The productive autonomy of public forest-dwellers in the Amazon: two case studies of community timber management

A autonomia produtiva de moradores de floresta pública na Amazônia: estudos de dois casos de manejo madeireiro comunitário

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ABSTRACT

Forest-dwellers in the Brazilian Amazon public forests share the management of the territory and natural resources with governmental agencies, subjecting themselves to State rules. This study aims to evaluate the perception of stakeholders about the autonomy of traditional communities to carry out community timber forest management (CFM) in two federal protected areas. A Swot analysis revealed mismatches in priorities among stakeholder groups (Communities, Government and Partners). Four autonomy parameters were evaluated by 111 stakeholders using a satisfaction questionnaire. Communities and Government had similar perceptions of the autonomy of communities to develop CFM, while Partners were pessimistic. Stakeholders showed greater satisfaction with communities' social organization than with their business management ability. Licensing, operational tools and administrative knowledge were perceived as bottlenecks for community enterprises. Nevertheless, targeted public policies and a minimum regulatory requirement for CFM may guarantee community autonomy to maintain their way of life and make their forest enterprises viable.

Keywords: Brazil. Community forest management. Protected area. Self-rule perception. Traditional populations.

RESUMO

Os moradores de florestas públicas na Amazônia brasileira compartilham a gestão do território e dos recursos naturais com o governo, sujeitando-se às regras do Estado. Este estudo tem como objetivo avaliar a percepção de partes interessadas sobre a autonomia das comunidades tradicionais para realizar o Manejo Florestal Comunitário de madeira (MFC) em duas unidades de conservação federais. Uma análise Swot (Fofa) revelou incompatibilidades nas prioridades entre os grupos de partes interessadas (Comunidades, Governo e Parceiros). Quatro parâmetros de autonomia foram avaliados por 111 entrevistados por meio de questionário de satisfação. As Comunidades e o Governo foram semelhantes na sua percepção da autonomia das comunidades para desenvolver o MFC, enquanto os Parceiros foram mais pessimistas. As partes interessadas mostraram maior satisfação com a organização social das comunidades do que com sua capacidade de gestão de negócios. Licenciamento, ferramentas operacionais e conhecimento administrativo foram percebidos como gargalos para as empresas comunitárias. Políticas públicas direcionadas e uma exigência regulatória mínima para o MFC podem garantir a autonomia da comunidade para manter seu modo de vida e viabilizar seus empreendimentos florestais.

Palavras-chave: Brasil. Manejo Florestal Comunitário. Percepção de autogoverno. Populações tradicionais. Unidade de Conservação.

1 INTRODUCTION

The livelihoods of several traditional peoples and communities in the Brazilian Amazon had to adapt to legal regulations when their territories were transformed into protected areas (PAs), which remain as public forests and under the tutelage of the State. As a result, the term "traditional peoples and communities" was legally defined in Brazil in 2007 as:

> "Culturally differentiated groups that recognize themselves as such, who have their forms of social organization, occupy and use territories and natural resources as a condition for their cultural, social, religious, ancestral and economic reproduction, using knowledge, innovations and practices generated and passed on through tradition." (BRAZIL, 2007).

However, in Brazil, the term traditional community alone refers to non-indigenous peoples, such as extractives, riverine, rubber tappers, quilombolas (descendants of former fugitive slave communities), among others (CALEGARE *et al.*, 2014).

Conservation units for sustainable use include categories of Brazilian PAs that allow the residence of traditional communities and the use of forest resources for commercial purposes under specific rules. Some specific units, such as National Forests and Extractive Reserves (hereafter, only called PAs), constitute a legal category of common property, whose ownership is of the State but co-managed with the communities (BENATTI, 2011; CARLSSON; BERKES, 2003). Thus, communities are subordinated to State laws (BENATTI, 2002).

Therefore, traditional communities living in PAs are confronted by their rights acknowledged in their legal definition and the legal framework associated with the management of public forests by the State. Although most of these areas result from traditional communities' historical struggle for land rights (AMARAL; AMARAL NETO, 2005), it is possible to infer that their social and productive autonomy may have been impacted by the co-management of the territory with public agencies.

In Brazil, the common property regime associated with collective forms of natural resource management is called "community forest management" (CFM). The CFM was recognized by Law 11,284/2006 (Public Forest Management Law) as the forest management by traditional communities to obtain economical, social and environmental benefits. They may sustainably use timber and non-timber species and other forest goods and services. CFM may occur in Brazilian PAs under specific criteria and regulations.

Since the 1990s, several CFM initiatives have developed in the Amazon encouraged by government projects and international cooperation (VERÍSSIMO, 2005), also revealing several challenges for its implementation, such as excessive bureaucracy; inadequacy and complexity of technical-administrative procedures for the community reality; high costs; financial dependence on partnerships; lack of training (AZEVEDO-RAMOS; PACHECO, 2016; CAVALHEIRO *et al.*, 2008; HAJAR *et al.*, 2011; MEDINA; PORKORNY, 2014; PACHECO, 2012; POKORNY; JOHNSON, 2008; WALDHOFF, 2014).

The federal environmental agency responsible for Brazilian conservation units is the Chico Mendes Institute for Biodiversity Conservation – ICMBio. In extractive reserves and national forests, the exploitation of timber forest resources must follow ICMBio management regulations and those determined by Law No. 12,651/2012. For instance, the activity must be foreseen in the UC management plan (BRASIL, 2002) and approved by its Councils. (ICMBIO, 2011).

