

Article

Logging Community-Based Forests in the Amazon: An Analysis of External Influences, Multi-Partner Governance, and Resilience

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Abstract: Over the last few years, forest-based communities have faced two different but related phenomena. On the one hand, they have become more integrated with global economies, accessing regional and international markets. On the other, they have been pressured by economic groups into becoming part of the ecologically unequal exchange that exports natural resources and generates social and environmental problems at a local level. However, within new approaches to managing common-pool resources in common properties such as sustainable-use protected areas, communities are finding their own ways to be resilient and to face the two phenomena that are part of the same global economic system. Communities have built a multi-partner governance system for forest management and community development that involves agents from the civil society, state and market. Accordingly, multi-partner governance has proven to be a strategy to protect community-based forests against increasing timber market pressure. The question that then emerges is, to what extent has multi-partner governance been effective in supporting forest-based communities to be resilient and to face pressures from the global timber market in forests under community use? The aim of this paper is to analyze forest-based community resilience to the global economic system in situations where common properties are under governance of multiple stakeholders. The research is based on a singular case study in the Tapajós National Forest, Brazilian Amazon, which is a sustainable-use protected area with 24 communities involved in a multi-partner governance system. The article shows that forest-based communities under pressure have been resilient, and facing the global economic system have created a community-based cooperative for managing timber and engaging all partners in the process to improve their collective action. The cooperative provides timber sales revenue that supports community development both through diversification of agroforestry production and building of infrastructure as collective benefits.

Keywords: community forest management; protected areas; cooperation; resilience; development; human well-being; policies

1. Introduction

Community forest management (CFM) has been presented as a strategy to protect forests against increasing forest degradation and as an alternative from timber sales to generate revenue for

communities. This revenue, in turn, supports community development through both diversification of agroforestry production and collective benefits [1–3]. In fact, CFM has proven to be a new approach through which local communities enter into the global timber market while still maintaining its awareness of local issues to assure local livelihood improvements. Within new approaches for managing common-pool resources in common properties such as sustainable-use protected areas, forest-based communities are finding ways to be resilient in a global economic system based on extensive natural resource use, local environmental degradation, and social conflicts. Resilience refers to the capacity of a system to absorb shocks and disturbances and still maintain essential properties through renewal, adaptation, transformation, and innovation [4–6]. Resilience in a complex social-ecological system (SES) is a dynamic concept going beyond sustainability and disturbance in ecosystem services; it includes social capacity for change at different levels (local to global) [4,5].

Despite the well-known importance of forests in maintaining biodiversity and providing ecosystem services, most tropical forest systems continue to be pressured by excessive forest degradation and deforestation [7–9]. The main causes of this are rooted in economic drivers that are associated with political and social issues [8]. Indeed, there is an association of loss and disturbance of the tropical forest with the global economic system that is based on international trade and an ecologically unequal exchange [10,11]. The dominant model for development based on economic growth has long been contested due to its negative outcomes and increase of inequalities [6,12,13].

The exploitation of natural resources with environmental degradation and social injustice has its roots in power dynamics that maintain political and economic influence on the means of production to generate profits for elites [14]. For example, forest-based communities are constantly pressured by both economic and political groups interested in accessing high-value natural resources such as timber. While these communities depend on forests for their livelihoods and cultural maintenance, timber companies are only interested in maximizing profits, even if their activities result in environmental degradation and social problems [15–17]. Within globalization and the neoliberal system, local communities are becoming more integrated with global economies accessing regional and international markets at the same time as they are being pressured by economic groups. As a result, they are becoming part of the ecologically unequal exchange that exports natural resources and locally generates social and environmental problems [15]. Resilience emerges as a capacity of local communities to deal with this new era where historically local forest-based users such as indigenous people and traditional communities (tapper rubbers, others) were undervalued, and now they participate as important socio-environmental agents in the global scenario to conserve forests.

With appropriate democratic ownership and control over forests, local communities have provided positive outcomes for both the environment and society [18–23]. Communities are based on local social norms, social capital, and traditions that can mitigate severe consequences of ecologically unequal exchange such as forest degradation, deforestation, and social conflicts [24]. They have knowledge and means such as local know-how and organizational capability to both manage forests and provide products (roundwood, timber furniture) to the demanding timber market with appropriate tools and techniques for maintaining standing forests and providing better conditions for local livelihoods [19].

However, forest-based communities do not have full rights to access and use forest resources [25–27]. This is especially common in co-management regimes, in which governments and local-based stakeholders share the joint responsibility to manage forests systems [26,28]. Many governments retain significant authority over forest management rights and local communities rarely have access to valuable resources, such as commercially valuable timber [1,25]. Emphasis is often on community responsibility for protection rather than on authority to manage forests [28]. Cronkleton et al. [26] reveal that state regulations to guide decisions toward forest use involved limited community participation in management, preventing access to benefits by local-based forest users. The authors argue that “mechanisms are needed to facilitate dialogue between state agencies and communities so that more local input contributes to the design and revision of regulations within co-management systems” [26] (p.101). In this sense, multi-partner governance has the potential to

build minimum consensus to achieve social and environmental dilemmas, such as who has rights to access and use the natural resources [26,29]. The multi-partner interaction could ensure resource complementarity (human, financial, and technological resources) toward forest conservation and local development to benefit forest-based communities [20–22].

This study tries to understand to what extent multi-partner governance is effective in supporting forest-based communities to address pressures of the global timber market in forests under community use. The aim of this paper is to analyze forest-based community resilience to the global economic system in situations where common properties are under governance of multiple stakeholders. The research is based on a singular case study in the Brazilian Amazon, precisely the Tapajós National Forest (TNF), a sustainable-use protected area that has 24 local communities. We investigate the how forest-based communities respond in terms of forest conservation and local livelihood improvements to pressures driven by the global timber market.

This article is divided into three sections besides this introduction and conclusions. First, in sections one we briefly discuss the meaning of community forest management and multi-partner governance for natural resource management. In the second section we provide information related to the TNF case study, seeking to show under which conditions CFM was implemented. In the third section we analyze the outcomes from the multi-partner governance system installed in TNF. We discuss the emergence of hybrid multi-level governance across state, market, and civil society, which demonstrates the power of partnerships to promote forest conservation and community development. We also discuss under which conditions the forest-based community has been resilient. The concept of resilience is understood as community capacity to address local issues in a new scenario that causes disturbance (timber market pressures) on the local social and ecological system. Finally, because multi-partner governance is a centerpiece of CFM in the TNF, we close the article with recommendations for the critical challenges that multi-partner governance faces in the case study. Lessons from this practice-based knowledge are relevant where governments face challenges to decentralize power and decision-making, while local communities acquire more rights to make decisions related to natural resource management.

1.1. Community Forest Management: Constraints and Opportunities

One factor that contributes to variability in CFM across countries is the type or combination of property rights held by communities that range from community-based to co-management arrangements [23]. Property rights can affect which CFM activities are pursued, how, and with whom. In turn, certain bundles of rights drive CFM schemes described as forest management in community lands, community–company partnerships, small-scale forest-based enterprises, and smallholder forestry [1,30–33]. While CFM can theoretically improve local livelihoods and contribute to conservation initiatives, especially in the tropics [23], a vast body of literature reveals that in practice the results are mixed [24,30,34]. For instance, while income has tended to increase, questions remain about other livelihood benefits gained and the long-term financial and ecological viability of timber management [2,31,35].

