

# Challenges to smallholder forestry policy reform on a post-industrial logging frontier: lessons from the Amazon estuary

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## HIGHLIGHTS

- Effective forest policy reform in Amapá, Brazil has been impeded by bureaucratic inertia and failure to adapt norms to local realities and livelihood dynamics.
- Small-scale timber production and processing in the Amapá estuary remains informal despite state attempts to provide an accessible pathway to formalization.
- Smallholder timber production in the Amapá estuary has declined due to shifting emphasis on açai production, reduced resource availability, difficulties formalizing forestry operations, and increased rules enforcement by environmental agencies.
- Timber is still an important livelihood for many families and mill owners that supply timber to local communities.
- Relaxed management guidelines for fast-growing timber species on the floodplain ultimately did not address the needs of smallholders.

## SUMMARY

In 2013, policy makers from the Brazilian state of Amapá launched regulatory reforms intended to streamline options to formalize smallholder forest management. This paper reviews that policy reform process and analyses observations from local stakeholders to identify lessons for the promotion of smallholder forestry. In 2014, 2017 and 2021, interviews were conducted with family timber producers and sawmill operators in floodplain communities and regional timber buyers to evaluate the impact of the policy reform on their operations. Interviews with policy makers sought to understand the rationale behind the reform and how the process played out. Although the reform efforts were well intentioned, results illustrate how bureaucratic inertia and complexity obstructed efforts to simplify policy and how policy did not address smallholder needs. While the reforms did not have the intended effect, the case offers lessons for future policy reform efforts.

Keywords: forest policy reform, small-scale forestry, forest governance, Brazilian Amazon, Amapá

## Défis rencontrés dans la réforme de politique de la foresterie des petits propriétaires sur une frontière post-industrielle: leçons de l'estuaire de l'Amazone

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En 2013, les créateurs de politique de l'état brésilien de l'Amapá ont lancé des réformes de régulation, visant à encadrer les options pour formaliser la gestion forestière des petites exploitations. Ce papier examine le processus de réformation de cette politique et analyse les observations des parties prenantes locales pour identifier les leçons pouvant être glanées dans la promotion de la foresterie des petites exploitations. En 2014, 2017 et 2021, des interviews ont été conduites auprès des familles des producteurs de bois et des opérateurs de scieries dans les communautés des plaines inondables, ainsi qu'auprès des acheteurs de bois régionaux, pour évaluer l'impact de la réforme politique sur leurs opérations. Des interviews de créateurs de politique ont cherché à comprendre le raisonnement sous-tendant la réforme et la manière dont le processus s'est opéré. Bien que les efforts de réforme aient été bien intentionnés, les résultats illustrent que les efforts vers une simplification de la politique ont été contrés par une inertie et une complexité bureaucratique, et que la politique ne répondait pas aux besoins de petits exploitants. Alors que les réformes n'ont pas connu l'effet attendu, le cas peut offrir des leçons à tirer pour les efforts futurs de réforme de politique.

## Desafíos en la reforma de la política forestal para pequeños propietarios en una frontera de tala postindustrial: lecciones del estuario del Amazonas

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Los responsables políticos del estado brasileño de Amapá lanzaron en 2013 reformas normativas destinadas a agilizar las opciones para formalizar la gestión forestal de los pequeños propietarios. Este documento revisa ese proceso de reforma política y analiza las observaciones

de las partes interesadas locales con el fin de identificar lecciones para fomentar la silvicultura de pequeños propietarios. En 2014, 2017 y 2021, se realizaron entrevistas tanto a productores familiares de madera y operadores de aserraderos en las comunidades de las llanuras de inundación como a compradores regionales de madera para evaluar el impacto de la reforma política en sus operaciones. Las entrevistas con los responsables políticos trataron de comprender los motivos de la reforma y cómo se desarrolló el proceso. Aunque la reforma fue bien intencionada, los resultados ilustran cómo la inercia burocrática y la complejidad obstruyeron los esfuerzos para simplificar la política y cómo ésta no abordó las necesidades de los pequeños propietarios. Aunque las reformas no tuvieron el efecto deseado, el caso ofrece lecciones para futuras iniciativas de reforma política.

## INTRODUCTION

Floodplain forests of the Amazon estuary comprise the oldest logging frontier in the Brazilian Amazon (Barros and Uhl 1995, Raffles 1999). Industrial extraction began in the mid-20th century when timber companies exploited high-value floodplain specialist species, processing them in large mills located in the Amapá state capital, Macapá (Barros and Uhl 1995, Pinedo-Vasquez *et al.* 2001). After several decades of intensive and unsustainable logging, the forests became depleted of industrial-grade commercial trees, and the mills began to close in the 1970s (Pinedo-Vasquez *et al.* 2001). As industries departed, smallholder families, many formerly employed by the industries, moved into the abandoned forests to homestead.

Some local families took over abandoned equipment to establish sawmills, using knowledge and skills gained while working for the timber companies (Sears *et al.* 2007). Timber was sourced from old fallows and remnant old-growth forest on or adjacent to their landholdings and those of neighbouring farmers. These family-run mills supplied local and regional markets (Pinedo-Vasquez *et al.* 2001). Motivated residents managed timber in earnest, particularly fast-growing pioneer species that regenerate naturally in their agricultural fallows, and protected or planted high-value species on their landholdings with an outlook to the future (Sears and Pinedo-Vasquez 2004).

This smallholder forestry system provided income to farming families and sustained the local mills until the mid-1990s, when estuarine farmers began to shift from annual crops and occasional timber sales to intensified production of açai fruit (*Euterpe oleracea* Mart.), a staple food in the region. The national and international markets for açai were booming (Brondízio 1999, Brondízio 2004, Brondízio *et al.* 1994). Açai palm is native to the estuarine floodplain forests and is easily managed in natural forests and agroforestry systems (Cavalcante 1991). Because of its high yield, insatiable market and low labour requirements, açai management quickly became a popular alternative to timber and annual cropping in the estuary, and estuarine farmers converted much of their mature forest fallows and remnant old-growth forests to açai stands, locally called *açaizais* (Fortini and Carter 2014, Weinstein and Moegenburg 2004). Nevertheless, local demand for lumber still motivates local forest management for timber today.

Virtually all small-scale timber production and transformation in the region has been informal, governed by well-organized local institutions (Menzies 2007, Rockwell *et al.*

2007, Zarin *et al.* 2007). A major barrier to legal operation has been the incompatibility of licensing procedures for timber harvest and transformation with the smallholder forestry and mill practices used locally (Menzies 2007, Vieira *et al.* 2014), a common situation world-wide (Holding Anyonge and Roshetko 2002, Mejía *et al.* 2015, Sears *et al.* 2021). Brazil's forest code requires technical management plans developed and supervised by licensed foresters through a highly bureaucratic procedure, all of which necessitates technical assistance and results in dependency on outside institutional and professional support. It has long been clear that regulatory reform based on local realities would be needed to provide a pathway to formality in this region (Fortini 2019).

Through a federal mandate for decentralization of public policy, state governments in Brazil gained the authority to adapt forest policy to better reflect state level conditions and goals (Rocha *et al.* 2020). In response, in 2012, the Amazonian state of Amapá initiated policy reforms intended to support the state's forestry sector, with a central focus on the promotion of smallholder forest-based livelihoods and natural resource management. Under the program *Pro-Extratativismo*, the state promoted four main commercial product chains: açai, timber, vines and Brazil nut. The cornerstone of the pro-timber strategy in the state forest policy initiative was Decree 3325, passed in 2013, which targeted the promotion of sustainable and legal timber production by rural landholders. This innovative decree recognized the distinct conditions of smallholders and communities managing forests in Amapá, which were overlooked by federal norms, and sought to simplify the rules for formalization.

