

Brazil nut forest concessions in the Peruvian Amazon: success or failure?

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SUMMARY

In Peru, concessions for harvesting Brazil nuts (fruits of the Amazon tree *Bertholletia excelsa*) were launched in the Madre de Dios Department in 2000. This study analyses the extent to which the Brazil nut concession system (which covers about 1 million ha of closed canopy forest) has met its objective of providing a governance model for sustainable and equitable use. Primary and secondary information sources were used to analyse governance outcomes based on 10 indicators, and the performance of Brazil nut concessions in two contrasting land-use types in Madre de Dios were compared (within and outside protected areas). It was found that corresponding institutional arrangements have led, more than a decade later, to different socioeconomic, ecological and legal outcomes. Particularly outside protected areas, where the vast majority of the concessions are located, a paradoxical situation was found of ineffective over-regulation on paper but minimal intervention from state agencies; ineffective state monitoring and sanctions; poor law enforcement with excessive punitive measures; power imbalances in the value chain and illegal timber harvesting; the lack of a multiple forest-use framework; and overlapping, conflictual customary and regulatory governance. This paper argues that at present, the long-term sustainability of the Brazil nut concession system seems compromised. If the Brazil nut concession system is to enter into a new decade, this may only be possible by formally recognizing the multiplicity of land uses, implementing and validating sound silvicultural approaches, minimizing land use and management trade-offs in alignment with local aspirations, and establishing effective negotiation platforms with different productive sectors and government agencies.

Keywords: forest governance, forest concessions, non-timber forest products, value chains, smallholder forestry

Les concessions de noix du Brésil en Amazonie Péruvienne: succès ou échec?

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Les concessions pour la collecte de la noix du Brésil (fruit de l'arbre d'Amazonie *Bertholletia excelsa*) ont été mises en place dans le département de Madre de Dios au Pérou en l'année 2000. Cette étude analyse dans quelle mesure le système de concession de noix du Brésil (qui couvre environ 1 million d'hectares de forêt à canopée fermée) a atteint son objectif de fournir un modèle de gouvernance pour une utilisation durable et équitable. Des sources d'information primaires et secondaires ont été utilisées afin d'analyser les résultats de gouvernance sur base de 10 indicateurs, et de comparer les performances des concessions de noix du Brésil dans deux formes contrastées d'utilisation des terres à Madre de Dios (à l'intérieur et à l'extérieur de zones protégées). Il a été constaté que les arrangements institutionnels correspondants ont conduit, plus de dix ans plus tard, à des résultats socioéconomiques, écologiques et juridiques différents. Particulièrement en dehors des zones protégées, où se trouvent la grande majorité des concessions, on a constaté une situation paradoxale d'une excessive et inefficace réglementation sur papier, mais d'une intervention minimale des organismes publics; une surveillance et des sanctions de l'État inefficaces; une faible application de la loi avec des mesures punitives excessives; des déséquilibres de pouvoir dans la chaîne de valeur et la récolte illégale du bois; l'absence d'un cadre d'utilisation multiple des forêts; et une gouvernance coutumière et réglementaire chevauchante et conflictuelle. Dans cet article nous argumentons qu'à l'heure actuelle, la viabilité à long terme du système de concession de noix du Brésil semble compromise. Si ce système de concession doit entrer dans une nouvelle décennie, cela ne sera possible que par la reconnaissance officielle d'une gestion multiple des terres, la mise en œuvre et la validation d'approches sylvicoles rationnelles, la minimisation des compromis en matière d'utilisation des terres et de gestion conformément aux aspirations locales, et l'établissement de plateformes de négociation efficaces avec les différents secteurs de production et organismes gouvernementaux.

Las concesiones de castaña en la Amazonía Peruana: ¿éxito o fracaso?

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Las concesiones para el aprovechamiento de castaña (los frutos del árbol amazónico *Bertholletia excelsa*) se pusieron en marcha en el departamento de Madre de Dios, Perú, en el año 2000. En este estudio se analiza en qué medida el sistema de concesiones de castaña (que cubre cerca de 1 millón de hectáreas de bosque) ha alcanzado su objetivo de brindar un modelo de gobernanza para el uso sostenible y equitativo. Se

emplearon fuentes primarias y secundarias de información con el fin de analizar los resultados de gobernanza con base en 10 indicadores, así como una comparación del desempeño de las concesiones de castaña en dos tipos de uso de la tierra contrastantes en Madre de Dios (dentro y fuera de áreas protegidas). Se encontró que los mecanismos institucionales correspondientes conllevaron, a más de una década posterior a su implementación, a diferentes resultados socioeconómicos, ecológicos y legales. Particularmente fuera de las áreas protegidas, donde la gran mayoría de las concesiones se localizan, se encontró una situación contradictoria de una inefectiva sobrerregulación por escrito, pero una mínima intervención por parte de las agencias del Estado; inefectividad tanto en la vigilancia como en las sanciones por parte del Estado; aplicación deficiente de la ley con sanciones punitivas desmedidas; asimetría de poder en la cadena de valor y tala ilegal; ausencia de un marco de múltiples usos del bosque; y la superposición conflictiva de gobernanza consuetudinaria y regulatoria. En este documento se discute que en la actualidad, la sostenibilidad a largo plazo del sistema de concesiones de castaña parece estar en peligro. Si el sistema de concesiones de castaña ha de iniciar una nueva década, solo será posible mediante el reconocimiento de los usos múltiples de la tierra, la implementación y validación de enfoques silvícolas, reducción de las mutuas compensaciones entre el uso y manejo de la tierra en consonancia con las aspiraciones locales; y el establecimiento de plataformas efectivas de negociación con diferentes sectores productivos y agencias gubernamentales.