Many forest-based communities have transitioned from passive participation in government-led initiatives to active control over forest resources. As the number of local communities that have (partial) rights to manage forests has increased, so has the number of communities that engage in timber management [25]. Many communities that have been granted more management rights now have more autonomy over their forest resources and can participate in formal timber markets (logging is legally permitted). Although these communities may have been informally logging for local use for generations and logging has been part of their livelihoods, they are inexperienced in forest management for commercial timber markets [36], as well as in reduced-impact logging (RIL), an essential component of sustainable forest management. RIL refers to the use of planned and controlled implementation of timber harvesting operations to minimize environmental impact on standing forests and forest soils [37]. Usually, state agencies require adoption of RIL components (pre-harvest inventories, defined

harvest intensity, cutting cycles, skid trail planning, and liana cutting) when communities venture to sell timber [38]. Therefore, communities must comply with regulations and seek governmental approval to log commercially [1,26].

Forest-based communities have an important role in both tropical timber supply and forest conservation. In Latin America, for instance, communities legally manage 216 million hectares of forest (one-third of the forested area). In 2010, the countries with the largest publicly-owned forest area under community management were Brazil and Colombia, with 152 million and 30 million hectares, respectively [1,27]. Within multiple-use forest management, logging on community land is an important component of forest production, local economies, and conservation agendas.

In Brazil, although government strategies such as private logging concessions (areas allocated by a government for logging in a public forest) have the potential to supply tropical timber for regional and international markets, surprisingly, they have not yet achieved this objective. Of the 5.3 million hectares available for timber production in publicly owned forests, only 1 million hectares were under effective logging in 2017 [39]. Furthermore, it took more than 10 years after approval of the Public Forest Management Law (Federal Law 11.284/2006) to reach this number. A recent and unprecedented study shows that the Effectiveness Index of forest concessions is still very low (less than 20) [40]. Community areas have been identified by the timber industry as potential suppliers, and with reason. In the past ten years, communities have been granted more management rights to participate in formal timber markets (where community timber management is legally permitted) [41].

If, on one hand, local communities are becoming more integrated with global economies (i.e., accessing regional and international market, being pressure by economic groups), on the other hand, tropical forests are continuously being pressured by economic activities as well as political and social forces [7,8]. Brazil contains the greatest portion of the remaining tropical rainforest in the world [42], which has lost 17% of its original forest cover [43]. Since the 1960s, the Brazilian government has promoted and provided incentives for large-scale infrastructure projects such as hydroelectric power plants, mining, and roads, as well as settlement projects focused on agricultural production (different scales) and cattle ranching [17,44]. Currently, the major drivers of deforestation are soy and beef cattle production, while selective logging, fuelwood collection, and wildfires are the major causes of degraded forests in that region [10,45,46]. Selective logging and agribusiness supply foreign markets, particularly the United States and China [10,47], and both productive systems are based on intensive use of natural resources with negative impacts on family farming, indigenous people, and local community livelihoods [48].

Collaborative approaches to CFM (forestry practiced on land that has some form of communal tenure and requires collective action) have provided an important vehicle through which tenure rights and responsibilities have been decentralized and forest devolved to local communities, but have also provided an avenue for conserving extensive tropical forested areas [26,49]. Research on CFM, and particularly on collaborative approaches to CFM, has been accumulating since the mid-1990s, resulting in a significant body of knowledge to inform both the implementation and governance processes, especially for cases where local community management rights are recognized by regulatory frameworks but where the state maintains the political responsibility to conserve biodiversity and landscapes [26]. Nevertheless, there are substantial gaps between science, policy, and practice regarding collaborative forms of CFM in contexts where governments and communities share responsibilities and rights in managing forests [1].

1.2. Multi-Partner Governance

The increased recognition of the human dimensions of managing natural resources has expanded opportunities for local communities and civil society organizations to participate in natural resource management—NRM [50,51]. This is because “all humanly used resources are embedded in complex, social-ecological systems” [18] (p. 419) and conservation is too complex to be addressed by a single sector [29,52]. Thus, governance is a critical component of the socio-environmental agendas, considering

that the scope and definition of this term varies considerably across disciplines [53,54]. Here, governance is applied to the natural resource management sphere and refers to a continuous process that creates and enforces rules related to people's access to and use of natural resources [55,56]. This definition comes from an extensive discussion of governance scholarship that understands this term as an emergent approach of environmental governance [56]. In natural resource management research and practice, both multi-level (local, meso, macro) and multi-sectoral governance approaches can provide the tools, rules, and resources for more equitable decision-making process and outcomes [57–60].

Some governance approaches (top-down) can be exclusionary, particularly where powerful actors marginalize local populations and deprive them of rightful access to resources (e.g., forest-based communities). The emergence of new forms of governance related to complex SES has further integrated states, markets, and communities to more equitably distribute power in natural resource use and to increase legitimacy of the process, participation, transparency, representation, inclusiveness, accountability, fairness, vertical integration, empowerment, and adaptability [29,57,61]. In this sense, multi-partner governance focuses on the social contexts that collectively mediate the complexity and uncertainty inherent in SES [56,62]. Considering the integration of the three main arenas of social interactions—states, markets, and communities [29]—the idea is to address challenges in natural resource management using a variety of perspectives [56].

Under democratic governments, civil society can monitor and/or participate in natural resource management, and people and local organizations may engage in decision-making through various strategies, approaches, or use of tools. In Brazil, for instance, sustainable-use protected areas typically have a governance committee composed of local and federal governments, local communities, community-based organizations, non-governmental organizations (NGOs), and universities. The premise is to recognize and consider different points of view in decision-making about how to manage natural resources achieving conservation and dignified conditions for local people [59,63].

Multi-partner governance emerges from the recognition that interactions between humans and nature are complex [29,64]. These interactions require multi-stakeholder involvement to address the multiple facets, scales, and interdependencies of contemporary social and environmental problems. No single sector (state, market or civil society) possesses all capabilities and resources to address the problems alone [29]. Multi-partner governance also emerges as an alternative to create suitable conditions for better distribution and exercise of power. This is especially critical in natural resource co-management systems, defined “as power-sharing in the exercise of resource management between a government agency and a community or organization of stakeholders” [65] (p. 331). Co-management refers to two or more social actors deciding, and usually struggling and negotiating, amongst themselves to define and share rights, responsibilities, and benefits of a SES [66].

In CFM, of all forest products (timber, seeds, fruits), selective logging has received special attention from environmentalists and governments, because it is often the most financially attractive, the most complex to manage sustainably, and has the most severe impacts on ecosystem services (e.g., carbon stocks and water) [67]. The co-management aspect of a governance systems refers to the process that involves both private and public actors in formal interactions towards NRM. Governance in this context means a new arrangement of management in which in some way the social actors share values, ideas, power, and resources in favor of a common goal [68,69].

