual harvesting plan. In CANOR, inventorying and annual operational plan formulation and submission costs were fully supported by external funds. In Porto Dias, road and patio opening was included in the activities of the subcontracted timber company. Thus the level of annual preharvest-

ing cost, when fully covered by community members, was about USD 9–10/m³.

Log transport (including timber loading) was in every case a major share of the production cost, but it was largest in CANOR (61% of the total cost). The unit log transport cost varied from USD 11/m³ in COOMFLONA up to USD 37/m³ in the case of CANOR. In CANOR and Porto Dias, log transport and loading were contracted out at an average price of USD 37/m³ and USD 26/m³, respectively. In COOMFLONA, a loader and a truck were rented. The loader rental rate accounted for the largest share of log transportation costs (USD 10/m³) and the transportation costs supported only covered log transportation to the patio.

Administration costs were substantial in COOMFLONA and Porto Dias because they covered the salaries of the team in charge of plans, responsible for all the procedures, tax/fee regularisation, sales negotiations, and accountancy as well as the running costs for the building and equipment (truck, chainsaw) of the association and cooperative.⁽³⁾ It was clearly a major fixed cost, but it also had some important benefits since there was a full team dedicated to management and operational planning from one year to another. In the case of CANOR, until 2009, the plan benefited from the support of an external team, financed by an external project, but in practice only one person, the association president, was in charge of plan management: the submission of each annual operational plan, harvest planning, sales negotiations, taxes payments, services contracting, etc. are difficult for one person to manage. Even in this last case, the administration cost was substantial, covering several trips to the state capital (Belém) made by the manager to formalise the plan and the association, as well as to pay annual taxes/fees.

A major initial cost not included in the data was the cost of drafting and submission of the management plan. Such initial costs were funded mainly by the Promanejo programme (cases: CANOR, Virola Jatobá, Porto Dias, Chico Mendes) or by an external funding agency such as ITTO, in the case of COOMFLONA. It was very difficult to obtain data on the cost of this first phase. However, the interviews conducted and data collected provide an idea of the level of this initial cost. CANOR received USD 265 116 in 2004 from Promanejo and about 50% of this amount was used to pay for the delimitation and forest inventory of the 24 blocks (a prerequisite for preparation of a technical forest management plan)

⁽³⁾ The detailed distribution of such cost is only available for COOMFLONA: 28% for administrative staff salaries, 30% for office expenses, 27% for equipment depreciation and running costs, 10% for taxes/fees, 5% external consultancy (more details in Santos Melo et al. 2011).

Table II 3.3 Benefits from CBFM in the five cases studied (USD).

	Coomflona 2008**	Canor 2008**	Porto Dias 2010	Virola Jatobá 2008**	Chico Mendes 2009***
Total cost	379 694	61 069	156 535	27 014	108 713
Sales	693 224	77 090	192 794	139 794	203 848
Subsidy			17 811		53 095
Net benefit	313 530	16 021	54 070	112 780	148 230
Net benefit/m ³ *	40	15	41	28	31
Net benefit/household	1742	2670	4506	616	3294

* m³ harvested
** for the production cost, all values for 2008 have been adjusted by the inflation rate between 2008 and 2010 (10%)
*** all values for 2009 have been adjusted by the inflation rate between 2009 and 2010 (5.9%)

and the elaboration of the forest management plan and the first operational plan by a forest engineer. The same level (USD 136 364) was reported by Virola Jatobá Association.

3.3.2 Benefits

Table II 3.3 shows the total benefits for each plan, the annual benefits for each cubic metre harvested, and the annual benefits obtained per household, assuming that the total benefit was distributed among all households involved in the association holding the plan. As mentioned previously, each community decided to distribute the whole or part of the benefit obtained or to invest in collective goods. Only CANOR and Porto Dias completely distributed the total benefit among all the households holding the plan.