INTRODUCTION

Successful forest governance can broadly be defined as the exercise of authority and development of institutions to ensure sustainable forest management (SFM) by maintaining forest values, ecosystem structure and function while satisfying human needs. Although there is no consensus on the particular modes of property right regimes to achieve SFM (Ojanen *et al.* 2017, Tucker 2010), forest concessions have proven a popular land-use model particularly in remote areas with low population densities and limited intervention from forest authorities (Karsenty *et al.* 2008, Singer and Karsenty 2008). This involves the granting of public forest lands and their resources through a long-term contract, for the exploitation of timber and/or non-timber forest products (NTFPs) to a private firm, community, individual or non-governmental organization and subject to compliance with a specified set of management activities and safeguards (Balbinotto *et al.* 2012, Karsenty 2007). The forest concession model has changed over time, starting in Africa in the late 19th century by European states with limited enforcement and accountability, to the current public–private partnerships with financial as well as social and environmental rights and obligations (Karsenty 2007, Karsenty *et al.* 2008, Singer and Karsenty 2008).

Although the forest concession model is implemented globally (Karsenty 2016), it is most prevalent in tropical regions (Gray 2002), where it has helped to promote SFM, especially in forest-rich countries (Balbinotto *et al.* 2012, Gray 2002, Karsenty *et al.* 2008, Singer and Karsenty 2008). Yet the forest concession model has been criticized for recurrent “design failures” (FAO 2018). Among other issues, for allowing corruption while promoting illegal logging (Finer *et al.* 2014); for being officially regulated by biologically unrealistic timber cutting cycles to maintain sustainable yields (McPherson *et al.* 2012); for lack of proper monitoring to encourage adaptive management (Balbinotto *et al.* 2012, Karsenty *et al.* 2008); for failing to solve overlapping land rights issues (Karsenty 2016); and for disregarding formal recognition of multiple forest uses along with local aspirations (Lescuyer *et al.* 2015).

Overall, tropical forest concessions have been largely promoted for timber exploitation. Yet the concession model

has been applied for the harvesting of NTFPs: for example, pygeum (*Prunus africana*) Permit Allocation Units in Cameroon (Ingram 2014) and in Guatemala, community concessions for timber and NTFP harvesting (Baur *et al.* 2012, Radachowsky *et al.* 2012). Across the Amazon basin, large tracts of closed-canopy forest harbour resident populations who harvest Brazil nuts (from the fruits of the Amazon tree, *Bertholletia excelsa*) under various tenure arrangements (Guariguata *et al.* 2017), including in particular, government-sanctioned concessions in Peru – the focal country in this study. There, the central government agreed in 2000 to honour the acquired rights of Brazil nut harvesters held under pre-existing contracts, thus creating the Brazil nut concession model. Since then, to our knowledge, no detailed assessments have been made of the effectiveness of Brazil nut concessions in delivering social and environmental benefits, despite the socioeconomic importance of this NTFP to the rural economy and its role in promoting forest conservation, not only in Peru but across Amazonia (Guariguata *et al.* 2017). Regardless of the management objective (e.g., timber, NTFPs, recreation, conservation), assessing the performance of the forest concession model in achieving broader SFM goals requires an examination of the governing institutions (Balbinotto *et al.* 2012) and the socio-political context (Singer and Karsenty 2008) both of which form the core of this paper.

BRAZIL NUT CONCESSIONS IN PERU

The social and ecological context

In the Peruvian Department of Madre de Dios, Brazil nut concessions are granted under two contrasting arrangements: those located inside protected areas (for the purposes of this study, the Tambopata National Reserve, hereafter referred to as “the Reserve”), and those located outside protected areas (Peña 2010). This study contrasts these two arrangements as it was predicted that they would lead to different governance outcomes. The existence of Brazil nut-rich forests, particularly across the western Amazon, has been shown, under specific contextual settings, to slow down deforestation. When access to roads and infrastructure development is limited and opportunities for livelihood diversification are

narrow, a higher degree of forest cover at the household level is usually linked to a high degree of economic dependency on Brazil nut harvesting. However, when household economies diversify, income from Brazil nut sales may be reinvested into non-forest activities. Household attributes such as age, amount of accumulated forest knowledge and proximity to the resource also influence the overall reliance on Brazil nuts as a proportion of total cash income (Guariguata *et al.* 2017). Particularly in Madre de Dios, many Brazil nut harvesters extract substantial volumes of (not always legal) timber from their concessions as supplementary income (Garrish *et al.* 2014).

Brazil nut harvesting, considered a low-impact forest use (Ribeiro *et al.* 2014, Wadt *et al.* 2008, Zuidema and Boot 2002), is permitted in all types of public forests in Peru. The entities responsible for granting a Brazil nut concession are the National Natural Protected Areas Service (SERNANP) in protected areas, and Peru's Regional Directorate of Forestry and Wildlife (DRFFS) elsewhere. According to the DRFFS, as of 2017 Madre de Dios had 1 123 Brazil nut concessions registered outside of protected areas, while SERNANP reported 85 concessions in the Reserve and 13 in the buffer zone of the adjacent Bahuaja Sonene National Park. Brazil nut concessionaires generally live in Puerto Maldonado, the capital of Madre de Dios, or in villages along the Interoceanic Highway that connects Peru and Brazil. Peru is the second largest exporter of Brazil nuts worldwide (Guariguata *et al.* 2017) and Brazil nut-rich forests cover about 2.5 million ha across Madre de Dios (Cossío *et al.* 2011, Escobal and Aldana 2003). During the harvest season (December to April in Madre de Dios) the globose, woody fruits that fall to the forest floor, are cut open with a machete to extract the nuts (trees are not climbed for fruit harvesting).