The multiplicity of objectives and beneficiaries associated with co-management precludes the full satisfaction of everyone's wishes [70]. In nature conservation initiatives, needs and interests of forest-income dependent communities are often neglected, resulting in conflicts [71]. Tenure reform has opened economic opportunities for CFM through the devolution of management rights, and CFM is critical for conservation as well as poverty alleviation [26]. Since these reforms were initiated, CFM regimes have expanded to encompass about 11% of the world's forests [25]. However, the devolution of rights and their associated power to community-level stakeholders is usually incomplete [26,28]. Some rights are reserved for the state or are not exercised without official oversight or control. Collective-choice rights are particularly withheld by the state since they might empower local-level

actors. In addition, rights to exploit timber and other natural resources (i.e., mining, oil) tend to be reserved by the state, often to favor elite or corporate interests [52,72,73].

How to designate who owns forest tenure rights is still complex, particularly in the Global South. Local communities manage forest resources according to their own traditional ways of governing and managing them, but state laws have been established on top of those that demand more or less the same outcomes. But it might be problematic that there are two sets of laws (“de facto” and “de jure”) because communities and their norms are dynamic [74]. Adding to that complexity, governments have interests in controlling forest tenure rights as a legal avenue for overseeing forest degradation and deforestation [26].

In most countries, local communities forfeit their collective-choice rights and accept operational-level rights in exchange for continued access to and use of forest resources. Forest management rights, for instance, are generally prescribed in the regulatory framework (laws, policies, rules, and regulations) and can include such things as preparing management plans, carrying out forest inventories, and obtaining approval from government officials to harvest, transport, and/or sell timber [1]. Thus, communities might accept this regulatory framework in order to have tenure security, especially when natural resources are under exploitation pressure by external actors [75].

Spaces for inter-sector dialog and minimum consensus building can achieve social and environmental dilemmas about who has the rights to access and use the natural resources. Governance processes that involve different perspectives from a variety of multi-stakeholders can provide the means to empower local-based stakeholders, such as forest-based communities, to decide better alternatives for using their natural resources. Governance can be defined as participation, transparency, deliberation, accountability, empowerment, social justice, and a multilayered and polycentric organizational process [57]. In a common-pool resource (CPR) context, where the natural resource is governed under joint private (communal) and public (government) management [76], multi-partner governance emerges as an alternative to deal with different stakeholders’ interests. Going beyond participation and deliberation in decision-making, the social actors can work together to implement and monitor the planned actions to devise new forms of governing the common-pool resources such as forests and fisheries [29,76].

2. Materials and Methods

Our analytical-descriptive study uses a singular case study research design [77]. We focus on the case of a sustainable-use protected area in the Brazilian Amazon called the Tapajós National Forest (TNF). We collected data from multiple sources, which allowed us to draw from a variety of historical and behavioral aspects of the phenomena being studied [77,78]. The advantage of using multiple sources of evidence is related to what is called “convergent lines of investigation” [77] (p.143) and the process of triangulation of primary and secondary data sources by three techniques of data collection: semi-structured interviews, archival research, and participant observation [78].

Fourteen semi-structured interviews were conducted with staff members of different regional and local organizations (Table 1). The interviews consisted of open questions to guide the interviewer, and interviews lasted an average of one hour and thirty minutes. Semi-structured interviews covered information related to (a) conditions in which the community began running the community forest management; (b) partnerships established (institutional, financial, technical), and government projects that supported logging activity operations; (c) institutional mechanisms, such as inter-sector dialog and partnerships to support the community-based cooperative logging activities; (d) external pressure on timber resources (illegal logging and requests from timber companies for commercial partnership); (e) mechanisms to conserve local forest resources; (f) mechanisms to promote community development; (g) multi-partner governance system constraints; and (h) future perspectives for maintaining multi-partner governance system as a way to improve CFM in the TNF.

Table 1. List of organizations interviewed, a brief description of the organization, and the number of organization members interviewed.

Organization	Acronym *	Brief Description	Number Interviewed
Federation of Organizations and Traditional Communities of the Tapajós National Forest	FCFT	Representative entity of the forest-dwellers of the Tapajós National Forest. FCFT holds the land use concession contract.	01
Mixed Cooperative of the Tapajós National Forest	Coomflona	Community-based cooperative that does forest management in the Tapajós National Forest.	04
Brazilian Forest Service	SFB	Governmental agency responsible for the management of public forests.	01
Brazilian Institute of the Environment and Renewable Resources	IBAMA	Governmental agency responsible for the approval of community forest management in Tapajós National Forest.	01
Chico Mendes Institute for Biodiversity Conservation	ICMBio	Governmental agency responsible for the management of federal conservation units such as Tapajós National Forest.	02
Federal University of Western Pará	UFOPA	Public university located in Santarém, Pará state.	02
International Institute of Education in Brazil	IEB	Non-governmental organization that carries out actions to promote community forest management.	01
Project to Support Forest Management in the Amazon	ProManejo	Inter-governmental Brazilian project that developed adoption of sustainable forest management systems in the Amazon, with an emphasis on the harvesting of timber products, through strategic actions and demonstration projects, carried out from 1999 to 2006.	02

* Organizations' acronyms in Portuguese.

Participant observation occurred during the 52nd Regular Meeting of the Tapajós National Forest Consultative Council, held in the municipality of Aveiro, Pará state. Participant observation consisted of observations of meeting attendees, meeting facilitators, institutional mechanisms related to inter-sector dialog, positioning of organizations attending the meeting, who made decisions, what was decided, who openly agreed/disagreed, whether or not conflicts emerged and how people dealt with them, and how meetings ended. We took notes during participant observation through a protocol that considered both descriptive and reflexive notes [79].

Finally, we conducted archival research of documents directly related to the historical process for establishing community-based timber management in the TNF. Documents included governmental reports [80–83], community meeting minutes, documents related to the constitution of the community-based cooperative, and financial reports related to logging activities in the Tapajós National Forest.

Tapajós National Forest: Geographic and Sociopolitical Context

TNF is a public forest designated as a protected area with sustainable use of natural resources [84]. It is located in western Pará state on 527,000 ha along the eastern bank of the lower Tapajós River, on the other side of the BR-163 highway (Figure 1). There are 24 forest-based communities located inside the TNF with approximately 5500 people [85,86]. TNF families live mostly from agriculture, extraction of fruits and other products (e.g., Brazil nuts, rubber), and fishing [85]. Since 2004, the main commercial economic activity in TNF has been timber production [86,87].