All of the plans ultimately provided a net benefit and thus succeeded in selling timber at a higher average unit price than the average unit production cost supported by the community. The lowest benefit per cubic metre was obtained for CANOR. In fact, the situation remained quite critical until the end of 2010 because the total timber volume sold up to 2010 was only 551 m³ (gross sales: USD 40 517) and thus the cooperative remained for some time with a negative balance. Amaral Neto et al. (2011) carried out a survey on behalf of SFB and reported that the community ultimately succeeded in selling the remaining harvested timber. The lowest net benefit per household was calculated for Virola Jatobá. Timber production was lower than expected; instead of harvesting 8000 m³ from 500 ha, the enterprise harvested only 4054 m³ of round timber because of an overestimation of the timber potential by the previous forest inventory. Some trees that had been marked for harvesting were located in preservation areas so were not removed and there was also a higher occurrence of hollow trees than anticipated.

The highest net benefit per cubic metre harvested was calculated for COOMFLONA and Porto Dias,

despite their relatively high production costs. The high sales prices negotiated explain the positive results. COOMFLONA and Porto Dias succeeded in negotiating prices of USD 122/m³ (4) and 145 USD/m³ (including transport costs), respectively, whereas the sale price for CANOR was USD 73/m³. (5) Moreover, Porto Dias and Chico Mendes settlements benefited from a significant additional subsidy from the state government of Acre. COOMFLONA benefits could have been much higher because they harvested 7843 m³ but succeeded in selling only 5704 m³ of round logs in 2008.

Some additional income is derived by households with members involved in plan administration or forest management operations (Table II 3.4). For Chico Mendes and Porto Dias, none of the community members were employed by the timber companies in charge of the harvesting phase, and plan administration was exclusively ensured by Cooperfloresta. Table II 3.4 shows that the additional income was quite significant for households involved in administration or forest operations and often surpassed what might be expected from the net benefit distribution of the plan. (Figure II 3.3)

3.4 Discussion

In our case studies, the total additional income per family varied from USD 616/family up to USD 5347/family. Such values are equivalent respectively to 0.16% and 1.4% of the minimum salary (6), a rela-

(4) USD 110/m³ in 2008 adjusted at a 10% inflation rate between 2008 and 2010.

(5) USD 67/m³ in 2008 adjusted at a 10% inflation rate between 2008 and 2010.

(6) The Brazilian minimum salary in 2010 was USD 297 / month distributed over 13 months (<http://www.portalbrasil.net/salariominimo.htm#sileiro>).

Table II 3.4 Total income per family including salaries (USD).

	Number of households	Net benefit per family	Salary	Total income per family
COOMFLONA				
With member involved in administration	10	1742	3605	5347
With member involved in forest management	42	1742	3000	4742
Virola Jatobá				
With member as permanent worker for the timber company	2	616	2895	3511
With member as temporary worker for the timber company	10	616	3837	4453
CANOR				
With member involved in forest management	4	2670	469	3139

tively low value when one considers that 80% of the land is locked up and cannot be converted to other uses. In the state of Pará, Sablayrolles et al. (2013) show that on a per-hectare basis, incomes from agriculture are often higher than incomes from timber harvest. Higher additional income only occurred for community members directly employed by a private timber company or involved in plan administration or forest operations. Moreover, CBFM positive net benefits are not always sustained each year. A look at the history of some of the case studies reveals several years without benefits following plan approval: four years for CANOR and Virola Jatobá; two years for Porto Dias and Chico Mendes. The reasons are linked to the difficulties in initiating forest operations and to market uncertainty. Sometimes it is not possible to reach an agreement for timber sales, harvesting becomes very risky, and the community lacks capital to cover preharvesting and harvesting costs. After 2010, all initiatives except that of CANOR succeeded in renewing their forest operations, highlighting the importance of internal organisation schemes (such as COOMFLONA, Cooperfloresta), and/or partnerships with a private timber company even though this may appear somewhat costlier in the short term.