The Brazil nut concession granting process

Regulations regarding the exploitation of forest resources in Peru first appeared in Forestry Law No. 21147 (1975) with a dual system of harvesting permits: granted to logging companies for areas up to 100 000 ha for a renewable period of 10 years, and to small-scale extractors for areas up to 1 000 ha for 2–10 years. The law contained no sustainability criteria, which led to the near local extinction of several timber species. In response, the government created the current concession model to promote sustainable use (Escobal and Aldana 2003, Galarza and La Serna 2005, Smith *et al.* 2006).

At the time of their establishment, Brazil nut concessions were gazetted only for fruit harvesting, even though they were allocated within forests harbouring substantial volumes of both medium- and high-value timber species (Cossío *et al.* 2011). During the concession allocation process, priority was given to Brazil nut harvesters who could demonstrate an economic and social association with the solicited land (Cossío *et al.* 2011, Peña 2010). Campsites, trails or agricultural areas were used to delimit the concession area (Peña 2010), a process largely carried out by non-governmental organizations. However, the delimitation process was deemed to be uncoordinated, underfunded and spatially imprecise

(Chávez *et al.* 2012). According to the DRFFS, the area of individual Brazil nut concessions currently registered outside of protected areas ranges between 24 ha and 4 373 ha (average: 860 ha). Including non-protected areas, the total area under Brazil nut concessions in Madre de Dios is estimated to cover 1 million ha of Amazonian forest (Perales and Guariguata 2015). Overall, the abundance in the concessions of productive Brazil nut trees (i.e. equal to or greater than 40 cm in diameter) is 0.5–1.5 individuals per ha (Cossío *et al.* 2011, Rockwell *et al.* 2015).

The governance of Brazil nut concessions in Madre de Dios

The differences between the governance arrangements for concessions inside the Reserve and outside protected areas are highlighted in Table 1. Outside of the Reserve, the DRFFS carries out administrative functions, while concession monitoring and compliance with existing regulations is conducted by the Monitoring Agency for Forest Resources and Wildlife (OSINFOR). Within the Reserve, SERNANP has the sole responsibility for overseeing the concessions.

Although Brazil nut concessionaires have exclusive rights on their concessions (Cossío *et al.* 2011, Peña 2010), felling Brazil nut trees for timber is illegal (Cossío *et al.* 2011, Perales and Guariguata 2015). Outside of protected areas, concessionaires have alienation rights to transfer the concession to another party, although they cannot sell it. Once Brazil nuts are harvested from the forest floor, concessionaires are obliged to pay a harvest tax to the DRFFS of about 0.033 PEN (USD 0.010) per kilo, while concessionaires in the Reserve pay about 0.10 PEN (USD 0.030) per kilo to SERNANP. Brazil nut concessionaires outside of the Reserve had to complete an Annual Operational Plan (POA) to harvest in a given year until its abolishment in 2014 (Perales and Guariguata 2015), when Forestry Law No. 29763 sought to simplify the regulations on the harvesting activity. The POA was replaced with a Declaration of Management (DEMA) for a renewable period of up to five years. The main difference between these two requirements is that the DEMA is signed directly by the concessionaire and not through a government official, as was the case with the POA. Since 2004, concessionaires outside of the Reserve have been allowed to harvest timber after drafting a so-called Intermediate Forest Management Plan, with minimal bureaucratic and fiscal requirements compared to those in neighbouring timber concessions (Cossío *et al.* 2011). The approval of these plans involves prior field inspection and approval by a forestry regent.

A key difference for concessionaires within the Reserve, is that they are not allowed to harvest any timber. In addition, the way harvest quantities are handled and reported to relevant authorities is different between concessions within the Reserve and those outside. Concessionaires outside the Reserve (which, as mentioned, make up the large majority in Madre de Dios) need to estimate, before harvesting, the nut volume likely to be extracted in any given year (estimated by the number of trees in a given concession) and report this to the DRFFS, while those within the Reserve simply report the

TABLE 1 Key responsibilities and authorities governing the Brazil nut concession system in Peru

Concession category	Governance level	Government authorities	Responsibilities related to the concession
Concessions outside of protected areas	National	Ministry of Agriculture (MINAGRI)	<ul style="list-style-type: none"> Determining and changing the use classification for soils Identifying and authorizing the change of current soil use
		MINAGRI – National Forestry and Wildlife Service (SERFOR), created in 2014 under MINAGRI	<ul style="list-style-type: none"> Regulating and promoting the sustainable use and conservation of forest resources Formulating norms for the authorization of forestry concessions
		Monitoring Agency for Forest Resources and Wildlife (OSINFOR), independent of MINAGRI since 2009	<ul style="list-style-type: none"> Monitoring and controlling compliance of concessions with forest management plans, concession contracts and forestry laws. Sanctioning non-compliance
	Regional	Regional Directorate of Forestry and Wildlife (DRFFS), under MINAGRI, gaining most of its functions since 2010	<ul style="list-style-type: none"> Authorization and cancellation of the concession contracts Administration and authorization of forestry concession management plans Visual control of the Brazil nut concessions prior to the authorization of complementary timber management
Concessions within protected areas	National and decentralized offices	National Natural Protected Areas Service (SERNANP)	<ul style="list-style-type: none"> Approving forestry concession permits and authorizations Monitoring and control of Brazil nut concessions

Source: Adapted from Kowler *et al.* 2016, SERFOR 2015, Peña 2010.

extracted volume to the authorities after the harvest has ended (Perales and Guariguata 2015).