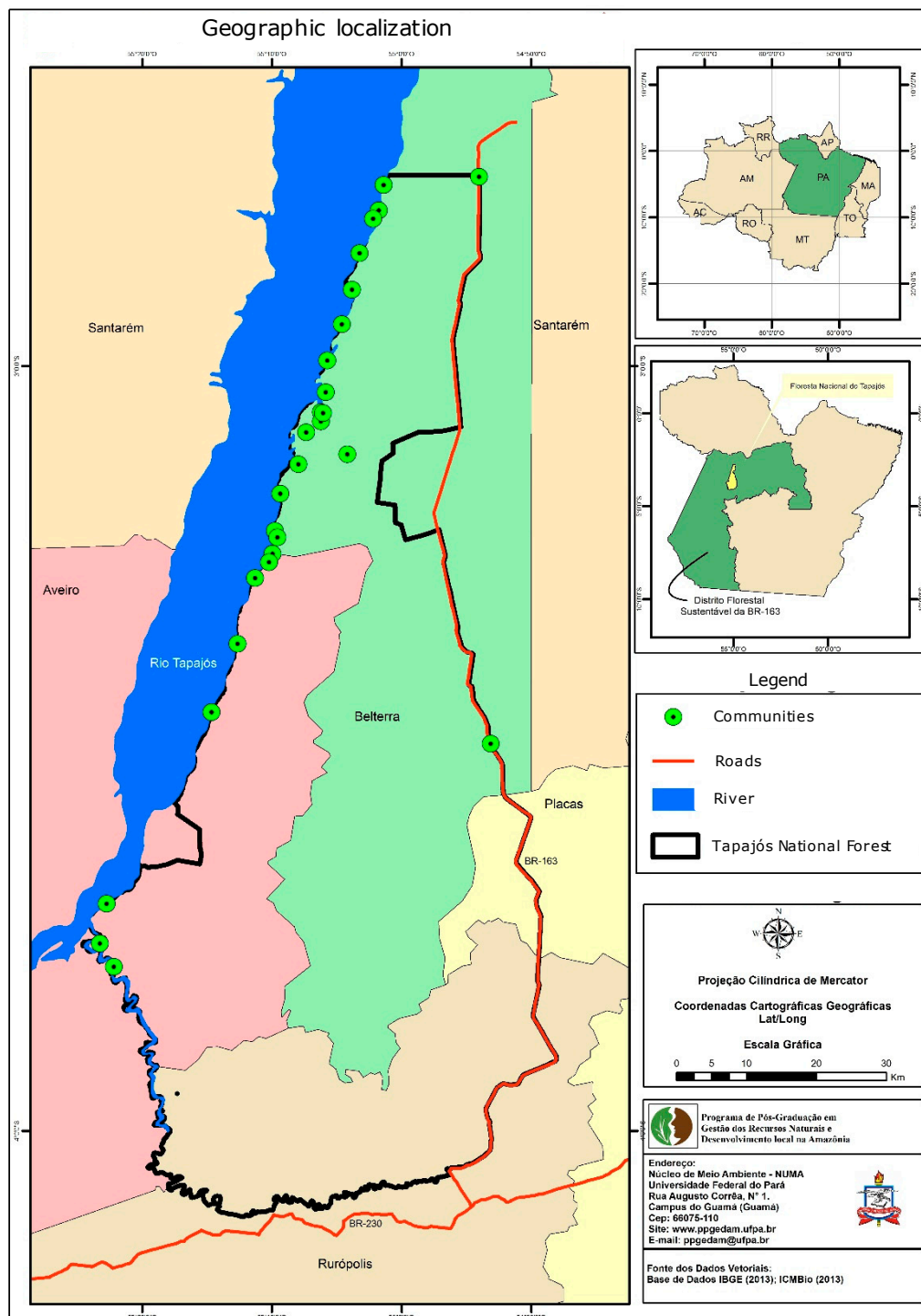


Figure 1. Tapajós National Forest is located near an interstate highway (BR-163) and distributed in the areas of four municipalities: Rurópolis, Belterra, Placas, and Aveiro.

TNF is located on a regional scale in dense tropical forest [80,88], a dominant vegetation in the Brazilian Northern region that covers most of the states of Pará, Amazonas, Amapá and Roraima [80]. TNF vegetation is mostly dense tropical forest (Figure 2), a type of vegetation characterized by the dominance of large trees under a climatic regime of high temperatures and intense precipitation distributed throughout the year (dry period up to 60 days) [88]. However, TNF also contains a great diversity of landscapes, including more than 160 kilometers of shoreline, rivers, lakes, wetlands, upland forest, hills, plateaus, fields and açai (*Euterpe oleracea* Mart.) palm groves [80,86,87].



Figure 2. Dense tropical forest in Tapajós National Forest.

TNF was created in 1974 during the Brazilian dictatorship for the original purpose of being a forest for timber production. During that period, the Brazilian government ignored local populations who had long lived within the TNF perimeter, imposing restrictions such as prohibiting forest management rights [82]. Indeed, TNF was created without the input or consent of the communities living in the area. Only after 30 years did the Brazilian government assure local land tenure rights through a land use concession contract, called *Contrato de Concessão de Direito Real de Uso—CCDRU*, for TNF residents. This allows forest-based communities to live inside the protected area and use its natural resources for both personal and commercial purpose [80].

Before the CCDRU, local populations had already organized. They had institutional representation through community-based associations. They also were assisted by social movements, government agencies, and non-governmental organizations (NGOs) that supported them to promote economic sustainable activities such as forest management [82]. However, in 1999, community members protested against a government-based initiative that gave permission to a local timber company to harvest trees as part of an experimental project funded by the International Tropical Timber Organization (the ITTO project). TNF residents and some partners requested to the Brazilian Institute of the Environment and Renewable Resources (IBAMA) rights to manage their forest resources and to implement commercial timber harvests.

TNF is located in a geographic region with land use conflicts due to migration, extensive agriculture activities, timber exploitation, and the ranching frontier [85,89]. The region has already had high deforestation rates [89,90] and new infrastructure projects such as hydroelectric dams that are threatening biodiversity and indigenous people's livelihoods. The Brazilian government created protected areas in the region to mitigate the negative impacts of land use change [91]. Since 2000, when Brazil's National System of Conservation Units Law (Federal Law 9.985/2000) was implemented, the TNF was integrated to a global conservation strategy to protect the world's threatened species and landscapes as well as threatened human communities and sites of great cultural and spiritual value [92].

In Brazil, federal conservation units are considered protected areas and cover almost 20% (60 million hectares) of the federal government-owned forests. A large portion (26 million hectares) is under community-based use [39]. Some of those areas, such as National Forests, Extractive Reserves, and Sustainable Development Reserves, have specific rules for managing their natural resources, especially timber, as outlined in the Federal Normative Instruction 16/2011 [93].

The tropical forest in TNF is rich in high-value timber resources [88], which attract timber companies to the area. During more than a decade, local communities in the TNF were pressured to sell their timber resources with no strategic plan to conserve forests and promote local livelihoods. Forest-based communities organized in local associations created alternatives for dealing with timber market pressures as well as the low capacity of the Brazilian state to provide basic rights to the rural population, such as health assistance, education, and transport [94]. As a strategy, they started a

process to manage their timber products, operating at all levels of the business instead of selling timber as standing trees to an outside entity (external operators and buyers), as was common in the region [95].

In 2004, three intercommunal TNF associations formed the Federation of Organizations and Traditional Communities of the Tapajós National Forest (FCFT). In 2005, the FCFT founded the Mixed Cooperative of the Tapajós National Forest (Coomflona) and the cooperative received a non-onerous (zero-cost) concession for harvesting timber. The main commercial forest product is tropical timber. The area destined for logging covers 32,417.88 ha, and represents 6% of the total area of the TNF [86]. Timber harvesting is based on reduced-impact logging, which means only 2–3 trees are harvested per hectare, allowing the forest to regenerate [96].