This paper reports on forest policy reform in the state of Amapá, Brazil, and specifically on Decree 3325, which included as one of its goals the development of a regulatory pathway for the formalization of small-scale forestry. We focus our analysis on the reform's relevance in estuarine communities, which, due to their distinct hydrological condition, are governed by different land tenure rules, and as a result land tenure regularization in these areas has focused on recognition of communal property rights, while in upland areas private individual titling is more common. We review federal forest policy, the state forest policy development, and smallholder timber management systems in two communities of Amapá to analyse the rationale behind the reform and how the process played out. Research entailed policy analysis, on-site ethnography, and key informant interviews over seven years. In the end, the reform failed to create a simple pathway for smallholder timber producers to legalize their harvest as planners did not account for contradictory agendas in

governmental agencies; nor did they introduce options adapted to local livelihood dynamics. Lessons learned from this case can inform future efforts to support the formalization of forest-based livelihoods.

## METHODS

This study combines policy analysis with semi-structured interviews with multiple stakeholders in the Amapá forestry sector and ethnographic fieldwork in selected floodplain communities from 2014 to 2021. Research was initiated in 2014 with interviews with key informants involved in policy design and implementation. Policy analysis was based on literature review and informant accounts, as well as a review of relevant reports and publications related to the reform provided by informants. In late 2014, fieldwork was carried out over three weeks to interview informants in rural communities and conduct follow-up interviews with key informants in government agencies in the state capital, Macapá. In 2017, a second round of interviews was undertaken in the field to assess the impact of the policy implementation. Subsequently, once fieldwork was completed in Amapá and authors were no longer in the region, follow-up telephone interviews were conducted in 2020 and 2021 with key informants from the communities and state agencies to track progress.

### Study site

The focal area for this study is the estuarine region of the state of Amapá, in the Brazilian Amazon (Figure 1). Located on the flat northern land mass at the mouth of the Amazon River, the humid tropical forests and rural settlements near the coast of Amapá are subject to both seasonal and freshwater tidal flood pulse dynamics, which inundate farmland and forests alike twice daily. Smallholder farmers have practiced shifting cultivation in these floodplains with long fallows, forest management, fisheries management and animal husbandry (Brondízio *et al.* 1994).

Fieldwork focused on farmers in two settlements, Foz do Mazagão Velho and Anauerapucu, each formally registered as an Agro-extractivist Settlement Project or PAE (the Portuguese acronym for *Projeto Agroextrativista*). These two settlements were purposefully selected from the 21 PAEs in Amapá for their location on the estuary and prevalence of timber activity. Foz do Mazagão Velho (henceforth Foz), one of three PAEs in the municipality of Mazagão, previously had been prioritized by the Amapá government for rural development support and had been targeted by the State Forestry Institute (IEF) to formalize the timber supply chain. The PAE Anauerapucu was identified as a settlement where smallholders managed timber but did not receive forestry development assistance from the government. Foz was recognized as a PAE in 2012 and is located 50 km from the state capital city of Macapá. There are approximately 195 households dispersed

along rivers transecting the settlement. Anauerapucu was formalized as a PAE in 1998 and is located 27 km from Macapá in the municipality of Santana. There are 518 resident families distributed in five villages, most of which had occupied their homesteads long before the area became a PAE. Both settlements are connected to the nearby urban centres of Macapá and Santana by a state highway, but residents mainly depend on local waterways for transportation. The two cities are hubs for the trade of agricultural products and natural resources for local markets and for export.

### Data collection

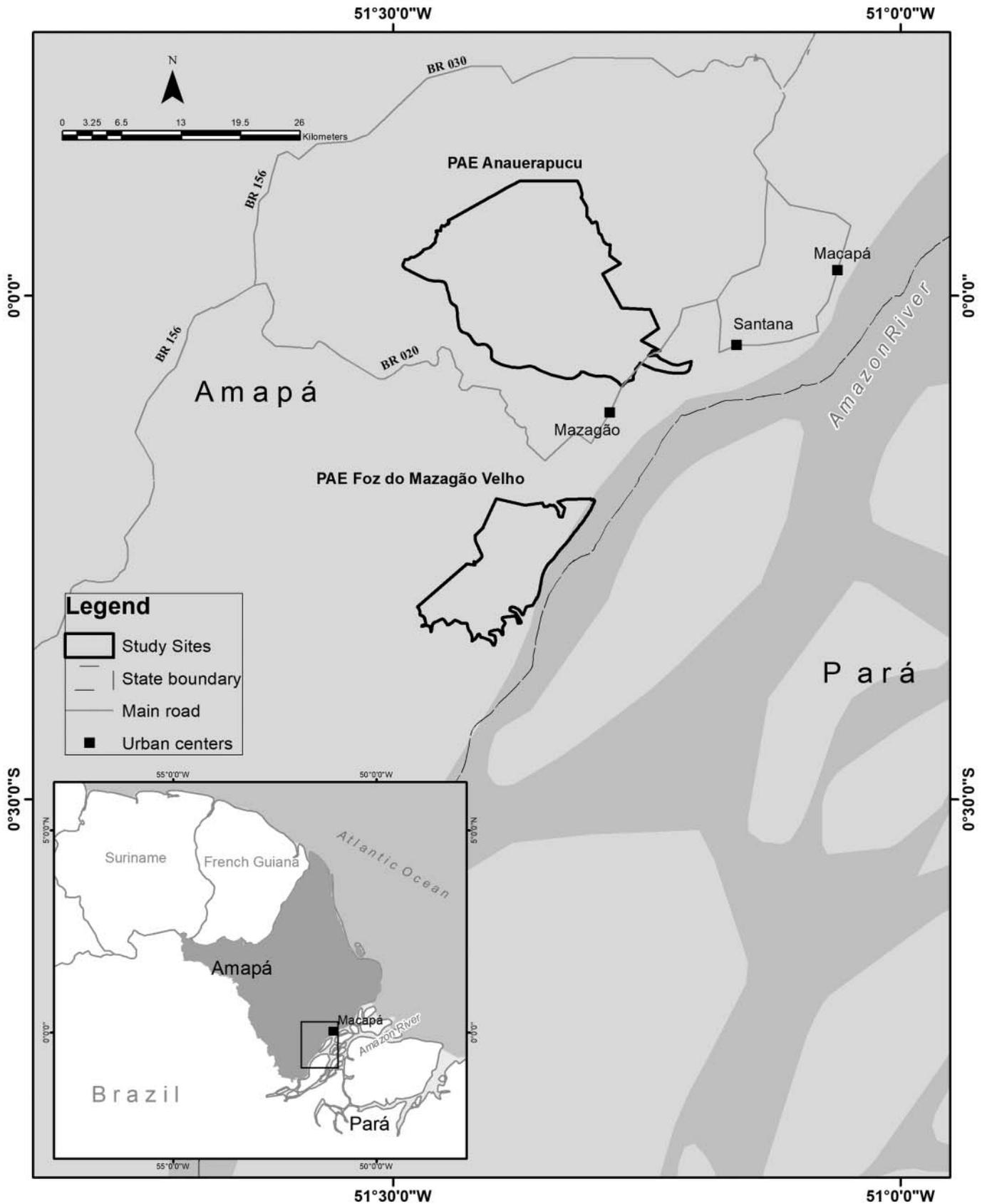
In 2014, semi-structured interviews were conducted with 27 purposefully selected producer households involved in family forestry – including producers and millers – in the two settlements. Selected households in the villages were identified using a two-stage cluster sampling method. First, hamlets within each PAE were identified by key informants as sites where families produced timber. Second, in the selected hamlets lists of families actively working with timber at the time as producers, loggers, or millers were generated with the assistance of community leaders. The lists were used to randomly select 16 households in Foz and 11 in Anauerapucu (Table 1). The sample size was limited by the time available at each site.