Brazil nut concessions in the Reserve are regulated by the Master Plan of the Tambopata National Reserve and Bahuaja Sonene National Park. This five-year renewable plan defines the regulation of all activities implemented within the protected areas. In contrast to concessionaires outside of protected areas, those within the Reserve are only allowed to enter their concession in preparation for the harvest season (15 days between November and December) and during the harvest season (up until April). Any additional visits need to be authorized by SERNANP.

ANALYTICAL FRAMEWORK: ASSESSING FOREST GOVERNANCE OUTCOMES

As mentioned above, the objective of this study was to assess how the Brazil nut concession system had performed after more than a decade of implementation. The analysis is framed by the approach of Von Halle (2014), where the factors influencing forest governance outcomes are grouped into three essential components: (i) the institutional arrangements, (ii) characteristics of the forest users, and (iii) characteristics of the forest product value chain (Table 2). This framework assumes that if there is no intervention aimed at resolving existing problems in any of the above components, local governance outcomes will be less than optimal, thus compromising sustainable forest use. This assumption was tested using empirical evidence in other Amazonian forests (in Peru, Brazil, Ecuador and Colombia) (Fanzeres *et al.* 2014). The three components mentioned align with the views of other

scholars in the sense that evaluations of forest use and forest management require an analysis of the institutions that regulate the concession system (Balbinotto *et al.* 2012), the socio-political context where the concessions are located, and the place where the forest product value chain begins (Ingram 2014, Singer and Karsenty 2008). Context about the three components is provided below.

First, institutions that fit the local context by respecting the needs and capacities of forest resource users help promote SFM (Mayers and Vermeulen 2002, Ostrom 1990, Ros-Tonen and Kusters 2011, Tucker 2010). When forest-dependent people are included in decision-making, institutions are more likely to fit the local context and be seen as legitimate; while excessive, top-down forest regulations restrict users from fully benefiting from the forest (Ingram 2014, Mayers and Vermeulen 2002, Ostrom 1990, Ros-Tonen and Kusters 2011, Tucker 2010). In addition, regular monitoring and effective law enforcement mechanisms ensure the maintenance of forest values compared to sporadic monitoring (Gibson *et al.* 2005, Gray 2002, Tucker 2010). To be effective, law enforcement strategies should tackle the roots of illegal or uncontrolled forest activities through measures aimed at prevention, detection and suppression (Azevedo-Ramos *et al.* 2015, Ferraz and Serôa da Motta 1998, Kishor and Rosenbaum 2012, Ostrom 1990). Secure rights, such as clearly defined boundaries, help forest users to protect their land, to empower them against outsiders and provide an incentive for long-term management (Mayers and Vermeulen 2002, Ostrom 1990, 2009, Tucker 2010).

Second, the characteristics of forest users influence specific outcomes of forest governance (Agrawal 2001, Ostrom 2009, Von Halle 2014). In addition, the importance of the resource for the forest users' livelihoods and the high

value attributed to the resource are associated with the long-term maintenance of the forest (Agrawal 2001, Ostrom 2009). The existence of collective action, such as cooperatives, can increase the participation of forest users in global markets and result in higher benefits (Ingram 2014, Mayers and Vermeulen 2002, Ros-Tonen and Kusters 2011).

Third, the characteristics of forest product value chains shape access to markets while affecting how forest resources are managed, including NTFPs (Ndeinoma and Wiersum 2017, Wiersum *et al.* 2014). Small-scale forest producers often face restrictions and limitations hindering them from entering specific markets, which may also lead to power imbalances with big buyers of forest products (Ros-Tonen and Kusters 2011). However, reducing market-entry barriers can minimize manipulative or inequitable deals (Mayers and Vermeulen 2002). Access to markets can also influence NTFP harvesting strategies (Ruiz-Pérez *et al.* 2004).

METHODOLOGY

Based on a literature review, and guided by the three components described above, a set of enabling conditions and