Within the right to implement CFM on an experimental basis, Coomflona began to operate logging activities in an annual harvest area of 100 ha and incrementally increased the area over time to 1000 ha, for a cutting cycle of 30 years [87]. Since 2010, Coomflona has annually managed about 1000 hectares under reduced-impact harvesting techniques and produces approximately 27,000 m³ of roundwood. In Brazil, the federal Chico Mendes Institute for Biodiversity Conservation (ICMBio) administers federal conservation units, and Coomflona has a license from ICMBio to operate the community forest management plan. This means that the cooperative can harvest and sell timber and non-timber forest products with the legal permission of the government agency.

Coomflona is a well-structured cooperative. It has an assembly, an ethics and finance committee, a leadership committee and technical and legal assistance for administering its business with transparency, inclusion, and equitability. In Brazil, cooperatives are organizations that support both productive and commercial associations of people with common interests. They must be organized in a democratic way in which every cooperative-member has the right to vote and make decisions. In the case of Coomflona, during the General Assembly, held during the first three months of the year, the financial information for the previous year is presented and validated by the Finance Committee. In addition, members can ask to see the accounting records at any time. During the General Assembly, cooperative members also decide the strategic plan for the year and the Leadership Committee executes it.

3. Results and Discussion

3.1. Multi-Partner Governance for Community Forest Management

The ongoing community forest management in the TNF is a result of collective action involving multi-partner governance with agents from government agencies, NGOs, local university, local timber industry, social movements, forest-based communities, and a community-based cooperative (Coomflona). Partnerships have been essential to local governance. The multi-partner governance installed in the TNF incorporates actors from all three sectors: state, community, and market [29,97]. The partners have distinct interests but the same final goal: to promote forest conservation and generate benefits for forest residents [97] in order to maintain socio-ecological cohesion. However, each social actor has a distinct interest. ICMBio, for instance, wants to protect the national forest from deforestation and land use conflicts. The timber industry wants to access high value timber resources. Local families want to access better health and education conditions as well as generate extra income for personal expenses. Coomflona, for its part, wanted to establish CFM as an alternative to meet a variety of expectations.

Coomflona, which is represented by forest-based community members, is in fact the main actor of this multi-partner governance system. Coomflona is unique among Brazil's community forest enterprises because of its large contiguous annual harvest area (1000 ha in 2013 and 1600 ha in 2014), its annual income (\$1.4 million in 2014), its timber sales from a central log yard, and its employment of local people for field activities (logging planning, tree inventories, cutting trees, harvest activities). Coomflona is recognized as a successful community forest enterprise due to its stability: 10 years in the timber market and a progressive increase in managed area, timber production, and revenue (Table 2).

Table 2. Managed area (hectares), timber production (cubic meters), and demonstration of the results of fiscal years (real values in USD for 2015) from 2006 to 2014, of the community timber management carried out by the Mixed Cooperative of Flona do Tapajós.

Year	Managed Area (ha)	Timber Production (m ³)	Gross Revenue (USD)	Costs (USD)	Net Revenue (USD)
2006	100	1544.80	201,850.19	182,893.32	18,956.87
2007	300	3650.80	284,299.88	229,734.24	54,565.65
2008	521	7843.30	161,876.53	165,706.05	−3829.52
2009	700	13,421.70	475,926.81	352,737.10	123,189.71
2010	1000	14,266.90	551,721.77	508,722.15	42,999.62
2011	1000	15,064.00	777,173.10	612,308.45	164,864.65
2012	1000	18,894.20	912,923.43	877,324.04	35,599.39
2013	1000	22,027.94	1,030,700.07	873,277.83	157,422.24
2014	1600	35,000.00	1,487,939.46	1,368,952.28	118,986.99

Source: Adapted from [86,98]. Notes: Real value in USD was 3.8752 in 2015.

The cooperative employs more than 200 local people, making it the principal source of employment for the local communities in the TNF [86,87]. With few exceptions (lawyer, forest engineer), the workers are forest residents in TNF and members of Coomflona. The cooperative members decided in an assembly that each family from the TNF has the right to have one member employed by the cooperative. They also created some mechanisms to avoid more than one member per family occupying a local job. This is because they want to offer opportunities for each active worker living in TNF. Those decisions were made when the cooperative was created and with the support of the Brazilian Forest Service (SFB) and an NGO, the International Institute of Education in Brazil (IEB). These partners contracted a lawyer and an expert in third sector organizations to advise on the decision-making process. As the TNF is a government-owned area and the forest is considered a common-pool resource, the government deliberated that all families living in this area should receive benefits from the community forest management. For the same reason, the cooperative members decided to create funds designated for distinct purposes (Table 3). After accounting for all of the cooperative's expenditures, profit is allocated as follows: investment fund (45%); legal reserve (10%); a fund to support communities (15%); health care fund (5%); social, educational, and technical assistance fund for cooperative members' education and training (5%); and a fund that cooperative members decide how to allocate (20%).

Table 3. Financial benefits distribution from the community-based forest enterprise, according to statutory regulations, approved at the General Assembly.

Funds	%	Brief Description
Investment	45	Investment in future activities (monitoring, harvesting, etc.).
Cooperative members	20	Benefits only the cooperative members with health care assistance or paid in cash in equal shares to cooperative members, like a dividend.
Community assistance	15	Benefits all communities located inside the Tapajós National Forest. The communities can submit a collective project to access a financial support from the cooperative.
Legal reserve	10	Savings infrastructure and future investment.
Health care	5	Benefits all communities. Used to improve conditions for health and welfare.
Social, educational, and technical assistance	5	Benefits cooperative members in accessing education and training.

In 2004, when the cooperative was created, its members on the leadership committee realized that they needed external support to establish the basic conditions for running CFM. The understanding of the cooperative members that they were limited by technical knowledge to put CFM into practice encouraged them to seek organizational support. The positive outcomes that the cooperative has had

are partly related to its capacity to seek partners and strengthen its social capital [24,99]. Data show that without the partnership within the governance system created to establish the forest management, the cooperative would hardly have advanced in its activities.

“... I think one of the main factors that contributed to the success [of Coomflona] was not necessarily the support they had; of course, it contributed, but it was their ability to reach out to other actors, to establish these partnerships” (Research participant from SFB, personal communication, 23 October 2014).

Since 2005, Coomflona has been establishing partnerships with several organizations. However, partnerships are dynamic and survive according to partner interest and capacity to maintain them [100,101]. Coomflona has experienced this dynamism. It has had more than 22 partners since the cooperative was created. At the beginning, Coomflona had strong support from organizations related to land tenure rights. This is because, at that time, the forest-dwellers of TNF did not yet have the legal right to use natural resources. Over the years, and after TNF residents received their legal rights through the land use concession contract (CCDRU), Coomflona experienced a change in their set of partners. It was identified that Coomflona itself is considered a partner in the system. In addition, there is a core of partners centered on Coomflona formed by partners from government agencies: Chico Mendes Institute for Biodiversity Conservation (ICMBio), Brazilian Forest Services (SFB), and Brazilian Institute of the Environment and Renewable Resources (IBAMA); Non-profit organizations: Tropical Forest Institute (IFT) and International Institute of Education in Brazil (IEB); Social movement: Federation of Organizations and Traditional Communities of the Tapajós (FCFT); Local university: Federal University of Western Pará (UFOPA); and a local timber company.