Despite the difficulties, promising initiatives of CFM have been observed in the Amazon with the support of stakeholders, including governmental agencies (DE JONG *et al.*, 2008; ESPADA *et al.*, 2018; HUMPHRIES; MCGRATH, 2014). However, whether the regulations imposed in public territories to execute CFM in protected areas jeopardize forest-dwellers' productive ways and social organization is unclear. Due to these restrictions, community autonomy in CFM in public forests is understood here as the free will of traditional communities to carry out their economic activities in their way and guarantee their survival within the legal parameters of the State.

In this context, this study evaluated the perception of stakeholders about the autonomy of traditional communities to perform CFM in protected areas in the Brazilian Amazon. Furthermore, forest timber management was chosen as the economic activity to be evaluated as it is a regulated activity, unlikely non-timber products management. As a result, several Amazon communities had to adapt their traditional management to perform timber CFM in public forests.

2 METHODS

2.1 STUDY AREA

The study was carried out in two federal protected areas in Pará state, Eastern Amazon, Brazil, with long history of implementation of CFM: Tapajós National Forest (Flona Tapajós) and Verde para Sempre Extractive Reserve (Resex VpS).

Flona Tapajós has 527 thousand ha and 3,417 people distributed in 24 communities. It was created in 1974 and covers four municipalities in Pará state: Belterra, Aveiro, Placas and Rurópolis. The first community-based timber project dates from 2005 (FERREIRA NETO, 2008). A single Sustainable Forest Management Plan – SFMP was implemented by a cooperative managed by the community (Coomflona – Cooperativa Mista da Floresta Nacional do Tapajós). Coomflona has 206 members from different communities (ESPADA *et al.*, 2018). Since 2014, the CFM performed by Coomflona has a 30-year cutting cycle in an area of 82,933.55 ha (Portaria ICMBio nº 511/2019) and is certified by the FSC (Forest Stewardship Council).

Resex VpS is in the municipality of Porto de Moz and was created in 2004. It has 1.3 million hectares and 10,000 people. The protected area results from the long struggle of communities against illegal loggers (MARIN, 2014). At Resex VpS, six CFM initiatives were carried out by community associations, each holding a SFMP. One of them was certified by the FSC System in 2016. The total area under CFM is 44,000 hectares, with a cutting cycle of 25 years.

Brazil's National Forests have Advisory Boards, while Extractive Reserves have a Deliberative Council, headed by ICMBio and participation of different stakeholders. Flona Tapajós had two previous critical

legal instruments for the development of community production activities: the Management Plan of the PA, which defines the zoning of the unit (e.g. production and preservation areas) and a state concession permit that allows land use and access to forest resources by communities (Use Rights Concession Agreement – CCDRU, in the Portuguese acronym). Resex VpS did not have either instrument when the Sustainable Forest Management Plan was implemented and when this study was performed, relying only on an Emergency Plan.

2.2 INTERVIEWS

We used qualitative document analysis to access the CFM model employed in each PAs (e.g., minutes of meetings; reports; operational plans; sustainable forest management plans; management plan of the PAs; emergency plan). Based on those documents, literature review on CFM, the Brazilian legal framework and previous visits to the study sites, we elaborated statements or questions. Finally, we applied them in semi-structured interviews to access the perception of stakeholders about community autonomy to perform CFM.

Three stakeholder groups were interviewed: *Government* (governmental agencies present in the PA); *Partners* (research institutions and non-governmental organizations working in partnership with the communities in CFM); and *Community* (community members who lived in the study areas). Each PA received two visits in 2016. In the first visit, we carried out a pilot test of the questionnaire, allowing for a better understanding of the realities to build contextualized choice options in the questionnaire. For instance, problems were associated with the CFM implementation stage of each study area; and illegal timber, a substantial challenge in the Amazon (BRANCALION *et al.*, 2018), was irrelevant to the reality of the UCs studied. In the second visit, we applied the final questionnaires. The questionnaire had a header explaining the purpose of the study and an informed consent on participation in the study, and data use signed by the interviewee. Individual information was kept anonymous, and we used only aggregated data.

The questionnaire on community autonomy in the CFM had two parts: (a) a Swot analysis (Strengths, Weaknesses, Opportunities, and Threats); and (b) a five-point Likert scale satisfaction questions: (1) very unsatisfied; (2) unsatisfied; (3) neutral; (4) satisfied; and (5) very satisfied. Likert scale survey questions measure a respondent's opinion or attitude towards a given subject.

The Swot analysis distinguishes between the internal (strengths and weaknesses) and external (opportunities and threats) environment (GÜREL; TAT, 2017). We presented multiple-choice alternatives based on relevant factors identified in the literature, and the interviewees were instructed to prioritize the best answer in their view (Tab. 1). We also gave them a choice to add a different answer if the others were unsuitable for them. Finally, the answers were analyzed through descriptive statistics for the total number of interviewees and stakeholder groups.

Table 1 | Multiple choice options offered to respondents in Swot analysis.