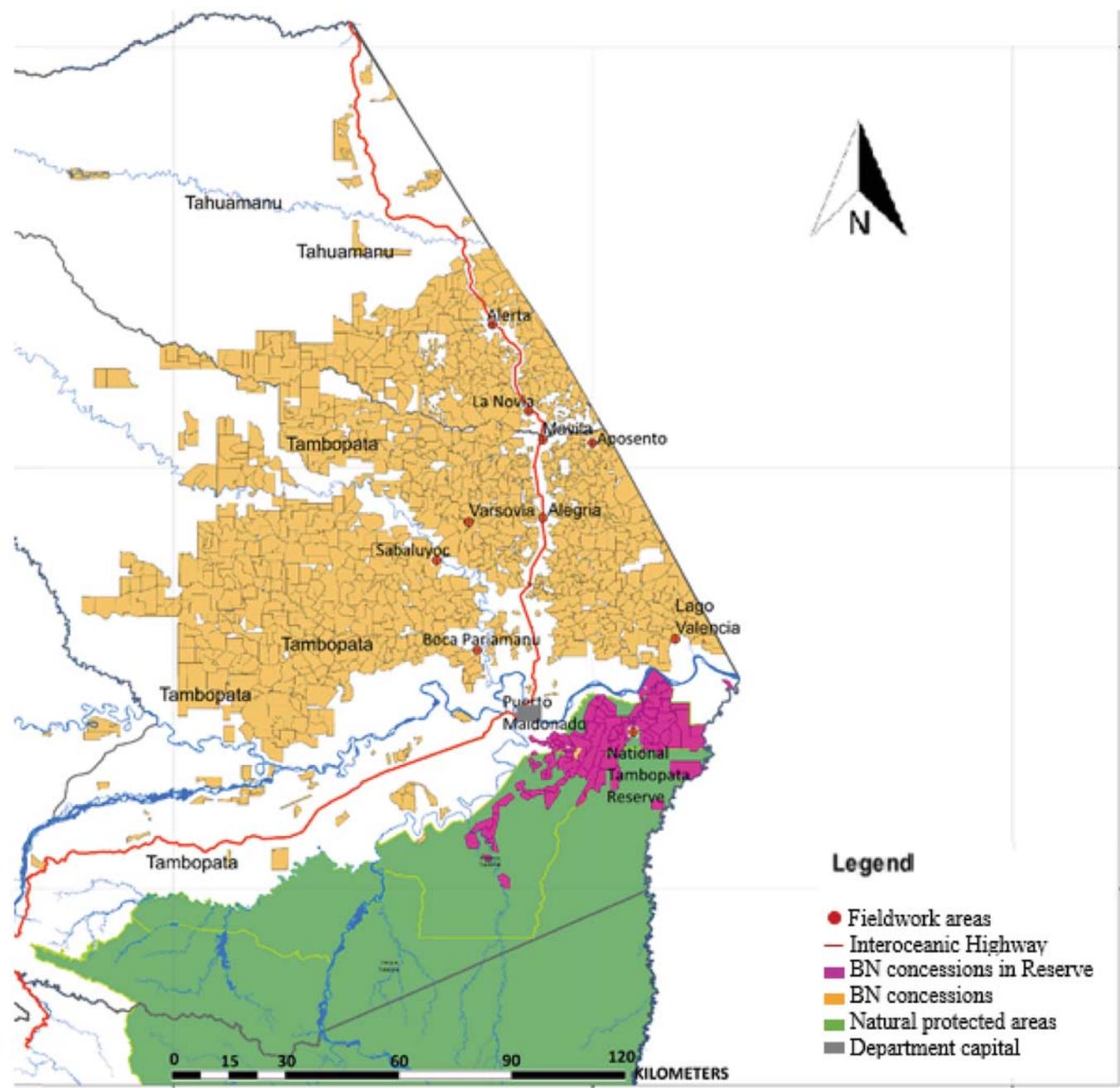
respective indicators (10 in total, Table 2) were defined to assess the performance of Brazil nut concessions in Peru in maintaining socioeconomic and environmental values while promoting sustainable forest use.

As a primary source of information, in May–July 2017, 50 semi-structured interviews were conducted with Brazil nut concessionaires (39 concessions outside of protected areas and 11 concessions in the Reserve) (Figure 1). As no lists were available with contact information about the concessionaires, and because some concessionaires were unwilling to be interviewed, snowballing was used. To this end, the leaders of Brazil nut harvester associations were contacted. To minimize bias and maximize representativeness, interviews were carried out in different locations, while trying to achieve balance among those Brazil nut concessions close to the Interoceanic Highway (18) and those further away (21). Questionnaires were adapted to the differences in regulations and overseeing authorities both inside and outside protected areas as previously described. Questions covered normative and regulatory aspects, tenure security issues, interactions with state agencies, the degree of involvement in Brazil nut producer associations, and relationships with relevant stakeholders along the Brazil nut (and timber) value chains, aligned

TABLE 2 Essential components and governance conditions (from Von Halle 2014), and related indicators of performance for assessment of the Brazil nut concession system in Peru

Essential components	Governance enabling conditions	Indicator	Source	
Institutional arrangements	Institutions that fit the local context	1. Absence of regulatory burden for concessionaires	Agrawal 2007, Mayers and Vermeulen 2002, Ros-Tonen and Kusters 2011, Tucker 2010	
		2. Inclusion of Brazil nut concessionaires in decision-making process	Agrawal <i>et al.</i> 2008, Mayers and Vermeulen 2002, Ros-Tonen and Kusters 2011, Tucker 2010	
	Quality of law enforcement	3. Regular monitoring	Gibson <i>et al.</i> 2005, Gray 2002, Tucker 2010	
		4. Effectiveness of measures and tools to prevent forest crimes	Azavedo-Ramos <i>et al.</i> 2015, Ferraz and Seroa da Motta 1998, Kishor and Rosenbaum 2012	
	Secure rights	Secure rights	5. Existence and effectiveness of mechanisms for resolving disputes and conflicts over tenure and rights	Agrawal <i>et al.</i> 2008, Kishor and Rosenbaum 2012, Mayers and Vermeulen 2002, Von Halle 2014
			6. Clearly defined boundaries	Gray 2002, Mayers and Vermeulen 2002, Ostrom 2009, Tucker 2010
Users (Brazil nut concessionaires)	Resource value merits sustainable management	7. Concessionaires livelihood dependence on Brazil nut concession resources	Agrawal 2001, Ostrom 2009	
		8. Concessionaires perception of the value of Brazil nut concessions	Agrawal 2001, Ostrom 2009	
	Forest users' leadership and involvement in decision-making process	9. Participation and benefits from concessionaires' associations	Agrawal 2001, Marshall <i>et al.</i> 2006, Mayers and Vermeulen 2002, Ostrom 2009, Ros-Tonen and Kusters 2011	
Forest product value chain	Market opportunities enable Brazil nut concessionaires to benefit sustainably from forest resources	10. Absence of barriers to market entry	Marshall <i>et al.</i> 2006, Mayers and Vermeulen 2002, Ros-Tonen and Kusters 2011, Von Halle 2014	