Household interviews elicited information on livelihoods, property rights, production strategies, forest management practices, and knowledge of forest regulations. Mill owners were asked about production trends and details of supply chain dynamics. For both types of informants, the goal was to assess their understanding of regulations related to timber activity in the study region and how their views influenced their use of forest resources. At the end of the interview, informants were asked if they had heard about Decree 3325 and their opinion of it. If they had not heard of the decree, it was explained, and their opinion was again solicited.

Other stakeholders involved in the value chain were also consulted (Table 2). Interviews were conducted with 16 owners and employees of lumber retailers (*estâncias*) in the Amapá ports of Santana (2) and Macapá (14) who bought and sold sawn wood from local mills. The aim here was to learn about their role in the supply chain for timber originating in the study region and more broadly the characteristics of the regional timber market.

Finally, ten representatives from government agencies involved in the forest policy reform in Amapá were interviewed to understand the goals and objectives of the policy reform, including the technical justifications for the changes. The agencies included two Amapá state agencies, the State Forestry Institute (IEF) and the Institute of Land and Environment (IMAP), created in the 2000s to help implement forest policy. Representatives from regional offices of federal agencies were interviewed, including from the National Institute for Colonization and Agrarian Reform (INCRA) and the national agency responsible for riparian areas the Secretariat for Union Patrimony (SPU). A researcher from the Brazilian Agricultural Research Corporation (EMBRAPA) was a key

FIGURE 1 Map of study sites in Amapá



Basemap Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community  
Smallholders Data Source: [https://certificacao.incra.gov.br/csv\\_shp/export\\_shp.py](https://certificacao.incra.gov.br/csv_shp/export_shp.py)  
Road data: Open Street Map (OSM)

TABLE 1 Population and sample size of selected communities in the target settlements, Amapá (2014)

	Foz do Mazagão Velho PAE				Anauerapucu PAE	
	Mutuacá	Espinhel	Foz do Mazagão	Igarapé Grande	Vila Anauerapucu	Vila Nova
Resident families	34	15	57	49	250	38
Families working in the forestry sector	17	14	20	25	19	*
Families interviewed	3	2	4	7	9	2

\* This information was not available during fieldwork

TABLE 2 Local stakeholders and state agency representatives interviewed during three research stages

Acronym	Name	Jurisdiction	Number of interviews		
			2014	2017	2020/21
<i>Local stakeholders</i>					
Foz PAE	Foz do Mazagão Velho PAE	Local	16	24*	2
Anauerapucu PAE	Anauerapucu PAE	Local	11	-	-
	Lumber retailers	Local	16	8	
<i>State agencies</i>					
IEF	State Forestry Institute	State	5	3	2**
IMAP	Amapá Institute of Land and Environment	State	2	1	1***
EMBRAPA	Brazilian Agricultural Research Corporation	National	1		
INCRA	National Institute for Colonization and Agrarian Reform	National	1	1	
SPU	Secretariat of Union Patrimony	National	2		

\* 16 original + 8 new

\*\* In 2019 IEF was dissolved, its responsibilities related to the forest sector policies were transferred to the State Secretariat for the Environment (SEMA) and the ones related to forest technical assistance to the Institute of Rural Development of Amapá (RURAP)

\*\*\* In 2019 IMAP was dissolved, its responsibilities related to the forest sector licensing were transferred to the State Secretariat for the Environment (SEMA) and the ones related to land regularization to the Land Institute of Amapá (Amapá Terras)

informant, given their knowledge of forest ecology and management in Amapá's floodplains and their direct involvement in the state forest policy reform, including the development of Decree 3325.

In September 2017, a second round of interviews was conducted in Foz with families that had participated in a community forestry training program intended to pilot the reform mechanisms. Anauerapucu was not revisited because it had not been included in the training program. Also, during this second field visit, follow-up interviews were conducted with lumber retailers, and additional interviews were conducted with the same representatives from IEF, IMAP, and INCRA. Results and analysis from the 2014 fieldwork were discussed with all interviewees.

In the third phase of the research, in September and October 2020 (when authors were outside the state), and again in early 2021, we contacted by telephone two key informants from the former IEF agency (which was dissolved in 2019 and the staff distributed among SEMA, the Environmental Secretariat and RURAP, the Institute of Rural Development of Amapá), one from IMAP (dissolved in 2019 and the staff distributed among SEMA and Amapá Terras, the Land Institute of Amapá) and two previously interviewed families from Foz to track changes in forest policy in the state.

## RESULTS

In this section we first describe smallholder timber production systems in the study area and some components of the supply chains. We then provide an analysis of federal forest policy and regulations relevant to these smallholder systems. We present the state forest policy reform process in Amapá, finally reporting on the perceived impacts of Decree 3325 for family forestry and milling.

### Small-scale forestry on the estuary

The reported land use and livelihoods of sampled households were similar between the two PAEs. Participating families reported an average landholding of 42 ha in Foz and 33 ha in Anauerapucu, with a range from <1 ha to 130 ha. All possessed formal documents recognized at the federal level legitimizing their land possession. Notably, 23 out of 27 smallholders retained mature forest area on their plots, covering an average 87 percent of the property in Foz and 66 percent in Anauerapucu. They maintained highly diversified but small-scale production areas within their plots but reported increased emphasis on açaí and much less on annual crops or timber compared to past decades. Only nine families cultivated

annual crops, and seven of those were in Anauerapucu, where a government program guaranteed purchase of family farm products. With the exception of only two families from Foz, all maintained açai stands (*açaízais*) on their landholdings, originating either in mature forests, where farmers had removed large canopy trees to encourage açai growth, or in agricultural fallows, where they managed natural regrowth to optimize for açai.

Community leaders reported that 11 family sawmills were operating in Foz in 2014, of which seven were included in our sample. These small sawmills operated on the millers' property. One of the mills included a furniture workshop. The other 19 households (eleven from Foz and eight from Anauerapucu) either engaged in logging and/or sold standing trees. Five families in Foz sold trees in 2014 versus two in Anauerapucu.

While in the past families would fell their own trees and transport logs to the mill, in 2014 the millers provided this service, selecting only high value trees. Informants reported that timber harvested in the previous 12 months was mainly for domestic use, for example for repairs or new construction. Motives for selling timber included the need for cash for unplanned expenses, supplemental income when açai was out of season, or the need to clear trees to establish new açai stands or manage existing stands. In general, farmers strategically selected trees for harvest to open canopy gaps that would promote açai regeneration or growth. They reported that they saved only trees that would serve for future timber harvest.

The mill owners processed timber from their own property, and all but one supplemented that with supply from neighbours. Millers reported that their output in the past decade had been primarily for the local market, to neighbours and lumber yards in Santana and Macapá. During the 2014 interviews, none were aware of formal transactions with government agencies or registration at any point in their engagement with the supply chain.

They reported several challenges to the harvest, transport, processing, and sale of the trees and lumber originating from the smallholder forestry system in the region. First, logging and milling were highly dependent on manual labour, which was scarce since many people preferred work with açai. Also, logging was perceived as hard and dangerous work, and the operations lacked safety equipment or procedures. Second, millers reported a reduction in local timber stocks, which resulted in greater travel distances to find timber and increased transport costs. Finally, they reported that the informal structure of the value chain weakened their market leverage and resulted in low prices for their products and high risk of fines and wood confiscation. In addition, mill owners reported that the informality threatened their dignity, recounting how the environmental police not only fined them for unauthorized transport of timber but also demanded bribes and verbally humiliated them. They reported that they could not afford to comply with formal regulations but also lacked the technical capacity to do so. Thus, the sawmill owners preferred to sell the lumber in the community, where transportation costs were low, and they did not risk encounters from the environmental police.