Options	*Strength*	*Weakness*	*Opportunity*	*Threat*
1	Community's ability to access logging licensing process	Weak social organization	ICMBio support	Centralized decision-making in ICMBio headquarters
2	Community with technical logging capabilities	Few people trained for timber management	Partnership with NGOs and universities	Lack of funding for communities
3	Job opportunities	Profit sharing from CFM among community members	Curbing illegal logging	Delay for logging license approval
4	Community capable of marketing timber alone	Community's ability to access logging licensing	Few competitors in legal timber market	Missing or outdated PA management plan
5	Community organized in associations or cooperatives	Access to machinery and equipment	Legislation and standards suitable to community management	External interference in the decision-making of the community
6	Profit sharing from CFM among community members	Difficulty in marketing wood	Land tenure security for logging permits	Unsuitable rules for CFM
7	Other	Difficulty in processing wood	Other	Other
8		Other		

Source: The authors.

In the Likert scale questionnaire (BOONE, JR, H. N.; BOONE, D. A., 2012), we used three main elements that may interfere or impact CFM to choose parameters of analyses: (i) management standards of PAs established by Brazil's regulations (National System of Conservation Unit – Law 9,985/2000; and licensing of the CFM in PAs – ICMBio's Normative Instruction No. 16/2011); (ii) the set of procedures involving forest management and logging production; and (iii) the traditional way of life of forest-dwelling communities. We used, then, four parameters to assess stakeholder satisfaction with the autonomy of traditional communities in the CFM:

a. *Social Organization and Labor:* the social organization of the community is key to developing and complying with the different stages of management (AMARAL; AMARAL NETO, 2005; MEDINA; POKORNY, 2014), as well as implementing its governance system with the transparent participation of the community members (RITCHIE *et al.*, 2001). Besides associations or cooperatives are required as legal entities responsible for the development of the logging activity (Normative Instruction no. 16/2011) and became the way of coordinating and managing the activities of traditional communities (DE JONG *et al.*, 2008, p. 65). However, as their original forms of organization and labour are characterized by cultural differentiation "(...) based in social cooperation and own relationship with nature" (DIEGUES; ARRUDA, 2001, p. 27), it is relevant to assess the perception of stakeholders in the way communities carried out their productive activities.

b. *Participatory Decision Making:* community participation is highly relevant to influence decisions that strengthen and structure the CFM (AMARAL; AMARAL NETO, 2005). The Deliberative (or Advisory) Council is the decision-making arena in PAs (Law No. 9,985/2000) and includes representatives from Government, non-governmental organizations and the communities. At the local level, though, each community influences decisions on the activities developed in its territory through its assembly (AMARAL *et al.*, 2007). Thus, it is essential to assess the perception of stakeholders about the degree of autonomy of the community in decision-making processes in a context imposed by State rules.

c. *Productive Choices and Community Development:* how the community intends to develop a given activity involves the choice of objectives and strategies, such as the selected productive area and the forest resource to be explored (AMARAL *et al.*, 2007). Therefore, assessing the degree of community autonomy in this parameter requires understanding land-use rules, production criteria, and other social actors' influence in productive choices (RITCHIE *et al.*, 2001).

d. *Business Management:* the planning of production and marketing is crucial for the stability and success of the productive activity (AMARAL *et al.*, 2007). Management of the timber business, combined with the freedom to carry out planned activities, reveals community capabilities for the productive organization, including processing and commercialization (PORRO *et al.*, 2008). The level of involvement and participation of external actors in these activities reflects the degree of independence of the community. Extrinsic aspects of logging may also interfere with community business management, such as access to credit and licensing (AZEVEDO-RAMOS; PACHECO, 2016; MEDINA; POKORNY, 2014; WALDHOFF, 2014).

Each parameter had specific questions, totalling 66 questions (Tab. 2). *Community* and *Government* groups answered the 66 questions, while *Partners* answered only 21 questions associated with their role. Therefore, only these 21 questions were used in the analyses when the three groups were compared (Tab. 2). The 66-question and 21-question questionnaires presented Cronbach's alpha value ≥ 0.6, showing good internal consistency (GLIEM. J. A.; GLIEM, R. R., 2003).

For the *Community* group, we interviewed 40 members from 11 communities of Flona Tapajós and 42 members from seven communities of Resex VpS, totalling 82 interviewees older than 18 years old. For the *Government* group, 14 people were interviewed (six from ICMBio and eight from the Brazilian Forest Service). Finally, for *Partners*, we interviewed 15 people, including respondents from a research institute (two people from the Federal University of Western Pará) and five NGOs (five people from the Sustainable Development Committee of Porto de Moz – CDS; three people from the International Institute of Education of Brazil – IEB; two people from Tropical Forest Institute – IFT; one person from the Institute of People and the Environment of the Amazon – Imazon; and two people from the Institute of Forest and Agricultural Management and Certification – Imaflora).

The differences among groups (Community; Government; Partners) and PAs (community and government agencies of Flona Tapajós and Resex VpS) were tested by two-way Analysis of Variance (Anova). In addition, the cross-evaluation of two segment levels (Community and Government) and two PAs (Flona Tapajós and Resex VpS) resulted in four distinct groups, which were compared by one-way Anova followed by Tukey's posthoc test.