For all participants interviewed, partnership is characterized when both parties offer support and both parties receive benefits.

“... [Partnership] is established under some conditions that benefit both. It brings benefits to all involved” (Research participant from SFB, personal communication, 23 October 2014).

“... A partner is the one that stands with you when things get difficult. Just as in marriage, in sadness, and happiness. It is the one who helps and is helped. It stands side by side during difficult times and always tries to contribute” (Research participant from Coomflona, personal communication, 5 December 2014).

Cooperation can strengthen trust between partners [99] and achieve broad objectives such as conservation and development [102]. Indeed, trust is a key factor in the ongoing partnerships in TNF. The mutual support occurs in different ways that characterize the partnership in distinct categories: institutional, political, financial, and technical. ICMBio, for instance, is considered by the interviewees as an institutional and political partner because this government agency intermediates dialogues between Coomflona and other federal agencies. It also offers support in commercial negotiations such as reinforcing the importance of CFM that gives more confidence for business investment, and disseminates the initiative led by Coomflona. Additionally, cooperation occurs due to the financial and material donation that Coomflona gave ICMBio to build a security cabin at the entrance of the TNF. The Brazilian government has budget and human resource constraints on implementing their activities, such as monitoring access to conservation units in the case of ICMBio. In less developed countries, budgetary constraints can be costly to environmental protection because they affect state capacity [29]. In terms of technical partnerships, the interviewees cited IFT and IEB because these NGOs offer forest management training activities to cooperative members to build their technical and administrative know-how. SFB and IEB also supported the cooperative in deciding how to use the financial benefits from timber commercialization. The local university, UFOPA, offers its expertise in production diversification, for example, with scientific studies on how to use tree branches to produce charcoal. Coomflona offers its logging area to serve as a field research site for UFOPA's students and

professors. The local timber industry makes contracts to buy timber from Coomflona, giving part of the payment (5%–10%) before the logging season. With this advance payment, the cooperative can buy inputs (fuel) to start the logging season. Besides this, Coomflona offers transparency and timber from a legal origin. In Brazil, even though there is a government document attesting to the timber's origin, there are illegal timber companies that abuse this document [103]. Each partner, through its unique expertise, provides support for promoting sustainable forest use and local development in the Tapajós National Forest.

3.2. Multi-Partner Governance Outcomes: Conservation, Development, and Resilience

The multi-partner governance system installed in TNF builds capacity for local populations to successfully implement a CFM enterprise led by Coomflona. It is the only forest concession in a Brazilian national forest implemented by a cooperative (forest concessionaires in other national forests are private timber companies) [39,104]. Coomflona administrative and financial management is innovative for a CFM enterprise [86,87,105]. The main innovations are related to social welfare and access to health and education in a rural area where local populations do not have regular access to these services and live in poor conditions [94]. The municipalities where the TNF is located have some of the lowest Human Development Index (HDI) values in Pará state: Aveiro (0.541), Placas (0.552), Rurópolis (0.548), and (0.588); while Belém, the capital of the state, has 0.746 and São Paulo, the wealthiest municipality in Brazil, has 0.805 [106].

The legal reserve funds from Coomflona are applied to maintain infrastructure, for example, roads that connect communities to the federal highway BR-163. This allows the families go to urban areas in the municipalities of Santarém and Belterra where they may access markets for personal goods and to trade their agriculture products, as well as services provided by the main hospital and other urban facilities. The community assistance fund invests profits to improve quality of life, for example, with water pumps and infrastructure. This fund also invests in new productive activities that involve more than one family in the community. The 24 communities of TNF can submit a project to acquire tools for harvesting non-timber forest products. Indeed, some communities received financial aid from Coomflona for this purpose and now they are selling crafts made from latex in Santarém. The funds also allow the families to diversify production; since 2015, Coomflona has been investing in fruit pulp from native trees species. With the assistance offered to communities, Coomflona produces and sells latex products, medicinal oils, seeds, and fruit pulp. Thus, the cooperative diversifies its business activities, employs more people, and generates more cash income. ICMBio staff estimate that the cooperative provides direct and indirect benefits to about 1000 people in TNF [107]. In 2014, the cooperative opened a store in Santarém (in front of its main office) to sell manufactured products, including doors, furniture, and crafts (Figure 3). It is also working with external partners and communities to develop community-based tourism activities in the Tapajós National Forest.

The innovative initiatives that forest-based communities have implemented in TNF to manage timber resources can be considered responses to the ongoing pressure of the global timber market in tropical forests, mainly in community-based forests. The cooperative's success to date is partly due to the strong organizational and financial operating bases it has built with the help of its partners. After some years strengthening its organizational and technical capacity, in 2013 Coomflona achieved the Forest Stewardship Council (FSC) certification for its timber production.

Beyond the social and economic outcomes, the CFM in TNF mitigates deforestation and forest degradation. ICMBio staff members estimate that the logging drastically diminished since 2010 when Coomflona increased its managed area, employed more local workers, and increased its profits. Indeed, data from a project for monitoring deforestation in the Brazilian Amazon led by the National Institute for Space Research confirm this statement (Figure 4).



Figure 3. Products available at the store run by the cooperative in Santarém, the main municipality in western Pará state (Photos from Coomflona).

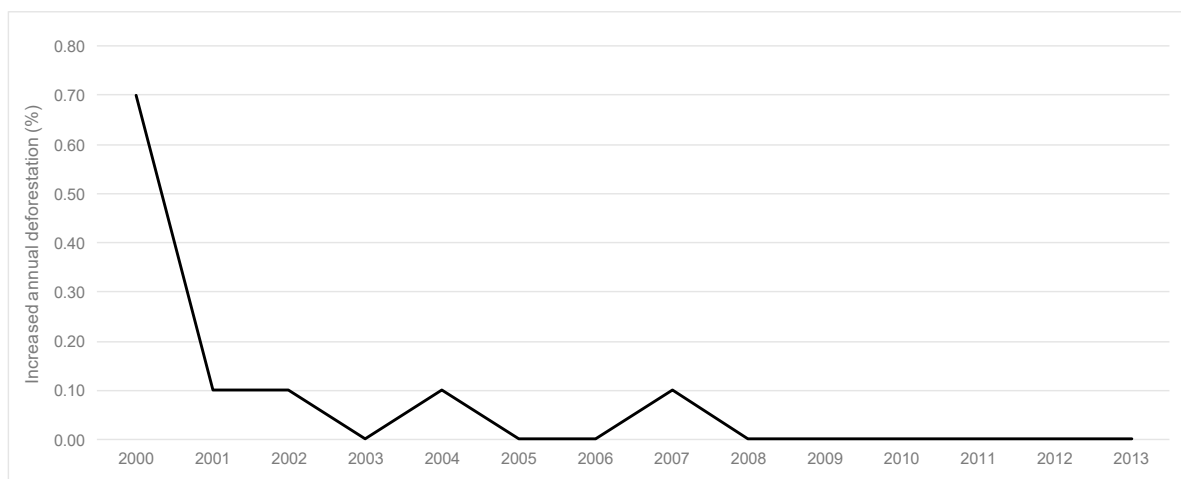


Figure 4. Increased annual deforestation in Tapajós National Forest between 2000 and 2013 (Adapted from [98]).