FIGURE 1 The location of Brazil nut concessions inside the Tambopata National Reserve (purple) and outside protected areas (yellow), Department of Madre de Dios, Peruvian Amazon



BN = Brazil nut.

Note: Names for fieldwork areas (red dots) are those used by concessionaires interviewed.

with indicators 1–10 (Table 2). In addition, two central government officials and three local government officials were interviewed, and a group interview carried out at the local OSINFOR office. Also, one local SERNANP officer, three individuals from a private donor organization and staff from local non-governmental organizations were interviewed. Finally, two representatives from Brazil nut processing companies (one certified and one non-certified) were interviewed.

The contents of official, secondary data was further analysed; specifically, data from OSINFOR regarding concessionaire's compliance with rules and regulations governing Brazil nut harvesting and forest use. Annual reports from the DRFFS and SERNANP concerning claims and complaints made by concessionaires to relevant authorities were also analysed, as well as data on the annual harvested volumes of Brazil nuts and the issuing of timber harvesting permits in concessions outside of the Reserve.

RESULTS

Indicator 1. Regulatory burden

The majority (72%) of the 39 concessionaires interviewed outside of the Reserve do not agree that regulations governing concessions are, as a whole, legitimate. In particular, they perceive regulations on timber harvesting and the prohibition of land clearance for agriculture to be too strict. Regarding timber harvesting, more than half of the 39 concessionaires reported that they do not harvest timber because getting a permit is too expensive, procedurally complicated and time-consuming. According to OSINFOR, concessionaires often sign timber harvesting permits without fully understanding the contents, as usually the forms are completed by third-party loggers. As a result, 14 (36%) of the 39 concessionaires interviewed received fines for breaking the terms of the harvesting permits. Further, more than half (59%) of the concessionaires interviewed outside of the Reserve considered current norms and regulations to be a disincentive to sustainable forest management. An informal 2017 survey, conducted by OSINFOR itself, asking Brazil nut concessionaires if they agreed with the agency's work, indicated that among 52 respondents, 44.2% disagreed, 40.4% more or less agreed and 15.4% agreed.

In any case, the imposition of fines by OSINFOR has apparently led to a reduction in the number of permit requests for timber harvesting in concessions outside of the Reserve. Although it cannot be ruled out that timber yields have concurrently decreased over time in the concessions, making timber harvesting less attractive, the number of timber harvesting permits granted fell from 300 in 2014 to 97 in 2015 and increased only slightly to 99 in 2016.

In contrast, concessionaires within the Reserve did not identify major regulatory or administrative burdens related to concession management. In essence, this is because they have less paperwork to complete, while legal requirements are closely aligned with the local realities of Brazil nut harvesting activities. As previously mentioned, concessionaires outside of the Reserve have to estimate and report to the DRFFS the volumes of Brazil nuts likely to be harvested during a given season (with no obvious use for guiding management; Perales and Guariguata 2015), while inside the Reserve, concessionaires simply report the actual volumes harvested to SERNANP, with no prior paperwork involved.

Indicator 2. Inclusion of Brazil nut concessionaires in decision-making processes

Outside of the Reserve, 38% of the 39 concessionaires interviewed argued that the forest law enforcement agency, OSINFOR, solely acts as a controller and provides little if any support for improving management practices or including concessionaires in local decision-making. The remaining 62% did not adjudicate on OSINFOR yet some interviewees admitted that informative workshops were previously organized by this agency. In contrast, concessionaires within the Reserve indicated that SERNANP is more of an ally than a

command-and-control agency. During the elaboration of the Master Plan (carried out every five years), SERNANP organizes participatory workshops with Brazil nut concessionaires to include recommendations or observations that may help to improve concession management. It should be noted, however, that it may be easier for SERNANP to work with the limited number of concessionaires in the Reserve (about 80 in total), than it is for OSINFOR to engage with more than 1 000 concessionaires geographically dispersed outside the Reserve.

Indicator 3. Regular monitoring

Interviewees from SERNANP and OSINFOR argued that they have too few staff to regularly monitor the concessions. At the time of the study, OSINFOR had only six staff assigned to 1 123 concessions for annual inspections. Between 2009 and 2016, OSINFOR carried out 634 inspections of Brazil nut concessions outside of the Reserve, suggesting that about half of the concessionaires had never been inspected. In contrast, within the Reserve (according to SERNANP), staff annually visit about 60% of the 80 concessions during the harvest season. Although these visits do not cover every concession, all concessionaires entering and leaving the Reserve have to check in at control posts at any given time. This mandatory activity (not implemented outside the Reserve) allows SERNANP to systematically monitor each concessionaire before, during and after the Brazil nut harvest season.