The score formed by the 21 questions was compared between the three groups (Community, Government and Partners) and these groups in their respective PAs through one-way ANOVA followed by Tukey's posthoc test. The comparison of the scores of the parameters was performed using a one-way repeated measures Anova. The non-parametric Kolmogorov-Smirnov test previously verified the normality of the data. All tests were performed considering bilateral hypotheses and a 5% significance level (ZAR, 2010).

Table 2 | Five-point Likert scale questions applied to measure stakeholders' satisfaction about the autonomy of traditional communities in community forest management in two Amazon protected areas.

Parameter	*Questions*
Social organization and Labor	1 - respect for forms of social organization (representation, decision-making)
	2 - the way leaders are chosen by the community
	3 - associations represented by community leaders
	4 –communities participating in the decision-making process in PA *
	5 – compliance with community rules by associations/cooperatives in decisions on timber forest management
	6 – consultation with families by the association/cooperative in decisions on timber management
	7 – freedom of communities to solve internal conflicts involving timber forest management
	8 – respect for collective areas by all community members
	9 – respect for the areas of family agriculture by timber management activities
	10 – respect for the period of activities of logging management to the calendar of festivals and cultural practices of the community
	11 – freedom for the use of fallen wood
	12 – freedom to use traditional knowledge in the stages of logging (e.g. inventory, mapping, harvesting)*
	13 – interference of logging on the harvesting of other forest resources by the community*
	14 – freedom of the community in the choice of manpower for forest management
	15 – exchange of traditional knowledge on the use of timber forest resources among the community
	16 – the volume of timber available to meet the internal needs of communities
Participatory Decision Making	17 - number of community representatives on the PA Council
	18 - the way in which community representatives of the PA Council were chosen
	19 – the intensity of participation of community families in association/cooperative meetings on timber management
	20 - discussion and approval of the CFM proposal by the PA Council*
	21 – measures of the PA Council to ensure the interests of communities in timber management
	22 - advanced disclosure of association meeting dates to community members
	23 - advanced disclosure of PA Council meeting dates
	24 – access to information on timber management passed on to communities by ICMBio
	25 – access to information on timber management passed on to communities by the association or cooperative
	26 - easiness to understand ICMBio standards and documents*
	27 - access to information on the results of association/cooperative meetings
	28 - access to information on the results of PA Council meetings
	29 – participation of communities in the elaboration or review of the PA management plan

Parameter	Questions
Productive choices and Community Development	30 – freedom of families to choose their land use
	31 – freedom of families to carry out logging within forest management
	32 – mandatory SFMP for low-intensity logging in collective or family areas*
	33 – influence of ICMBio in the territory planning of the PA *
	34 - current content of the PA management plan
	35 – freedom to plan logging activities by communities
	36 – participation of families in the choice of priorities in timber forest management
	37 – interference of NGOs or companies in timber production planning in communities
	38 – ICMBio interference in timber production planning in communities
Business management	39 – profit-sharing from timber production
	40 - participation of families in decisions on where to use the profit from timber production
	41 – freedom of communities to decide on profit sharing from timber production among members
	42 – ability of communities to develop the SFMP and the annual operational plan
	43 – freedom of associations/cooperatives to decide on how to manage timber business*
	44 – freedom of communities to manage the values obtained from the selling timber
	45 - ICMBio's participation in the management of the timber business*
	46 – participation of NGOs or companies in the management of the timber business*
	47 – the ability of communities to manage the timber business*
	48 - understanding of communities on timber forest management techniques
	49 – freedom of communities to decide on the timber buyer
	50 – ICMBio's participation in the timber marketing*
	51 – participation of partners (NGOs) in the timber marketing*
	52 – communities' capacity for timber processing*
	53 – contribution of timber profit to investments in other productive activities
	54 - facility to access credit or investments for logging*
	55 – independence of communities from external financial partners for timber management
	56 – control of communities over spending and profits from timber forest management
	57 – transparency with which the timber management accounting balance is presented to community members
	58 – the ability of communities to pay for technical assistance or training
	59 – freedom of communities to choose the type of technical assistance or training aimed at logging they want
	60 – mandatory presentation of the land use granting license to carry out logging activity*
	61 – the average time for SFMP approval by ICMBio*
	62 – the average time for inspection and approval of the annual operational plan*
	63 – number of ICMBio staff to meet the demands of the communities regarding timber management*
	64 - distance from ICMBio offices for communities to access their services*
	65 – community capacity to prepare the documents to obtain the timber forest management permit
	66 – clarity of the stages of the licensing process of community forest management*

* questions applied to the three stakeholder groups: Community, Government and Partners. The others were only applied to Community and Government groups.

Source: The authors.

3 RESULTS

3.1 SWOT ANALYSES

The Swot results on CFM were presented for the three most voted options by each element of Swot analyses for all interviews (n = 111) and by stakeholder groups (Fig. 1). The main *Strength* pointed out by the interviewees was associated with social *organization, technical capacity of communities and job opportunities* offered by the forest management activity. Overall, stakeholder groups agreed with the same choices, but the government group did not highlight the community technical capacity as a strength. As the main *Weakness*, the interviewees chose *access to machinery (e.g. skidder, bulldozer), the logging licensing process, and the low number of community members trained for timber management.* The disaggregated data showed that partners highlighted aspects associated with logging operation (licensing, timber processing and marketing). Communities agreed with them on the difficulty to access logging licensing but, like Government, considered access to machinery as the main weakness for CFM.