Communally-managed forests have lower deforestation rates than protected areas without sustainable use of their natural resources [24,99]. Wali et al. [99] have demonstrated that communities in the rural tropics are more likely to collaborate with conservation initiatives when they improve local

peoples' well-being and secure local livelihoods. The developing literature recognizes the importance and necessity of including community perspectives into natural resources co-management [52,99,108,109].

Besides the fact that forest rights (including collective-choice) have been devolved to communities, their participation in natural resource co-management increases transparency, trust, accountability, institution building, representativeness, perception of justice, and satisfaction with outcomes [51,110,111]. Fairness in natural resources co-management is also reported as related to winning a voice in the process (participation in decisions), to being considered in the process (have questions answered), and to achieving (partially or fully) desired outcomes [112], which can promote forest conservation integrated with community development.

Resilience, meaning local communities' capacity to react in an adverse social-ecological environment, has gradually emerged in the Tapajós National Forest with the growing capacity of forest-based communities to create alternatives to established mechanisms that explore community-based natural resources without generating real benefits to local populations. Community members have created conditions (lobbying governmental agencies, embracing partners) to win governmental approval to establish CFM instead of a local timber company (the ITTO project). Coomflona representatives also had the sensitivity and awareness to engage with partners that had diverse expertise (institutional, political, technical, financial) to compensate for the weaknesses of the cooperative itself. Resilience has also emerged with the adaptation of Coomflona to the timber market (Coomflona has been operating timber sales for more than a decade) and its innovation in converting what is usually a profit-based business into a more social form of entrepreneurship. With this approach, Coomflona seeks to develop better conditions for local livelihoods through the legal reserve fund that turns investments into agroforestry production (also related to food security) and building of collective infrastructure. Within this case study, conditions for resilience in community forest management have been:

- Spaces for inter-sector dialog bringing together agents from the state, market and society;
- Capacity of social actors to build a minimum consensus to tackle social and environmental dilemmas such as who has rights to access natural resources and how to use them both for conserving forests and promoting local livelihoods improvements;
- New governance arrangements (multi-partner) to promote social learning and knowledge sharing to advance with new practices for community forest management, as well as to ensure human, financial, and technological resource complementarity to find out new economic alternatives to support community sustainable livelihood.

3.3. Multi-Partner Governance System: Challenges and Recommendations

The multi-partner governance system installed in the TNF has been effective for forest conservation and development due to the different forms of support (training, technical, and legal assistance). From its partners, the Coomflona improves its main activity: timber management in a common property system. However, there are distinct interests and influences, and some weak relations between partners were observed during the fieldwork. In the TNF, there is a core group of organizations working more closely and more frequently to solve problems related to the ongoing timber management activities. This group is composed of government agencies (ICMBio and SFB), NGOs (IFT and IEB), a local university (UFOPA), and the cooperative (Coomflona). The main goal for all organizations is to promote community forest management as a way to conserve the forest and generate income for local people. However, each organization has its strategies, budget, and timeline for achieving its activities and objectives. Additionally, uneven power relationships drive conflicts observed between Coomflona and ICMBio. Research participants reported that ICMBio was using its position as government agency to influence the leadership committee decision-making (Figure 5).

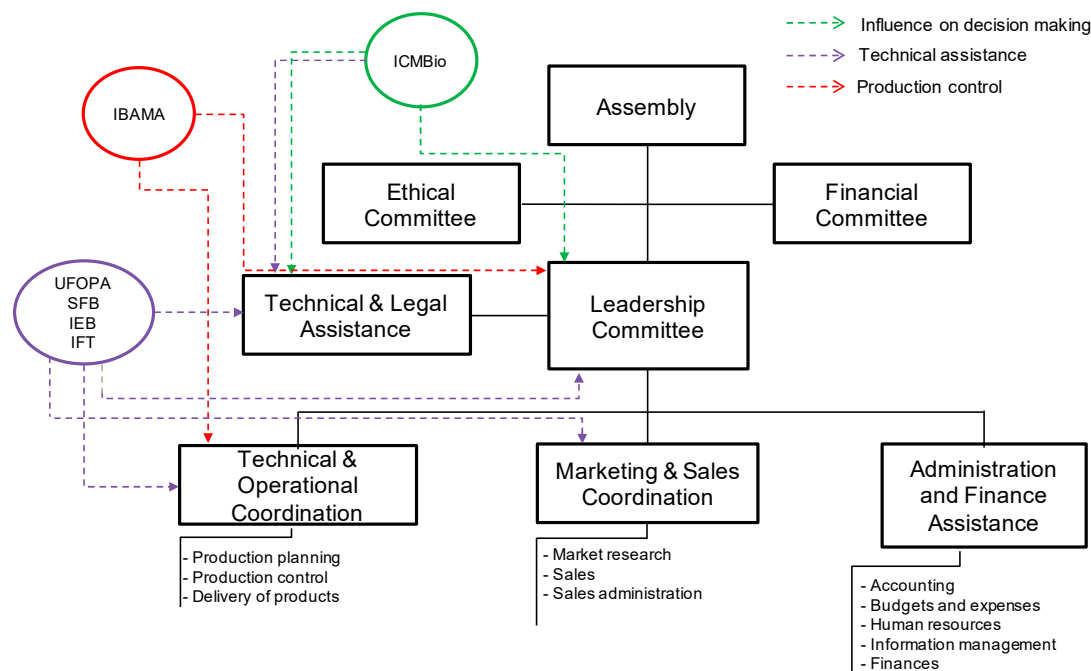


Figure 5. Influence relations in decision making, technical and institutional assistance, and timber production control according to the organization chart of the Mixed Cooperative of the Tapajós National Forest (Adapted from [98,107]).

Coomflona is an independent community-based forest enterprise that operates the forest management in TNF, and ICMBio is the government agency that administers federal conservation units such as TNF, but without responsibility for interfering in a community's economic activities. In other words, theoretically ICMBio should not make decisions related to Coomflona economic activities. With all the success of Coomflona in increasing its revenues and generating more local jobs, ICMBio wanted to increase the managed area in order to generate future revenues and local jobs. However, Coomflona plans its strategies in a general assembly involving all its members (more than 200) and some of its partners. The Coomflona processes for planning and creation of new local rules are different from ICMBio, because the cooperative needs more time than ICMBio. The pressure from ICMBio on the cooperative was creating conflicts between the cooperative and ICMBio, but also weakening the relationship with other partners. The ICMBio staff observed the weakness of this process.

“... ICMBio's time is not always Coomflona's time. There are things that we [at ICMBio] want for the Tapajós National Forest as a whole, which oftentimes are not included in Coomflona's annual planning” (Research participant from ICMBio, personal communication, 23 January 2015).