To overcome these challenges and improve timber production, mill owners recommended "appropriate forest regulation and monitoring." For them, the licensing procedures must be feasible for the forest owner to comply with management and harvest regulations, which would allow all actors downstream on the supply chain to work without fear of sanction. This statement by a small sawmill owner captures a widespread sentiment among both producers and loggers.

"They [government officials] should create [regulations] that are aligned with the small sawmill's reality, because they aren't. I don't chop down a tree because I like to; I do it because I need to and my heart hurts when I do it, with the number of birds that live in the tree. I need to survive; that is why I log. The problem is that the environmental [guards] arrive and fine us, and they don't want to understand our reality. If the timber was legal, I could transport it over land, but because it is illegal, we have to transport by river, which is much more expensive."

Millers also emphasized the importance of technical assistance, capacity building and access to credit to invest in production improvements, as reflected by the following statements:

"We should have access to technology and to equipment for furniture making. The government should give us support for that. My dream is to be able to use all the timber; currently, we use only 50% to make boards and the rest is wasted [as sawdust and scrap]."

"The government should provide credit and technical support for us to do timber management. Most of the properties no longer have timber, so we need to grow it; here the timber develops very fast. We just need some support."

Finally, millers indicated that formalization should also lead to higher prices along the supply chain, which could provide incentive to plant more trees and manage for timber again on these landholdings.

### **Federal norms for timber management in floodplain settlements**

Forestry legislation in Brazil is extensive, complex and distributed among legal instruments produced by different agencies, some of which are complementary, others conflicting (Carvaleiro *et al.* 2008). Regardless of the type and scale of forest operation, formal authorization for commercial forest management in Brazil has always been required with some previous attempts to streamline the process for community operations (Waldhoff and Vidal 2015, Azevedo-Ramos and Pacheco 2017, Costa *et al.* 2018). Historically, regulatory processes were highly centralized and bureaucratic. However, following a global decentralization trend in forest administration, which had started in the 1980s (Agrawal and Ribot 1999), Brazil began decentralizing its forest sector in 2006 with the Law on Management of Public Forests (Law

n° 11.284) (see also Rocha *et al.* 2020). This law distributed responsibilities for forests among national, state, and municipal government agencies. States gained authority over the management of forest on public lands, state conservation units, rural properties, and rural settlement projects within their jurisdiction.

Even though this decentralization process meant states could create their own regulations, as we explain below, the agencies responsible for forest licensing in Amapá were using federal norms to orient their activities until 2013.

Interviews with key informants from governmental agencies in Amapá coupled with our own reading of the forest policy revealed four key federal norms relevant to forest management on the estuarine floodplain: two institutional norms from the Ministry of Environment (IN-04, IN-05), one from the National Institute of Colonization and Agrarian Reform

(INCRA, IN-65), which applies to lands located in settlements projects managed by INCRA, and one resolution from the National Council of Environment (CONAMA Resolution 406) (Table 3).

IN-04 defines the process for landowners to demonstrate legitimate property claims to initiate forest management planning. Among required steps, applicants must receive authorization, referred to as APAT (*Autorização Prévia a Análise Técnica*, Authorization for Technical Analysis), which is based on a preliminary technical evaluation of the legitimacy of their property rights. The APAT is administered by the competent state environmental agency. This legal analysis requires the applicant to provide valid personal identification, a map of the forest area proposed for management, and most importantly, the land title or similar documents from the state office of INCRA.

TABLE 3 National-level Normative Instructions (IN) and resolution related to community forestry in PAE settlements

Norm (Year)	Institution	Purpose	Requirements and/or description of procedures
IN-04 (2005)	Ministry of Environment	Describes the process to obtain a preliminary license for technical analysis (APAT)	Applicant's valid identification, map of the forest area proposed for management, and land title or other proof of possession.
IN-05 (2005)	Ministry of Environment	Describes technical procedures for the elaboration, execution and evaluation of sustainable forest management plans (SFMP) for low and high intensity operations	<p><b>1-SFMP:</b> information on the landholding and forest to be managed including silvicultural system adopted; list of species to be protected; list of species to be harvested; logging cycle; intensity of logging; size of production units and planned annual production; a 100% inventory of commercial species and logging methods; volume estimate; maps of the landholding with microzoning.</p> <p><b>2-Annual operation plan:</b> list of planned activities for the production unit during the year.</p> <p><b>3-Report of general activities:</b> information about the sustainable management area, description of activities completed, and the volume harvested in the previous 12 months.</p>
CONAMA Resolution 406 (2009)	National Council of the Environment	Establishes technical parameters for the elaboration, presentation, technical evaluation and execution of SFMP	Procedures for calculating harvest intensity; determination of the default minimum harvest diameter of 50 cm for all species; description of procedures to calculate specific minimum harvest diameters; procedures to use timber residues after logging (e.g., branches, roots).
IN-65 (2010)	National Institute of Agrarian Reform-INCRA	Establishes criteria and procedures for sustainable forest management activities in PAE, mainly (a) to ensure that the settler or the collective group that represents the settler is the holder of the SFMP; and (b) to establish that forest management activities inside land reform settlements cannot be carried out by third parties. It also presents procedures for the approval of the APAT prior to submission to the competent environmental agency and requirements for documenting agreement to elaborate a SFMP.	<p><b>1-Documents required for APAT in a PAE:</b></p> <ul style="list-style-type: none"> <li>* Association's Bylaws, updated and notarized;</li> <li>* Associations National Register of Legal Entities (CNPJ);</li> <li>* Concession of use rights contracts (CCDRU);</li> <li>* Identification documents of all settlers involved;</li> <li>* Association's minutes approving forest management;</li> <li>* Signature of all involved.</li> </ul> <p><b>2-Requirements to develop SFMP:</b></p> <ul style="list-style-type: none"> <li>* Provisional or definitive land title of forest managers;</li> <li>* Environmental license for settlement;</li> <li>* Qualified technical assistance for forestry activities;</li> <li>* Topographic map for the settlement.</li> </ul>

Table 3 is intended to illustrate key aspects of regulations and is not an exhaustive list.

IN-05 defines the requirements for preparing sustainable forest management plans, presenting differentiated regulations based on the scale and intensity of proposed forest extraction (high versus low). The non-mechanized operations by smallholders and communities generally fall under low-intensity forest management. The steps and required information for the licensing procedure for both management categories are similar, requiring all landowners to prepare a sustainable forest management plan (SFMP), an annual operational plan (POA, acronym for *Plano de Operação Anual*), and an annual harvest activity report. The two main differences between high- and low-intensity systems are that the maximum allowable annual harvest in low-intensity systems is  $10\text{m}^3\text{ha}^{-1}$ , compared to  $30\text{m}^3\text{ha}^{-1}$  for high-intensity mechanized operations. The plans and reports for low-intensity operations systems are less detailed. Importantly, for both categories of forest management, the plans and reports have to be supervised and signed by a licensed forester.

The CONAMA Resolution 406 complements IN-05 by defining technical parameters to be adopted in all phases of the SFMP, from elaboration to execution.

The fourth relevant federal norm IN-65 dictates a critical step linking forest rights to land tenure, requiring INCRA to verify that the applicant complies with regulations related to land ownership and forest management. Two key aspects of the norm are especially relevant to estuarine smallholders at the center of this study. First, the norm defines procedures to verify whether the proponents of the plan are settlers that have a definitive or provisional title required for emitting the APAT. This ensures that the settlers will be the beneficiaries of the forest activity and is a response to repeated historical irregularities observed in contracts between logging companies and settlers in land reform settlements in the Amazon (Costa et al. 2018). Second, it establishes criteria to verify if proposed management activities have been supervised by a licensed forester and, if located in a settlement project, whether the settlement has an environmental plan and a topographic study. If both criteria are met, INCRA authorizes the SFMP. This norm also states that the only type of forest management that can be licensed in settlement projects with communal property rights is community management proposed by an association or cooperative.