Market conditions are still unfavourable to CBFM projects that lack support in the commercialisation phase. Despite the federal government's effort to fight illegal logging, local sawmills are still supplied by illegal sources. Timber from indigenous lands and settlement areas continue to supply many sawmills with or without the cooperation of the indigenous people and settlers, pushing timber prices down. The case of CANOR illustrates this situation. Several attempts were made with various timber companies to negotiate and sign a sales contract before harvesting,

but not even an oral agreement was reached. The cooperative only succeeded in selling its production after harvesting at a lower price than in the other case studies. The sales price did not differ because CANOR sold predominantly less-valued species: 51% of the timber sold for CANOR was of the highest valued species⁽⁷⁾, compared to 52% of highest value timber sold for Porto Dias⁽⁸⁾. Cooperfloresta intermediation and the fact that the Porto Dias plan was certified by Forest Stewardship Council (FSC) clearly made the difference during sales negotiations.

Reaching national or international markets remains a challenge for such communities. The buyers of Brazil's central region (Brasília) and southeastern region (São Paulo) demand processed wood that is costly and risky to produce. They are very strict about timber quality and the communities are not equipped or prepared to produce high-quality processed timber.

Even with strong support for marketing, the existing market chains lead to some difficulties in selling the entire production harvested at a remunerative price. The legal requirements of the forest management plan forbid harvesting the same parcel twice without waiting for the legal rotation period. Thus, communities often prefer to harvest all species even if they have not yet found a buyer for some of them. Thus, significant timber volumes can remain unsold, significantly decreasing the final benefit, which is what occurred for COOMFLONA. Community-enterprise partnerships may help reduce such risks, as timber companies are more skilled at processing logs and finding suitable markets for the end products. However, a community member of the Virola Jatobá Association claimed the enterprise tried also to harvest the most valued species to the detriment

⁽⁷⁾ Maçaranduba (*Manilkara Huberi*), jatoba (*Hymenaea courbaril.*), muiracatiara (*Astronium lecointei.*)

⁽⁸⁾ Cumaru ferro (*Dipteryx odorata*), garapeira (*Apuleia olaris*), ipê amarelo (*Tabebuia serratifolia*), ipê roxo (*Tabebuia impertiginosa*), angelim pedra (*Hymenolobium petraeum*), and maraçanduba (*Manilkara huberi*).

of other species that the community was interested in selling.

Given such market uncertainty, it is important to enhance communities' knowledge of the market value of timber stock in their legal forest reserve areas. In general, each community, supported by donors, manages to inventory the first parcel to be harvested. However, an extensive inventory in the entire forest reserve might avoid false expectations regarding potential benefits and prevent investing in elaboration of a plan with very limited financial viability. A full forest inventory can enable settlers and communities to better plan future timber sales and better guide logging operations. Markets need to be developed for the numerous less-valued species that are always difficult to sell since timber companies, as main direct buyers, are not interested in these species.

Securing market access at prices that make CBFM plans financially viable may be the first step to enhance CBFM potential in the Amazon and allow for more efficient use of public funds. For example, when the local or regional governments need to buy timber to build schools, medical centres, public housing, and other projects, they could preferentially buy it from areas under CBFM plans at guaranteed prices. The current procurement mechanisms do not allow this because the supplier chosen is usually the one offering the timber at the lowest price. Furthermore, establishing an official list of minimum prices for timber from CBFM projects may help CBFM managers reduce speculation while negotiating with buyers⁽⁹⁾. Public bidding systems, such as in COOMFLONA could also offer a mechanism for improving market access.

Looking at cost issues, it is clear that initial costs (i.e. inventory costs, preparation of forest management plans and annual operational plans, costs to start the bureaucratic process of approval, and follow-up) are prohibitive for the communities. In the cases where information was available (Virola Jatobá and CANOR), it seems to have exceeded USD 130 000. Though community members can possibly be betrayed by unethical professionals who overcharge for their services, particularly once they know that public funds are available, it is also true that contracting the services needed to draw up a forest management plan in the Amazon region is expensive. There are few forestry engineers and technicians available and their fees are usually high. Besides such services, the community members incur costs for travel to register documents in the state capital. For the Virola Jatobá plan elaboration and submission, travel expenditures and taxes/fees amounted to USD

9800 and USD 10900, respectively. In 2010, a new INCRA regulation made forest management plan approval even more complicated by increasing the control over potential illegal arrangements between smallholders and loggers. Forest management plans in settlements must be evaluated by INCRA to obtain full approval, which means a double approval process. Unfortunately, in Brazil, very little data exists on the cost of drawing up a forest management plan, even for private companies (Sabogal et al. 2006). The smaller the volumes available for harvesting, the greater the weight of this fixed initial cost.