Indicator 4. Measures and tools to prevent forest crimes

Of the 634 monitoring checks carried out by OSINFOR outside of the Reserve in 2009–2016, 59% resulted in sanctions, 32% found that management plans complied with existing regulations, and 9% did not clearly state whether or not management plans complied. The majority of illegal activities in concessions outside of the Reserve concerned timber exploitation: among the 373 sanctions, unauthorized timber extraction was reported in 78% of cases and the falsification of timber management plans to facilitate the exploitation and transport of illegal timber harvested elsewhere was reported in 65% of cases. Among the 75 concessions inspected more than once by OSINFOR, over a third were sanctioned both times. Fines are the principal enforcement mechanism used by OSINFOR, varying from 40 500 to 20 250 000 PEN (average exchange rate during 2017: 3.2 PEN per USD). These amounts are disproportionate given that Brazil nut concessionaires' annual income derived from Brazil nuts and other non-forest activities near the Interoceanic Highway is often less than USD 15 000 (Garrish *et al.* 2014). In contrast, no concessionaires in the Reserve were sanctioned for illegal timber extraction as the complete prohibition within the Reserve and the controlled access of concessionaires would make such illegal harvesting quite obvious. Most concessionaires in the Reserve considered the SERNANP monitoring system to be adequate and fair, although one mentioned it being too lenient when it comes to hunting.

Indicator 5. Mechanisms for resolving disputes and conflicts over tenure and rights

According to official documents, concessionaire's claims related to overlapping property rights and unclear concession boundaries were directly financed by concessionaires themselves rather than the DRFFS, who did not perceive itself to be responsible for such costs. Conflicts due to Brazil nut and/or timber theft, and land invasion are common, with 22 concessionaires (out of 39) outside the Reserve mentioning their occurrence. Although concessionaires outside of the Reserve are obliged to report any event of land invasion to the DRFFS, and even though the concession contract indicates that the state will intervene in cases of intrusion, concessionaires claim that the process is expensive and ineffective overall. Concessionaires within the Reserve, in particular, complained about indigenous people invading their concessions, which are often superimposed on indigenous lands (Chávez *et al.* 2012). According to the interviewees, members of adjacent indigenous communities enter the concessions when fruits start falling onto the ground and concessionaires have not yet entered the Reserve. As a way to avoid Brazil nut theft, SERNANP recently ruled that concessionaires within the Reserve can enter the protected area earlier than planned.

Indicator 6. Defined boundaries

The gazetting of Brazil nut concessions is aimed at promoting social equity among concessionaires by respecting smallholders' claims to traditionally harvested areas. However, over half of the concessionaires outside the Reserve mentioned the occurrence of boundary overlaps among adjacent concessions. In most cases, the concession boundary differs from the customary land area owned before the concession allocation process started. This creates a problem particularly for concessionaires who consider contractual boundaries to be a layer of formal property rights additional to their customary rights, compared to those who recognise only customary or regulatory rights. In contrast, most concessionaires in the Reserve reported no issues arising from boundary overlaps.

Indicator 7. Concessionaires livelihood dependence on Brazil nut concession resources

Although the primary objective of the creation of Brazil nut concessions was economic, the variability in economic benefits – due to differing concession areas and ease of access, high year-to-year variation in fruit production (Rockwell *et al.* 2015) and associated fluctuations in market prices – means that Brazil nuts are only a partial livelihood strategy for most concessionaires. However, 60% of the 18 concessionaires close to the Interoceanic Highway reported no secondary income sources from their concession. Despite this, moving to cities for non-forest work outside of the harvest season may be a liability as the risk of land invasion is higher, especially when concessions are close to the Interoceanic Highway.

Some interviewees further reported that illegal clearing for agriculture is occurring in concessions outside of the Reserve, as some concessionaires rent part of the land to third party farmers for additional revenue. To comply with regulations, these same concessionaires later denounce the farmers as invaders as they know that it takes years for the state authorities to intervene.

Indicator 8. Concessionaires' perception of the value of Brazil nut concessions

The interest among young people in participating in Brazil nut harvesting seems to be declining. Overall, 28% of all 50 concessionaires interviewed declared their children to be uninterested, while 41% mentioned that at least one child was interested. Among those concessionaires with no interested children, five intend to sell the concession to a third party (in spite of this being illegal); they implied that future buyers may be more interested in timber than non-timber resources. A concessionaire's son mentioned that harvesting Brazil nuts is stigmatic for young people and that full-time work in the city is seen as more socially acceptable. Official data from the DRFFS estimates that during 2017, among the 1 123 concessionaires outside of the Reserve, 35% were aged 22–50 years, 35% 51–70 years, and 10% 71–92 years (the age of 20% was unknown).

Indicator 9. Participation and benefits from concessionaires' associations

Among the 50 concessionaires interviewed, 58% belong to a Brazil nut harvester association. Those who were not members of an association cited distrust, poor financial management or the negative influence by elites over association issues (for financial or political gain). Among the 58% who were association members, 24% reported not obtaining any advantages from membership, while 44% said they gained a financial advantage. The two associations that were mentioned as providing such an advantage were the Organic Nut Collectors of the Peruvian Amazon (RONAP) and the Association of Brazil Nut Harvesters of Tambopata National Reserve (ASCART). The underlying motivation for being a member is that these associations negotiate better prices with large buyers.