The IN-65 is especially salient for small-scale forestry on the estuarine floodplain since demonstrating property rights there is not straightforward. Historically, Brazilian legislation treated all land affected by tidal or seasonal flooding as national patrimony that could not be titled to individuals or communities. Such lands were managed by the Secretariat for National Patrimony (SPU). However, this issue shifted in the early 1980's when the government introduced a new land reform modality called a PAE<sup>1</sup>. This new modality allowed INCRA to define and title communal polygons and grant usufruct rights (but not individual titles) to resident families so they could maintain traditional livelihoods based on sustainable extractive activities within customary holdings (Benatti 2016).

Historically, the lack of property rights for floodplain residents resulted in their exclusion from the formal timber sector. The creation of the PAE helped but was still insufficient. In 2005, in response to pressure from social movements, a joint initiative between INCRA and SPU attempted to further clarify land tenure regularization in floodplains (Valadares 2013). The result was the TAUS (*Termo de Autorização de Uso Sustentável*, Terms for Authorization of Sustainable Use), a document that recognizes the floodplain lands occupied by families and authorizes their sustainable use, among other benefits (Valadares 2013).

In subsequent years, new laws (11.481/2007 and 11.952/2009) defined an additional mechanism, the CCDRU (*Contrato de Concessão de Direito Real de Uso*, or Contract of Concession of Use Rights), which established a stronger legal bond between recipient families and their land and allowed use rights to be inherited (Chiavari et al. 2016, Valadares 2013). In a two-stage process, the SPU grants the CCDRU to INCRA, and INCRA, in turn, allocates the CCDRU either to individual families or to community associations in the PAE. Neither the TAUS nor the CCDRU is equivalent to a land title, nor do they provide property boundaries. While the CCDRU granted to households defines the proportional share of the territory each family is hypothetically entitled to, it is not based on the area they actually manage, nor is it demarcated. When the CCDRU is granted to an association it refers to the entire territorial area of the PAE.

Thus, to receive legal authorization for forest production, floodplain communities must first demonstrate property rights under IN-65 and then go through a bureaucratic process governed by IN-04, IN-05 and CONAMA Resolution 406, which had been originally designed to regulate high-intensity forestry operations of commercial timber enterprises (Carvalho et al. 2008, Azevedo-Ramos and Pacheco 2017).

By 2012 it was clear that small-scale forestry operations in the estuarine floodplains were not well-served by these federal norms for the authorization to harvest timber. Thus, in 2012, the new Forest Code (Law no. 12651) introduced progressive changes that mandated a simplified process for the approval of community forestry but left the responsibility for defining and implementing the norms to the states. This mandate for a simplified process sparked the forest policy reform in Amapá.

### State forest policy reform in Amapá

In response to the 2006 decentralization in the forest sector, the Amapá state government created two new agencies: the State Forestry Institute (IEF), to strengthen the forestry sector and provide technical assistance to rural communities, and the Institute of Land and Environment (IMAP), to oversee land tenure regularization and environmental licensing. IEF was charged with responding to the 2012 federal mandate for states to develop the implementing norms for community forestry regulation. IEF initiated a participatory process to develop the Amapá State Forest Policy and norms to better

<sup>1</sup> The first PAE, São Luís do Remanso, was created in 1987 in the state of Acre (Hall, A.L., 1997).

address the needs of small-scale forestry operations, specifically those of communities and families.

To carry out the proposal of the reform IEF hired policy experts from the Rural Federal University of Rio de Janeiro. The university team began with an evaluation of the forestry sector and forest governance in the state through 17 consultative meetings with relevant government agencies, private institutions, and civil society. Based on that review, the policy reform team led by IEF identified key barriers and bottlenecks to legalizing small-scale forestry operations. The reformers drafted a bundle of five regulatory instruments<sup>2</sup> for executive or legislative adoption. They also attempted to streamline procedures and align legal instruments overseen by different government sectors and agencies. The state then set out to address two overarching bottlenecks identified in the review, namely, onerous regulatory procedures for forest management plans and limited possibilities for documenting forest property rights.

The most relevant policy change for small-scale forestry in the estuary was the Forest Management Decree, known as Decree 3325, which set out to simplify the onerous federal forest management regulations. Four key components of this decree are relevant to our study.

First, while the federal norm IN-05 differentiated licensing requirements for high- and low-intensity forest management, the Amapá state Decree 3325 further differentiated these categories to enterprise (high-intensity) and small-scale (low-intensity), the latter of which can be proposed individually or by the community through an association or cooperative. In addition, for small-scale operations, the decree differentiated

allowable harvest volumes of 5 m<sup>3</sup> ha<sup>-1</sup> for upland forests (*terra firme*) and 10 m<sup>3</sup> ha<sup>-1</sup> for floodplain forests (*várzea*)<sup>3</sup>, to account for higher primary productivity on the floodplain (Ayres 1995).

Second, under the federal regulation IN-04, a definitive land title or usufruct concession document was a prerequisite for approval of a forest management plan. However, gaining usufruct concession documents involved lengthy judicial analysis for approval. Decree 3325 attempted to facilitate legal access to the forest by defining 16 alternative land documents to prove de facto rights. For smallholders in the floodplains specifically, the decree recognizes the TAUS and the CCDRU.

Third, it was clear from the forestry sector evaluation that requirements for presenting the sustainable forest management plan defined by IN-05 included insurmountable barriers for smallholders. Decree 3325 introduced a simplified procedure for small-scale operations (Table 4), eliminating the forest inventory and land maps. For individual smallholders, it dropped the requirement for a licensed forester to supervise and sign SFMPs, however plans submitted by community associations or cooperatives, for example organizations representing PAE residents, still needed a forester to supervise and sign off on the plan. Although the three steps defined in the federal norm for the licensing procedure were not changed, the requirements for small-scale (low-intensity) SFMPs and POAs were simplified for individual landowners and for communities. The Amapá policy reform also proposed cutting bureaucracy by creating a special office in IMAP to process paperwork from small-scale producers.

TABLE 4 Decree 3325 requirements for presenting Sustainable Forest Management Plan for individual and community applications

Procedural requirements	Additional requirements or exemptions according to applicant category
<p>1-<b>Sustainable Forest Management Plan (SFMP)</b>: simplified SFMP providing information about the property area and land use; definition of area to be managed; identification documents of the landowner.</p> <p>2-<b>Annual Operation Plan</b>: estimated volume of timber to be harvested and average volume per ha; equipment to be used; number of people working in the operation; methods for processing and selling harvested timber; geographic coordinates of the management area; and for each tree to be harvested, a list with species, circumference, height and volume (not a full forest inventory).</p> <p>3-<b>Harvest report</b>: list of trees harvested, including species, circumference, height and volume.</p> <p>4-<b>Sketch Map</b> (croquis) of the landholding area and area under management.</p> <p>5-<b>Signed terms of responsibility for forest management.</b></p>	<p><b>Individual applications</b></p> <ul style="list-style-type: none"> <li>- Can be exempt from technical assistance requirement (Art.98, 4°).</li> </ul> <hr/> <p><b>Community applications (associations or cooperatives)</b></p> <ul style="list-style-type: none"> <li>- Proof of technical assistance by Forest engineer.</li> <li>- General information about the association/cooperative (name, address, membership names and identification number etc).</li> <li>- Notarized proof of association/ cooperative's legal status.</li> <li>- Terms of Responsibility for forest management signed by all members.</li> </ul>

<sup>2</sup> These were the Law of the State Forest Policy (pending); Law of Management of Public Forests (pending), Decree No. 5762 on Forest Concessions, Decree No. 3325 on Forest Management, and the State Forest Program (Decree No. 3528). In 2017, the first two were still being negotiated within the state government, and ultimately were never approved by the state legislature (M. Marinho personal communication, June 28<sup>th</sup>, 2021).