Overall, the *partnerships* (from Government, NGO and Universities) for the CFM were perceived as the greatest *Opportunity* by interviewers, followed by *land tenure security,* which facilitated the approval of logging license (Fig. 1). However, stakeholders differed when ranking priorities: land tenure security for Partners; the environmental agency's support for Communities; and the partnership with research institutions and NGOs for Government.

	S Strength	W Weakness	O Opportunity	T Threat
Total (n=111)	Communities organized in associations or cooperatives (n=42; 37.8%) Communities with technical logging capabilities (n=18; 16.2%) Job opportunities (n=17; 15.3%)	Access to machinery and equipment (n=29; 26.1%) Access to the logging licensing processes (n=22; 18.8%) Few people trained for timber management (n=17; 15.3%)	ICMBio support (n=41; 36.9%) Partnership with NGOs and universities (n=31; 27.9%) Land tenure security for logging permit (n=14; 12.6%)	The delay for logging license approval (n=38; 34.2%) Missing or outdated P.A. management plan (n=21; 18.9%) Centralized decision-making in ICMBio headquarters (n=18; 16.2%)
Partners (n=15)	Communities organized in associations or cooperatives (n=8; 53.3%) Others (n=3; 20%) Communities with technical logging capabilities; and, Job opportunities (both: n=2; 13.3%)	Access to the logging licensing processes (n=5; 33.3%) Difficulty in marketing wood (n=3; 20%) Difficulty in processing wood (n=2; 13.3%)	Land tenure security for logging permit (n=6; 40%) Partnership with NGOs and universities (n=4; 26.7%) ICMBio support (n=2; 13.3%)	Lack of funding for communities (n=2; 14.3%) Legal rules inappropriate for CFM (n=3; 20%) Others (n=4; 26.7%)
Communities (n=82)	Communities organized in associations or cooperatives (n=29; 35.4%) Communities with technical logging capabilities (n=15; 18.3%) Job opportunities (n=13; 15.9%)	Access to machinery and equipment (n=24; 29.3%) Access to the logging licensing processes (n=16; 19.5%) Few people trained for timber management (n=15; 18.3%)	ICMBio support (n=36; 43.9%) Partnership with NGOs and universities (n=21; 25.6%) Land tenure security for logging permit (n=7; 8.5%)	The delay for logging license approval (n=34; 41.5%) Centralized decision-making in ICMBio headquarters (n=17; 20.7%) P.A. management plan missing or outdated (n=14; 17.1%)
Government (n=14)	Communities organized in associations or cooperatives (n=5; 35.7%) Job opportunities (n=2; 14.3%) Others (n=4; 28.6%)	Access to machinery and equipment (n=4; 28.5%) Weak social organization (n=2; 14.3%) Others (n=4; 28.5%)	Partnership with NGOs and universities (n=6; 42.9%) ICMBio support (n=3; 21.4%) Combating illegal logging; and, Few competitors in legal timber market (both: n=2; 14.3%)	P.A. management plan missing or outdated (n=7; 50%) The delay for logging license approval (n=2; 14.3%) Lack of funding for communities (n=2; 14.3%)

Figure 1 | Swot diagram on Community Forest Management in two Amazon protected areas. The results included the three first options prioritized in each block.

Source: The authors.

As for *Threats,* the interviewees highlighted the bureaucratic process involved with CFM, pointing out *the delays in logging licensing, the missing or outdated PA management plan and the centralized decision-making process* in ICMBio. For Communities, the operational issue (delays in licensing) was more relevant, while the Government centred on public management (lack of PA management plan). However, Partners prioritized other elements, such as the lack of funding for communities and the fact that the legal framework for logging was unsuitable for the specificities of traditional communities.

The different visions among stakeholder groups in the Swot exercise could be visualized by their different choices among SWOT categories (Fig. 2). Stakeholders only fully agreed on strengths for CFM.

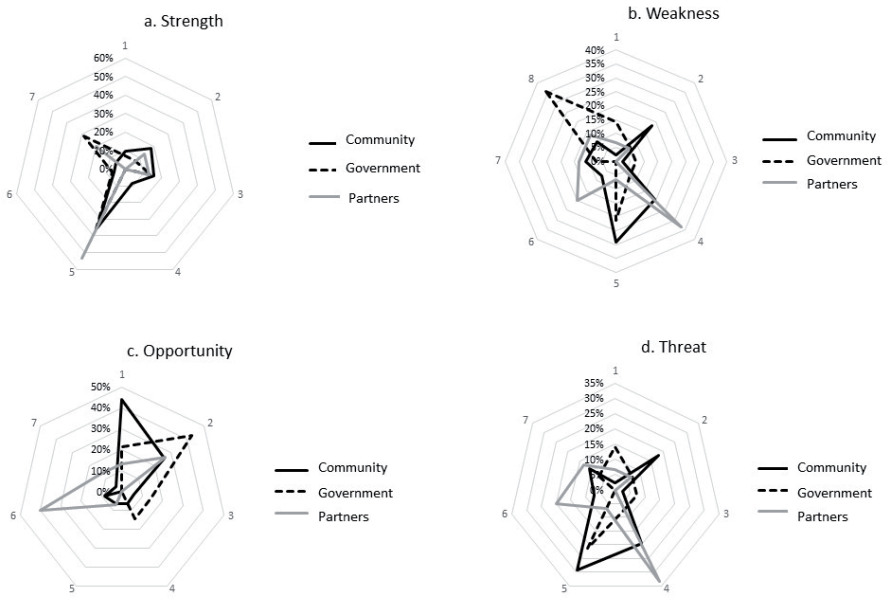

Figure 2 | Spider charts with Swot results showing (dis)similarities among stakeholder choices. Their numbers represent multiple-choice options (see table 1) outside the web. Each line in the web represents the percentage of responses for a different choice.