Such initial costs could be reduced with a more efficient administrative system and the possibility of registering forest management plans without travel to the state capital. As such a phase is systematically covered through the use of public funds, it could be argued that a public institution or an organisation directly paid by a public institution ought not to be entirely in charge of CBFM plan drafting and submission. For example, in Acre, the state government implemented a bidding system to contract forestry services to draw up, submit, and monitor CBFM plans.

In some cases of community-enterprise partnerships, the timber company supports the cost of formalising the forest management plan. But such cases can be expected to remain limited to communities with large forest reserves or, as in some cases, when the timber company plans to obtain legal access to the timber for the first harvest without taking care of post-silvicultural treatments (Amaral Neto et al. 2011).

Preharvesting and harvesting costs are substantial and there is little room to reduce such costs, except perhaps by investing in skidding equipment. Santos Melo et al. (2011) estimated that COOMFLONA could decrease skidding costs by 30% by investing in a skidder, which would also provide more flexibility for this phase and could be rented out to other communities.

The poor condition of internal settlement roads and external roads raises transportation costs. The case of CANOR is critical, but the situation may be the same for all smallholders with separate plots willing to invest in CBFM. Road improvement is necessary, as the poor conditions impose high sales costs for everything that settlers produce, including timber. However, road improvement cannot greatly reduce costs because the major share of transportation costs come from the rental of transportation and loading equipment.

Finally, looking at tenure issues, even if there has been significant improvement in legal access of communities to large forest areas, particularly through the expansion of RESEX, PDS, and PAE, it does not necessarily guarantee substantial additional income at the family level or full property rights. The issue

⁽⁹⁾ In Brazil, a system of minimum guaranteed price already exists for smallholders' agricultural outputs.



Figure II 3.3 Community workers measuring logs. ©Isabel Driego

of benefit sharing from CBFM in PDS is not clear and a potential source of conflict. Moreover, communities are still vulnerable to invasion from illegal loggers: in Virola Jatobá for example, the association complained regularly about illegal extraction in their forest reserve but control and sanctions were insufficient.

3.5 Conclusions

In the Brazilian Amazon, CBFM initiatives for timber production can be financially viable subject to significant public financial support and/or partnerships with private companies. Even with such support, the cash income a smallholder can gain from CBFM on 80% of his land is not sufficient by itself to sustain the family's livelihood. If smallholders are assumed to improve their incomes from their landholdings, while preserving 80% of the forest, it thus seems necessary to invest in research-development activities to support the implementation of sustainable cattle ranching and agricultural activities in the limited area allowed to be deforested or to find a way to increase SFM profitability. Other benefits from SFM are provided (some employment generation,

income diversification) but they were not systematically studied in this contribution.

Guaranteeing market access at remunerative prices for timber from CBFM projects is a priority for enhancing CBFM financial viability. The options to reduce production costs are limited, but some of the case studies illustrate that, even with high production costs, CBFM projects may succeed in producing net benefits when the communities have support in negotiating sales prices. Many communities, however, are not in such a situation.

Timber potential in smallholder forest reserves is unknown. Given the large initial fixed cost of drawing up, submitting, and initiating a collective forest management plan, a better assessment of such potential is required through a systematic inventory.

Keeping within the forest law is quite a long and costly process for communities that are often in very diverse situations in terms of such factors as land tenure, cooperation with private firms, and public and private technical support. The current legal framework can be simplified and should keep a certain level of flexibility to enhance smallholder investment in SFM for timber production.

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