<sup>3</sup> The CONAMA Resolution 406 cites research on of average tree volume, harvest intensity greater than 10m<sup>3</sup> ha<sup>-1</sup> could be authorized but would be limited to three trees per ha for harvest without machinery.

Fourth, to adapt regulations to the fallow forestry silvicultural systems typically used by smallholder farmers on the floodplain, Decree 3325 changed the rules for harvesting two fast-growing species common in fallows on the estuary based on scientific studies of their growth rates, *pracuúba* (*Mora paraenses* [Ducke]Ducke) and *pau mulato* (*Calycophyllum spruceanum* (Benth.) K. Schum.) (Castilho 2013, Guedes et al. 2012). It differentiated the minimum diameter of 50 cm for harvest in low-density stands and of 70 cm in high-density stands for *pracuúba*. The decree also allowed for thinning of small-diameter trees (10 to 30 cm) in dense stands of *pracuúba* and *pau mulato*.

These four aspects of the Decree 3325 – differentiating harvest volumes according to forest type, broadening the documentation to prove land rights, simplifying the procedure for obtaining a license to carry out forest management operations, and loosening minimum diameter for harvest and thinning operations for certain species – were designed to facilitate the legal entry of small-scale actors into the timber sector. In the next section we present the perceptions of actors with a stake in this reform, government agents, small-scale timber producers, and downstream supply chain actors.

### Perceived impacts of Decree 3325

#### *Timber producers*

During initial interviews with participating farmers in 2014, before discussing the Decree 3325, we asked if they knew the procedures to formalize production. None knew the full set of requirements, and most reported that they did not understand how to regularize their production. Families that had tried to obtain licenses said they had never succeeded and that government agencies had not provided the necessary information to legalize their activity, as stated by this producer:

“To do legal forest management we need a license, but it is very hard to obtain this license and no one gives us correct information about it. To get the license for my chainsaw I went three times to Macapá, and I didn’t get it. It is a lot of time and money that we spend to go to town.”

In 2014, among the informants in Foz and Anauerapucu, only the president of the association of Foz knew about Decree 3325. When the salient points of the decree were described, respondents did have opinions. Regarding the revised thinning allowance, in general, farmers recognized the importance of thinning trees in areas of forest regeneration, but opinions were mixed about the relevance of the rule, some doubting that there was much of a market for small-diameter logs. The majority (70 percent) opined that it was not worthwhile to mill 30-cm diameter logs because it would produce few boards, and, since the wood was not mature, the boards would warp. They suggested that trees should have diameters of at least 50 cm to provide sufficient return for the labour invested. One informant expressed concern:

“Without appropriate monitoring, it would be impossible to know if logging is being done in regeneration areas with

high densities of *pau mulato* and *pracuúba* or in mature forest areas. If [the government] allowed the removal of these small trees, they will be finished.”

Also, some respondents explained that these high-density stands of *pau mulato* only occur in areas left to fallow after they had cultivated crops. However, fewer families were growing crops due to a preference for açai, and, as a result, there are few new fallow areas where thinning operations might promote the growth of *pau mulato*. Some smallholders associated the decline of *pau mulato* with the reduction of annual crops production, as one stated:

“People removed too much *pau mulato* and did not plant. If people planted crops and let it fallow, the timber would come back. *Pau mulato* likes the fallow, the fire helps it germinate. After you harvest your corn, you will see that the area is full of *pau mulato*.”

As a second concern, informants had mixed views on the timber volume allowed for harvest (10 m<sup>3</sup> ha<sup>-1</sup> on the estuary). Many informants (44 percent) felt this volume was too low for families that depended on logging for their livelihood or even to clear new areas for the intensive management of açai. Others (33 percent) thought the volume was reasonable because it would allow them to produce timber and conserve the forest at the same time. As one informant stated: “I think it’s reasonable, because if [the forest] finishes one day, it will fail for us. We have to take care of it.”

In 2014, after our first field visit, state planners set out to test the new norms and mechanisms once the new policy was in place. The state engaged an NGO to carry out reform-related capacity building in five rural settlements, including Foz, providing training on how to develop SFMPs, supposedly in accordance with Decree 3325. As part of the project, the NGO published a manual to explain the new guidelines to small-scale producers so they could license their timber (Farias et al. 2016).

During our second field visit to Foz in 2017, only five of 16 families we interviewed knew about the salient changes introduced by the Decree 3325. These five were among the 13 that had participated in the 2014 capacity building project related to the implementation of Decree 3325. Participants stated that before the training they had not known about the regulatory procedures to legalize their forest production. All these families said that after completing the training course they would be able to gather the necessary information for the application requirements, however they would need the technician to process the data and generate the required maps with the localization of the trees. All families evaluated the pilot project as positive overall but were disappointed that their forest management plans developed under the project to date had not been approved.

#### *Timber processors and sellers*

In 2014, none of the 16 timber sellers in Macapá and Santana had any knowledge of Decree 3325; even in 2017 the eight urban lumber sellers re-interviewed were still unaware of the

decree. Millers did, however, note two changes in the sector since 2014. First, they stated that the supply of *pau mulato* had declined. Second, due to the economic recession, lumber yards were unable to pay up-front for the lumber delivered. They would only be able to accept and pay for lumber on consignment.

Representatives from the family sawmills reported in 2017 that they had either reduced their operations or had shut down altogether. Informants reported that of the 11 family mills operating in Foz in 2014, two had closed and one had been sold. The families that decided to close their mills reported that the environmental authorities had recommended it. In the other case, the mill was sold because it was no longer financially viable once urban lumber yards could no longer pay for the wood in advance. All the mill owners reported dedicating more time to managing açai.

#### *Government agents*

In 2014, the 11 government policy makers and technicians interviewed presented a mix of low awareness and apathy towards the forest policy reform in Amapá. Two government informants were not familiar with the policy changes underway, while two others reported their familiarity but continued to use federal norms and protocols. For example, one from IMAP continued to use the federal norms believing that the initial evaluative analysis conducted by IEF was inadequate. They felt that the consultation meetings with government agencies during design of the reform were only informative, and that participants' views were not reflected in the final decree text.

This informant further suggested that the decree was not aligned with the reality of floodplain communities, citing the reform's failure to include measures that promoted ecosystem conservation specific to the floodplain forest, such as rules to stabilize riparian areas in communities or rules that considered the effect of tides on timber management. They also thought that the harvest volume in the small-scale category was too low given the high regeneration capacity of the floodplain forest. Finally, the informants pointed out that the procedures for licensing smallholder production presented by the Decree 3325 were still overly complex. They concluded: "It is necessary to create a norm that offers solutions for the particularities of each context. In synthesis, the decree changed nothing. They spent public money to elaborate a law that doesn't change anything." In their view, the rules dictated in the decree did not differ much from the federal norms they used (IN-04 and IN-05).

In 2017, informants from the two agencies primarily responsible for administering the timber licensing procedures were aware of Decree 3325 but said that they were not implementing it. In the opinion of one informant from INCRA who was not following the new procedure defined in the decree, the approach taken by IEF to make the procedures less bureaucratic was not appropriate. The informant believed that the reformed procedures should agree with the legislation used by other agencies:

"In INCRA we use norm IN-65 that requires that SFMPs have technical supervision, but the decree [3325] exempted this responsibility. But, how is a small producer going to be able to develop a management plan? The requirements should be simplified, but [the changes should] not eliminate the role of the forest engineer. Instead, IEF should invest in technical assistance and provide this service to smallholders."