There is uneven power among partners [69,100,113]. However, mutual cooperation in partnerships can be a mechanism for balancing unequal power relations [69,102]. Indeed, it was observed that there is mutuality in the cooperation between the core groups of partners in TNF. Each partner contributes in some way to the establishment and development of the sustainable use of TNF as well as improvement of local quality of life. For example, IFT and IEB offer training to community members; UFOPA offers scientific research related to timber management to Coomflona in exchange for Coomflona receiving students to develop fieldwork activities in its forest management area. Additionally, good partnerships require transparency, communication, planning, and trust [69,114]. Research participants pointed out that some problems observed between the multi-partner governance in TNF were related to a lack of communication, planning, and definition of the role of each partner involved in the CFM. To deal with multi-partner governance challenges, we suggest some actions that can be adopted by the partners to create and maintain good partnerships (Figure 6).

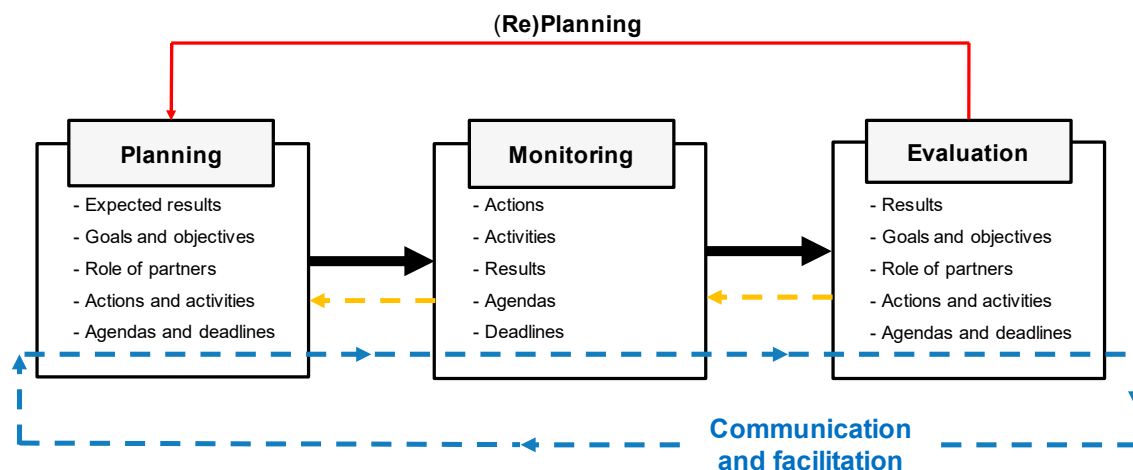


Figure 6. Recommendations for creating and maintaining partnerships.

Communication and transparency are key factors that influence the success of multi-partner governance. Together, the partners should define the role of each partner in the socio-economic and environmental governance process. With that, they should align their expectations, define the expected results, and then planning actions, activities, agendas, and deadlines. One or two partners (e.g., ICMBio, Coomflona) should facilitate the process of monitoring the plan allowing the information flow and communication among all the partners. With frequency (e.g., every six months), the partners should evaluate the process (e.g., strategy, plan, monitoring, etc.) and do a re-planning. Those recommendations can strengthen the social capital bonding between partners and improve the multi-partner governance to both forest conservation and community development.

4. Conclusions

Forest-based communities under pressure to export high value forest products such as tropical timber are finding alternatives to be included in the global economic system, while at the same time preserving their social norms and traditions as a form of resilience. They have reacted to adverse socio-ecological system based only on exploitation of natural resources for global market and economic ends. The way they have found is based on multi-partner governance.

The Tapajós National Forest case study shows that multi-partner governance has been an effective strategy to protect community-based forests against increasing pressure by timber companies in the global market for at least three basic reasons. First, because it is able to bring together agents from the local state, market and society to dialogue and build up a minimum consensus for resolving social and environmental dilemmas such as who has rights to access the natural resources and how to use them for both conserving forests and promoting local livelihoods improvements. Second, because the multi-partner interaction ensures human, financial, and technological resource complementarity to discover new economic alternatives to support community sustainable livelihood. Finally, multi-partner governance promotes social learning and knowledge-sharing to advance on new practices for community forest management.

Within the multi-partner governance installed in the Tapajós National Forest, forest-based communities have created alternatives in order to be resilient in the aggressive timber market system. This alternative is based on a community-based cooperative (Coomflona) that provides timber sales revenues in a collective way through measures such as educational and community funds that in their turn are improving local livelihoods in rural area. In fact, this cooperative is the main actor in this multi-partner governance system contributing to communities' resilience.

Coomflona employs more than 200 local workers and generated 1.4 million dollars (gross revenue) in 2014. What is especially notable, however, is its innovative administrative and financial management pattern that uses funds designated for distinct purposes that allows the cooperative to invest part of its

revenues in diversifying forest and agricultural production, improving infrastructure, and promoting welfare, for example, health care and education access. About 1000 people living in poor conditions with one of the lowest Human Development Indexes in Brazil are benefited by a community-based forest enterprise led by the Coomflona. After ten years operating in the Tapajós National Forest, Coomflona has become a model for community forest management in the Amazon region and an important global reference.

However, the multi-partner governance process installed in Tapajós National Forest area is facing some challenges that involve uneven power relationships, lack of strategy, and lack of communication among partners. To deal with these challenges, we suggest some actions that can be adopted by the partners. First, good communication and transparency should be created and maintained. Second, the partners should define the role of each partner in the social-ecological system. With that, they should align their expectations, define the expected outcomes, and then move to planning actions, activities, agendas, and deadlines. One or two partners (e.g., ICMBio, Coomflona) should facilitate the process of monitoring the planning, enabling information and communication to flow between all the partners. Periodically (e.g., each six months), the partners should evaluate the process (e.g., strategy, plan, monitoring, etc.) and do a re-planning. Those recommendations can strengthen the bonding of social capital between partners and improve multi-partner governance in both forest conservation and community development.

From the Tapajós National Forest case study, we conclude that multi-partner governance is more than sharing rights and responsibilities in decision-making processes; it is about how partners are organized, how they see each other and themselves, what they expect from the others; and with all this, how they can put together different expertise and resources to promote local development and to make links with the economic global system with the minimum conflicts.

The research demonstrates that forest-based community resilience to face and interact with the global market depends on how effectively the multi-partner governance promotes local development. The efficacy in protected areas with sustainable use of natural resources should be measured by outcomes in terms of people and community income, food security, improvements of health and education, social organization, and preservation of forest and local culture. If multi-partner governance promotes local development based on the forest management, outcomes of collective benefits make the multi-partner governance stronger. If multi-partner governance is stronger, it creates a virtuous cycle for community resilience. Thus, there is a significant link between multi-partner governance and forest-based community resilience.

The case study is based on a sustainable use protected area with support from NGOs, local university, and the federal government that embraced the local cooperative as the main actor in the construction of multi-partner governance. The next step is to look at other kinds of forest units to understand how they organize multi-partner governance and how this organization allows those communities to be resilient to face and interact with global market with the minimum conflicts. There is still a gap to understand how community forestry may be resilient in areas where NGO and federal governments are not present.

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