Source: The authors.

Additionally, when looking at the data across PAs, despite prioritizing different *Strengths and Weaknesses* among the three most voted choices, communities from both PAs agreed on their choices for *Opportunities* and *Threats.* As for *Strengths*, community members of Flona Tapajós (n = 40) prioritized job opportunities (25%) while Resex VpS (n = 42) emphasized social organization (50%). As for *Weakness,* members of Flona Tapajós (although recognized their technical capacity) highlighted the low number of trained people (27.5%) in relation to the population of the protected area, while members of Resex Vps chose access to machinery (33.3%). On the other hand, the communities for both PAs agreed on the same *Opportunity* ("ICMbio support"; 50% and 38.1% for Flona Tapajos and Resex VpS, respectively) and *Threat* ("the delay of logging license approval"; 45% and 38.1%, respectively).

3.2 LIKERT SCALE SURVEY

The analysis of stakeholder satisfaction on the autonomy of traditional communities in performing CFM by using the four parameters, first compared *Community vs Government* perceptions using the 66 questions of the questionnaire (Tab. 3) and then compared the three stakeholder groups (Community; Government; and Partners) using the 21 shared questions (Tab. 4).

For *Community vs Government* analysis, the parameter "Business management" is the only one that showed significant differences between PAs (Tab. 3d). Government showed higher satisfaction with

Flona Tapajós (level 4) than with Resex VpS (level 3). Communities from different PAs were both neutral about this parameter. Overall, “Business management” received the lowest satisfaction among the parameters (mean score = 3.44). The same trend is shown when analyzing aggregated data (independent of parameters), mostly because of differences in *Government* opinion between PAs, which showed higher satisfaction with Flona Tapajós (Tab. 3e). For the parameters "Social Organization and Labor" and “Productive choices and Community Development” (Tab. 3a, c), the community from Resex VpS was significantly more satisfied than the community from Flona Tapajós. "Social Organization and Labor" received the highest mean score among the parameters (3.84). *Government* and *Community* were neutral regarding the parameter “Participatory Decision Making” (Tab. 3b).

Table 3 | Perceptions of Community and Government groups on the autonomy of traditional populations by parameters (“A” to “D”) and total (“E”). Numbers are shown in mean values (standard deviation) of Likert scale choices (1-5).

A. SOCIAL ORGANIZATION AND LABOR

	Protected Area			*p-value*		
Group*	**Flona Tapajós**	**Resex VpS**	**Total**	**Group**	**PAs**	**Interaction**
Community	3.7 (0.45) [a]	4.0 (0.35) [b]	**3.9 (0.42)**	0.284	0.848	0.014**
Government	3.9 (0.43)[a;b]	3.6 (0.34)[a;b]	**3.8 (0.41)**			
Total	**3.8 (0.46)**	**4.0 (0.37)**	**3.9 (0.42)**			

B. PARTICIPATORY DECISION MAKING

	Protected Area			*p-value*		
Group*	**Flona Tapajós**	**Resex VpS**	**Total**	**Group**	**PAs**	**Interaction**
Community	3.5 (0.69) [a]	3.5 (0.49) [a]	**3.5 (0.59)**	0.102	0.413	0.375
Government	3.9 (0.42) [a]	3.6 (0.31) [a]	**3.8 (0.40)**			
Total	**3.6 (0.67)**	**3.5 (0.47)**	**3.5 (0.57)**			

C. PRODUCTIVE CHOICES AND COMMUNITY DEVELOPMENT

	Protected Area			*p-value*		
Group*	**Flona Tapajós**	**Resex VpS**	**Total**	**Group**	**PAs**	**Interaction**
Community	3.5 (0.49) [a]	3.8 (0.38) [c]	**3.6 (0.46)**	0.993	0.527	0.004**
Government	3.8 (0.52)[a;c]	3.4 (0.51)[a;c]	**3.6 (0.55)**			
Total	**3.5 (0.51)**	**3.7 (0.41)**	**3.6 (0.47)**			

D. BUSINESS MANAGEMENT

	Protected Area			*p-value*		
Group*	**Flona Tapajós**	**Resex VpS**	**Total**	**Group**	**PAs**	**Interaction**
Community	3.6 (0.55)[a;b]	3.4 (0.32)[a]	**3.5 (0.46)**	0.381	0.001**	0.002**
Government	3.8 (0.27)[b]	2.8 (0.31)[c]	**3.4 (0.58)**			
Total	**3.6 (0.52)**	**3.3 (0.36)**	**3.4 (0.47)**			

E. TOTAL

	Protected Area			p-value		
Group*	**Flona Tapajós**	**Resex VpS**	**Total**	**Group**	**PAs**	**Interaction**
Community	3.6 (0.47)[a;b]	3.6 (0.31)[a;b]	**3.6 (0.39)**	0.832	0.009**	0.004**
Government	3.9 (0.30) [a]	3.3 (0.28) [b]	**3.6 (0.43)**			
Total	**3.6 (0.46)**	**3.6 (0.32)**	**3.6 (0.40)**			

* Groups with equal lower case do not differ significantly

** Statistically significant (p < 0.05)

Source: The authors.