An informant from IMAP suggested that Decree 3325 did not facilitate the licensing process and had no impact on floodplain communities. However, they mentioned that the judicial department of IMAP had accepted the use of TAUS and CCDRU as proof of land possession on floodplain areas and that they had emitted APAT for the community forest plan in Foz.

One informant from IEF who was actively involved with developing Decree 3325 in 2013 suggested that the biggest challenge to its implementation was IMAP's resistance to adopting it. They further complained that even though all IMAP technicians were invited to participate in the meetings to design the decree, the majority chose not to. Because many IMAP technicians were still not aware of the decree, this person suggested, they erroneously continued requiring a full forest inventory according to IN-05 a requirement that no longer applied in Amapá. In addition, they pointed out that IMAP lacked sufficient technical staff to process and analyse applications from small-scale producers, even though the decree prioritized this.

#### *Implementing NGO*

Crucially, even the NGO charged with testing the implementation of the reform mechanisms with smallholder producers opted to ignore some procedures set out in Decree 3325. A forester from that NGO explained their reasoning. Acknowledging the conflict between state (Decree 3325) and federal regulations (specifically IN-05, IN-65), and recognizing that federal agencies still controlled key steps in the approval process, the NGO operatives elected to lead landholders along a path that would most likely ensure approval of SFMPs. They decided that since the state forest agency IMAP and the national agency INCRA were still operating under old protocols and would only authorize plans that complied with IN-05 and IN-65, the project would privilege the federal rules. The practical guide they developed to explain the administrative process for forest operations in the state, therefore, maintained the requirement that forest engineers submit management plans on behalf of individual small-scale operators and supervise the forest inventory, even though both requirements were supposed to be eliminated by Decree 3325 for those actors.

In summary, the NGO staff felt that Decree 3325 was not feasible in practice because of disagreements between technicians at two state agencies, IEF and IMAP, and that this conflict stifled efforts to implement the reform. Another barrier to developing a feasible pathway for community forestry, according to the NGO staff, was inertia by INCRA in resolving obstacles inherent in its own norm. This informant

recounted a case that illustrates the crux of the problem. Through the project run by the NGO, 13 families in Foz requested authorization through the community association of Foz do Mazagão to harvest timber by first applying to INCRA to emit the APAT required to start the licensing process. INCRA's response took eight months to arrive. Once the APAT was emitted by INCRA, forest technicians obtained the APAT from IMAP. After that they prepared the community management plan according to IN-05 and IN-65, but, ultimately, INCRA did not authorize the plan. The reason given was that the Foz PAE needed a topographic study, as stipulated in IN-65. Ironically, the topographic study was the responsibility of INCRA. As of July 2021, approval of the community management plan was still pending. In fact, not a single community forest management plan had been approved in the state of Amapá by this date.

Finally, the NGO technician considered the lack of technical assistance to be another key challenge for community forestry in Amapá. The technician argued that the state needs more staff and more training to effectively support community forestry.

## DISCUSSION

The results of this study illustrate a state-level attempt to reform forest policy in Brazil to better respond to the needs of smallholder and community timber producers. Although well intentioned, the reform has all but failed, largely due to bureaucratic inertia and a mismatch between state and federal rules.

Amapá's Decree 3325 attempted to facilitate timber licensing for families and communities located on the estuarine floodplain in four ways: expanding the list of acceptable documentation for proving property rights, simplifying the procedure for obtaining a license to carry out forest management operations, loosening the minimum diameter for harvest and allowing for thinning operations for certain species, and differentiating allowable harvest volumes between floodplain and upland forests. These changes were a state response to challenges apparent in federal norms governing property rights and to rules defining forest management planning and operations that did not reflect the realities of forest management in estuarine communities in Amapá. We discuss each of these elements in relation to the federal norms and the constraints perceived by smallholder producers.

First, securing land tenure is an essential first step for acquiring timber rights and formalizing forestry operations (Cronkleton and Larson 2015). Historically, floodplain residents have been excluded from regional timber supply chains due to the lack of legal property rights to land and resources, limiting their income (Pinedo-Vasquez *et al.* 2001). Joint efforts at the national level by INCRA and SPU have allowed floodplain residents to demonstrate use rights by emitting two types of documents, the TAUS and CCDRU. The Decree 3325 recognized these important advances in land tenure regularization and allowed both documents to be used as proof of

*de facto* rights on the floodplains in Amapá, which could allow smallholders residing there to formalize their timber operations. Although initially IMAP was reluctant to accept these documents as proof of land possession, their judicial sector eventually did. As a result, the Foz do Mazagão association received the APAT for their management plan, which set a precedent for other associations in the floodplain.

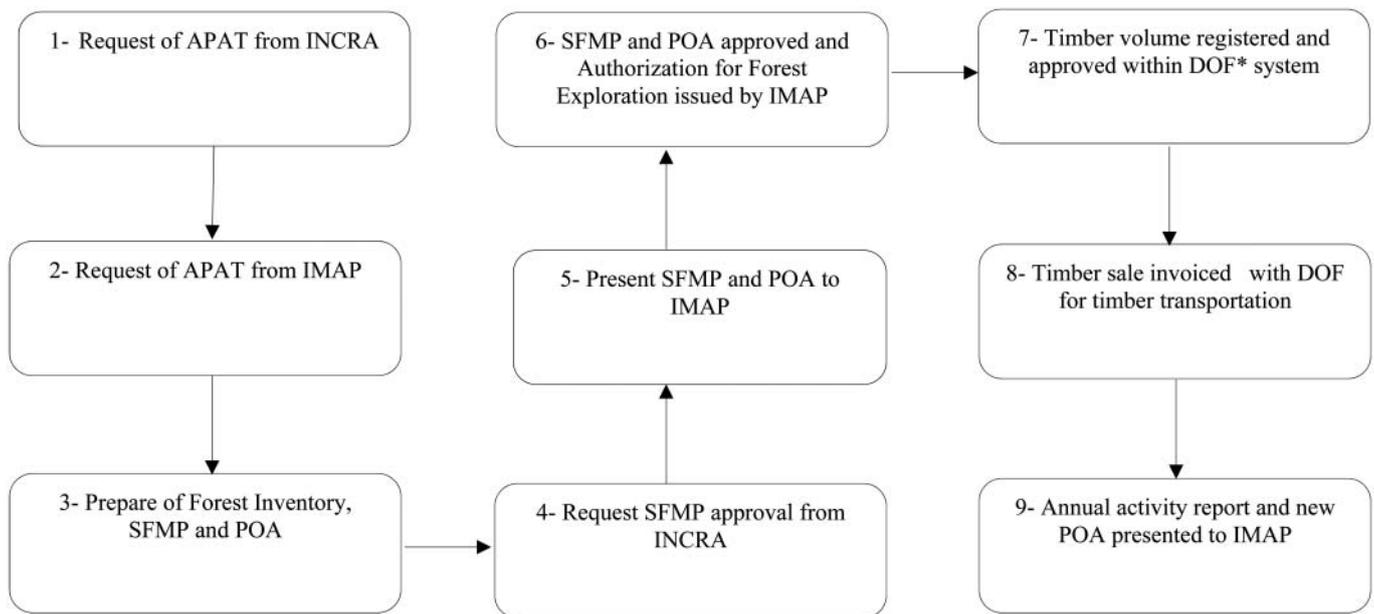
Second, the decree tried to make the licensing requirements easier for smallholders by simplifying the presentation of SFMPs and operational plans and exempting individual smallholders from technical supervision by foresters. This latter exemption could be an important step in making smallholders less dependent on external support for completing the licensing procedure (Fortini and Carter 2014). Initially, the lack of technical capacity among smallholders to write their own plans could be a constraint, but families can easily learn the new procedures for estimating volume and mapping the land. However, we did not observe smallholders attempting to take these steps on their own. Importantly, certain exemptions were not extended to community organizations requesting authorization, including those from PAEs. Thus, community SFMPs still had to be supervised by a forestry technician.