The comparison among the three stakeholder groups (Tab. 4) showed that *Partners* were significantly less satisfied (mean score = 2.8) with the autonomy than other groups (mean score = 3.4). *Communities* of both PAs and *Government* from Flona Tapajós did not differ in their satisfaction. However, in Resex VpS, *Government* presented a score (3.1) as low as *Partners* (2.8).

Table 4 | Comparison among the three stakeholder groups of the perception of autonomy for CFM (21 questions).

Group	*N*	*Mean value (SD)*	*p*
Communities	82	3.4 (0.41)[a]	
Government	14	3.4 (0.52)[a]	< 0.001
Partners	15	2.8 (0.50)[b]	
Total	**111**		
Flona Tapajós (Community)	40	3.4 (0.49)[a;b]	
Resex VpS (Community)	42	3.4 (0.33)[a;b]	< 0.001
FlonaTapajós (Government)	8	3.7 (0.49)[b]	
Resex VpS (Government)	6	3.1 (0.27)[a;c]	
Partners	15	2.8 (0.50)[c]	

Groups with equal lower case do not differ significantly

** Statistically significant (p < 0.05)

Source: The authors.

4 DISCUSSION

Overall, the Swot analysis showed that although stakeholder groups agree on variables that somehow affect the CFM, the rank of importance differed among groups. Furthermore, the autonomy of traditional communities to develop CFM was also perceived differently among stakeholders. In general, *Communities* and *Government* were more satisfied with the way in which communities organize themselves (*social organization and labour*) than with their form of doing business (*business management*). In turn, *Partners* appeared to be more pessimistic about community autonomy.

Partnerships with different interests are not a problem when the same ultimate goal is pursued among stakeholders, as observed in the CFM multi-partner governance experience at Flona Tapajós (ESPADA; SOBRINHO, 2019). However, the difference in perception among stakeholders may contribute to misunderstandings and conflicts in the way of approaching and solving issues. In this sense, different aspirations between stakeholders may cause a mismatch with communities' claims. Thus, in some cases,

what was perceived as below the aspirations of other actors may still be satisfactory for forest-dwellers. For instance, the perception of autonomy for the management of the forestry enterprise was more significant for the members of the Resex than for the Government. Moreover, the delay in approving management licenses was considered the biggest threat for Community while the Government and Partners minimally considered this issue. This fact highlights the importance of listening carefully to what communities need to develop their economic activities instead of telling them how to do it.

The autonomy of forest-dwellers in public areas permeates the direct relationship with State apparatus, the rules that interfere in the community's activities and spaces of decision-making. When co-managing common resources, autonomy may be facilitated when there is a relationship of trust between communities and the public agency (OSTROM, 2008). In this context, the Community group recognized the support of the managing agency (ICMBio) in CFM as the greatest opportunity for economic activity, indicating a relevant political openness from Government. Trust between actors is vital in a context where different stages of CFM depend on ICMBio's decision for its development (ICMBIO, 2011; PACHECO; AZEVEDO-RAMOS, 2019) and may affect both social interactions and local environmental conditions (PORRO, R.; PORRO, N. M., 2022).

Another positive factor for the community's productive activities in the Amazon is that a protected area brings land security in a region where the land title is a historical issue. In this study, the more a specific actor was involved with the bureaucracy associated with logging licensing processes, the more the actor recognized the importance of safe land use. Secure forest tenure involves a set of specific rights and benefits derived from forests (access, withdrawal, and benefits), management (overall decision-making including rights of exclusion), and alienation (ownership, right to compensation, right to sale) (SCHLAGER; OSTROM, 1992). Partners, followed by Communities, showed that view, but not by Government. The first usually assist the second on licensing. Forest management is a long-term activity (minimum cutting cycle of 10 years) and requires proof of land ownership (MMA, 2006). For that reason, many traditional communities in the region choose to request that their territories are considered PAs so that they may protect their ancestral lands, ensure the development of economic activities and access State social benefits (ARNAUD, 2019; MARIN, 2014).

On the other hand, in a context where their land is under the public domain, maintaining community autonomy in decision-making processes becomes a relevant issue for traditional communities. Interventions through state-controlled decision-making seriously undermine land tenure security by restricting local communities' access and control over forest areas. (DHUNGANA *et al.*, 2017). Nevertheless, in the two PAs evaluated in this study, the satisfaction of both Community and Government groups in the parameter "Participation in Decisions" was neutral, indicating room for substantial improvements. The interviews of many Communities members indicated that they had no knowledge of the decisions of the PA Councils. As communities are legally responsible for their managed areas, active and transparent community participation in decisions that influence CFM should be encouraged in public forests (AMARAL; AMARAL NETO, 2006; AMARAL *et al.*, 2007; LIMA, 2018).