Although the requirements were simplified by the decree, the pathway for approval was not, since authorizations from multiple agencies were still required (Figure 2). Furthermore, the state agency IMAP was still requiring a complete inventory and maps of the area, requirements that were dropped by the decree. Given the fact that smallholders inside PAEs can only apply for a community SFMP, they still rely on foresters. However, with exception of the 2014 NGO project to pilot Decree 3325, smallholders in the Amapá floodplain have had no access to technical assistance or credit lines to support timber management. As a result, most smallholders in our sample were unaware of the Decree 3325.

The most critical barrier, however, were the federal licensing agencies' enforcement of the federal norms IN-04, IN-05, and IN-65 that served as key steps in the administrative process, and the state agencies' unwillingness to pursue alignment with the state decree. The federal agencies had little incentive to respect state guidelines. In fact, it was not surprising that they were unwilling to abandon standard federal procedures to adopt others to reflect each states' regulations, since this would only complicate their processes.

Third, Decree 3325 included specific changes concerning the management of two of the most utilized species in the floodplain, *pracaúba* and *pau mulato*. Smallholders recognized the importance of thinning trees in areas of forest regeneration but reported that they have very few areas of new fallow, where these operations would be carried out. Thus, while the new rule is welcome, it does not address current forest management practices in the region, as the majority of smallholders were not opening new agricultural areas, where these species regenerate in high density (de Queiroz and do Amaral Machado 2007). Farmers who were managing fallows were converting them into *açazais* rather than maintaining tree diversity for timber production (Freitas *et al.* 2021). This confirms previous research showing that floodplain farmers

FIGURE 2 Main steps for licensing forest operations in PAEs in Amapá



\* Forest Origin Document (DOF, Portuguese acronym for *Documento de Origem Florestal*)

constantly shift their resource management practices in response to shifting ecosystem dynamics and market conditions (Pinedo-Vasquez *et al.* 2002, Pinedo-Vasquez *et al.* 2001, Vogt *et al.* 2015). Producers also questioned the utility of the option to harvest small-diameter trees, suggesting that the low volume and low quality of milling output would not justify the cost.

Finally, Decree 3325 differentiated allowable harvest volumes of 5 m<sup>3</sup> ha<sup>-1</sup> for upland forests and 10 m<sup>3</sup> ha<sup>-1</sup> for floodplain forests. Smallholders' opinions of this change were mixed, but the majority considered the volume to be very low, especially for millers who rely on timber for their livelihood. There is some room for adapting this norm to local conditions, since the implementing norm, the CONAMA Resolution (406), states that this volume could be raised based on specific studies from the region. Thus, further ecological studies from the Amapá estuary could help to adapt the rules to reflect the regional context.

Amapá's proposed State Forestry Law was designed to provide broad guidelines for improving bureaucratic efficiency and accessibility for all forestry actors by centralizing the licensing rules. The proposed law clearly stated that the government could create simplified mechanisms for the development, analysis and approval of management plans specifically for small-scale operations. The Decree 3325 and other instrument were approved, but as of October 2021, the law itself had not yet gone to the State Legislature for approval due to opposition from conflicting coalitions. Thus, the intended goal of the forest policy reform project was not fully achieved. In part this was due to the failure to date to pass the law. Also this was indicated by the fact that federal agencies still controlled key steps in the approval process and that both IMAP and the INCRA office in Amapá continued operating under federal protocols.

The state of Amapá is not alone in its failure to carry out forest sector reform in favour of smallholders and rural communities. Government agencies and civil society groups in neighbouring Pará have been discussing a proposed State Policy for Community and Family Forest Management since 2012, but it is yet to be approved (MPPA 2019). Attempts to do so in neighbouring countries have also come up short (Mejía *et al.* 2015, Sears *et al.* 2018).

While we applaud efforts to create opportunities to formalize small-scale timber production in Amapá, we recognize that simplifying norms and relaxing regulations for certain species and silvicultural systems is not usually sufficient to create change (Holding Anyonge and Roshetko 2003, Sears *et al.* 2018). Independently of whether foresters must sign plans or not, smallholders need to develop new capacity to understand the procedures to license timber production and to be able to deliver the technical information that is required. In fact, achieving equity and sustainability in the smallholder forestry sector requires advances in four key areas: policies, institutions, and governance; livelihoods and capacities; cultural and socio-economic aspects; and securing the natural resource base (de Jong *et al.* 2016). The situation in Amapá falls short in some of these areas, particularly in the state institutions' role in forest governance and in its capacity to provide technical assistance to allow compliance with formalization requirements.

In the absence of an accessible pathway for formalization of timber management, harvest and processing, all actors on the supply chain, and especially timber producers and millers, will continue to be vulnerable to sanction from law enforcement and will necessarily continue to work in the shadows. Inequities will continue, since transport costs are high and the selling price is low in the informal sector. The lack of formality also prevents actors from accessing credit to invest

in forest management operations or in appropriate machinery to reduce processing waste. In the end, while not the only factors, the low returns and high risk of sanction has likely reduced the production of timber from Amapá's floodplain communities compared to historical levels (Fortini and Carter 2014).

Given the importance of sustainable forest management for biodiversity conservation and confronting the climate crisis (Imai *et al.* 2009), and the prevalence of smallholder and community forestry in the Amazon (Pokorny *et al.* 2013), greater efforts should be made to support it. Formalization of community forestry coupled with technical assistance has the potential to support local livelihoods, address climate change, and strengthen the forestry sector. Studies indicate that sustainable timber production is still possible in the Amazon estuary (Fortini 2019).

While it has been shown that timber production is compatible with non-timber forest products (Guariguata *et al.* 2010), the dramatic shift over the past decades on the estuary toward commercial açai production is concerning. Açai-intensive systems that lead to mono-specific stands simplify the landscape, ultimately reducing resilience in the ecosystem and household economy (Weinstein and Moegenberg 2004, Freitas *et al.* 2021). Easing the pathway for smallholders residing on the floodplain to formalize timber production could provide some incentive to revert to the diverse forest management systems of the past.

## CONCLUSIONS

On post-industrial logging frontiers in the Brazilian state of Amapá, smallholder families have developed adaptive farm-forestry systems that combine timber and crops. However, historically these systems have operated informally, creating legal challenges for these producers. Amapá's government attempted to develop a forest policy that would support such small-scale forestry, benefitting local families and motivating forest conservation. Despite efforts to create enabling conditions to formalize an existing timber supply chain, significant barriers still exist. For state institutions, these included low technical capacity and lack of logistical and financial resources, coupled with overlapping and/or unclear institutional mandates among the government agencies responsible for overseeing forest management and land titling in floodplain areas.

The Amapá case illustrates that cross-sector and cross-jurisdictional policy coherence, and the political will within agencies to adopt innovative approaches to formalization in the forestry sector are critical for success. Barriers for small-scale timber producers centre on the continued complexity of compliance with state regulations and the poor dissemination of information regarding new requirements. The Amapá state forest governance structure is relatively recent and still struggles to define responsibilities and to have an adequate number of staff to perform its activities. The lack of appropriate legal norms and mechanisms governing small-scale forest management denies forest owners legal access to formal markets with severe consequences for both local livelihoods and forest conservation.

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