The productive activities of traditional communities are recognized as diversified and structured according to an annual productive calendar (BENATTI, 2003; PORRO *et al.*, 2008). Dependence and delays in acquiring the logging license may interfere with their freedom to manage productive activities. Likewise, the PAs' lack or outdated management plan directly interferes with the degree of autonomy of community development and productive choices and impacts the stability of these choices in the medium and long term. Not surprisingly, both elements have been identified as a threat to the CFM. Both are under the responsibility of the environmental agency. Thus, the State determines the scope of community autonomy through its rules and structural conditions. The development of productive forest activities is related to the role of the State, policy provisions, nature of forest administration, and decision-making processes (DHUNGANA *et al.*, 2017). In this sense, to enable productive activities of traditional communities, the public agency would need to synchronize the political will to support the development of CFM with its legal requirements and bureaucratic structures. Regulatory processes

that ultimately reduce community autonomy or make it unfeasible must be modified. To enhance the engagement of different communities in the Amazon in the CFM model, therefore, the community system of use and management of natural resources, as well as their productive capacity and organization, should be considered in the foundations of the legal and normative structures of the logging activity (ASSUNÇÃO; PORRO, 2018; PACHECO; AZEVEDO-RAMOS, 2019).

Amazon forest-dwellers are not a uniform category. For instance, in productive activities, they may differ depending on their cultural background, local characteristics, and training opportunities. Flona Tapajós' pioneering forest management has received significant financial support and training from several partners for years (ESPADA *et al.*, 2018), which is unlikely to be repeated in the Amazon scale. Differences between the two PAs in this study reflected the degree of stakeholder satisfaction. For example, regarding business management, the Government group expressed greater satisfaction with Flona Tapajós than with Resex VpS. For the former, the major concern was job creation, while for the latter was still the difficulty in dealing with the bureaucracy of the CFM licensing process. The simplification of licensing process could therefore facilitate the access and understanding of communities in different stages of maturity in CFM.

Business management proved to be still a challenge for community autonomy, usually associated with little experience in business management by communities (EKE *et al.*, 2016). Nevertheless, as communities are aware of that, they have also found ways of dealing with it. For instance, some of them migrate from partnerships with NGOs to employing professionals who help them in accounting and timber marketing under their supervision. However, it is noteworthy that the potential conflict between the traditional way of timber management by communities (DIEGUES; ARRUDA, 2001; PACKER, 2015) and the use of formal CFM techniques imposed by the regulations was not verified in this study. The technical procedures in logging production and the formalization of associations or cooperatives were not perceived by the Community group as an issue for their autonomy. However, logging techniques require training (ESPADA *et al.*, 2018), which represents an enormous effort to overcome for Amazon communities. Additionally, the formalization of social organizations involves financial, legal and accounting challenges (PAES, 2018) since the sustainability of the community timber business requires proper administration and management for the long-term growth and permanence of the activity (RADACHOWSKY, 2013).

Therefore, incentives and support are needed for the evolution of CFM in the region. Public policies should be directed to this specific public to give them conditions without loss of autonomy. Some key elements may involve, for instance, opportunities to access credit (e.g., for rental or purchase of machinery) or technical, operational and administrative changes in the current CFM model towards a more adaptable one to community realities (LIMA, 2018).

The establishment of partnerships has contributed to the implementation of the CFM in the Amazon (ESPADA; SOBRINHO, 2019; LIMA, 2018; MEDINA; POKORNY, 2014; WALDHOFF, 2014). However, they cannot result in the loss of autonomy of communities in accessing the natural resources on their own (MEDINA, 2012). In this study, for the *Partner* group, and to a certain degree for the *Government* group, the community autonomy for carrying out the timber business is still far from reality, especially in Resex VpS. However, due to their roles in CFM, both actors are in a position to pressure for changes that optimize the independence of communities, incorporating adaptive management, promoting training in commercial and financial management and building bridges to fair markets. On the other hand, as revealed by the community's perception, the satisfaction with their autonomy in CFM can be achieved in more specific conditions than that desired or expected by third parties. It is argued that the effectiveness of community forest management demands the articulation between the consolidation of the internal social norms of the community with the production activities traditionally carried out (ASSUNÇÃO; PORRO, 2018).

For CFM to become a reality as a productive alternative in the Amazon, it may be necessary to provide effective participation opportunities in decision-making processes and time and conditions so that traditional communities can be protagonists of their financial security and the sociocultural

reproduction of their way of life.

5 CONCLUSION

In both case studies, communities and government were similar in their perception of the autonomy of communities to develop CFM, while partners were critical. Communities and government were satisfied with the forms of social organization, productive choices and development of traditional communities to carry out CFM. On the other hand, they were less satisfied with the decision-making processes in PA management and with the business management by communities.

The stakeholders' perception showed that the CFM has operational difficulties in different stages that may lead to different views among the stakeholders. This mismatch in perception and priorities may postpone solutions in the long run. Ultimately, the State determines the scope of community autonomy in CFM in public areas through its rules and structural conditions. Therefore, through its rules, the government may foster greater autonomy for traditional communities in their productive activities. In order to be able to multiply the experience of CFM as an economic alternative for Amazon forest-dwellers, it is essential to ensure that communities can make the forestry business viable with regulatory requirements kept to a minimum. Licensing, operational tools and administrative knowledge are still bottlenecks for community enterprises. Being forest-dwellers in public areas, the broad inclusion of community members in decision-making processes is also essential.

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