Indicator 10. Barriers to market entry

Among the 50 concessionaires in our sample, only 18% (who are also members of ASCART) reported having access to bank credit, while 58% had obtained an advance payment from a given nut buyer, to be later reimbursed with the proceeds from the harvest. It was reported that these individual buyers are more likely to provide loans when they have a long-term relationship with the concessionaire. However, this may reduce the concessionaire's ability to switch to another buyer when external factors (e.g. likely changes in the price of other internationally traded nuts) or intrinsic factors (e.g. interannual variation in Brazil nut production) change the

international price. In addition, and because of the short supply season (3–4 months every year) the economic value of Brazil nuts in local markets tends to gradually increase past the harvest season. However, the need to reimburse cash advances from buyers means that concessionaires are usually forced to sell their product right after the harvest season ends, usually at a lower price.

Furthermore, as mentioned above, those Brazil nut concessionaires participating in timber markets are restrained by complex regulations that make them heavily dependent upon third-party loggers to carry out the paperwork and execute the harvesting, thus greatly reducing timber profits. Finally, the benefits of product certification reported by the interviewees were mainly associated with enhancing their skills in sustainable production and forest use rather than economic benefits. According to one representative of a certification company, concessionaires are less willing to adopt certification because it requires stricter compliance with standards, while not always generating a financial edge over noncertified practices.

DISCUSSION

The creation of the Brazil nut concessions in 2000 was an attempt by the Peruvian government to include NTFPs as a way to formalize the diversification of the forest sector and enhance local livelihoods. Through a qualitative approach, this paper has attempted to shed light on whether the current Brazil nut concession system, more than 15 years after its establishment, promotes sustainable forest use. The reader should be aware that this analysis is based on a small sample, compared to the more than 1 000 concessions officially registered in Madre de Dios, across up to 1 million ha of Amazonian forest. Therefore, the results are indicative and should be carefully interpreted.

Contrasting outcomes were found in this study when comparing Brazil nut concessions within the Tambopata National Reserve and those outside of protected areas, which comprise the vast majority of Brazil nut concessions in Madre de Dios. Based on the set of indicators applied, the results suggest that Brazil nut concessions within the Reserve are performing better than those outside of it. Overregulation, ineffective monitoring and accompanying sanctions, and overlapping property rights and tenure types are common issues for concessions outside protected areas; while illegal, uncontrolled logging is rampant (Praeli 2019). When combined, these factors may not be conducive to the long-term sustainability of Brazil nut concessions outside of the Reserve; these findings are not very different to other assessments of NTFP governance worldwide, particularly those systems involving both small-scale harvesters and owners (Laird *et al.* 2010b). More broadly, these results mirror problems common to tropical forest concessions globally: weak governance, over-complicated rules with limited recognition of local aspirations in management objectives, inequitable benefit sharing and poor law enforcement (FAO 2018). The different governance approaches to Brazil nut concessions inside and outside the Reserve by different agencies (DRFFS and OSINFOR

outside protected areas, and SERNANP inside the Reserve), further illustrates how management outcomes can be contrasting even within the same forest-use type. Less cumbersome administrative procedures in the Reserve appear to suit the realities and needs of Brazil nut harvesters, compared to concessionaires outside of the Reserve. That being said, the DRFFS could learn from the participatory approaches used by SERNANP in promoting adaptive management. It also should be noted that at the time of their creation, Brazil nut concessions outside of the Reserve were not conceived with a multiple-use mindset – despite harbouring substantial timber volumes (Cossío *et al.* 2011). They have since been governed through top-down technocratic approaches and a timber-oriented philosophy (Cossío *et al.* 2011, Perales and Guariguata 2015). This issue may also reflect on their seemingly negative performance over time.

One key message from this analysis is that the effectiveness of command-and-control measures is questionable: concessionaires outside of the Reserve generally felt that the state has mostly focused on compliance with rules and regulations, while emphasizing punitive measures, instead of resolving conflicts, securing their rights, or helping to improve management. This situation is widespread for many forest and agriculture smallholders across the Amazon (Pacheco *et al.* 2016). It is worth noting that, in comparison with Peru, Bolivia's success in dominating the global Brazil nut export market over time has relied less on harvesters following government-led regulations and norms and more on adapting to international market and trade forces (Guariguata *et al.* 2017).

The weak social capital of concessionaires, mentioned explicitly by the leaders of two Brazil nut harvester associations, is another key issue hampering the Brazil nut concession model in enhancing forest values and local livelihoods. A reduced degree of collective action among Brazil nut harvesters had been already documented in Madre de Dios; this has resulted in poor financial management of Brazil nut harvester associations as well as harvesters becoming prone to manipulation by elite groups for financial or political advantage. (Quaedvlieg *et al.* 2014). This has made harvesters prone to marginalization in forest-related decision-making processes while increasing their vulnerability to powerful actors along the forest product value chain (Ingram *et al.* 2015, Ros-Tonen and Kusters 2011). Promoting associative initiatives warrants attention from both governmental agencies and non-governmental organizations. Collective action and processing could also help to stimulate product commercialization in the national market. For example, Brazil seems to have a wider array of Brazil nut products primarily catering to the national market (Homma *et al.* 2014) compared with Peru and Bolivia, both of which cater primarily to export markets for shelled and unshelled nuts, although with some incipient product diversification.

On the issue of integration of management objectives, this research finds no clear evidence of a concerted, effective, multisectoral and multi-actor effort across Brazil nut concessions, particularly outside of protected areas. Concrete actions to integrate, for example, agriculture, sound silvicultural practices, timber and Brazil nut extraction, and ecotourism, as a holistic land-use model, were not evident during the

research. Although it is well known that when more than one use (and more than one actor) is involved, forest management trade-offs become increasingly acute (García-Fernández *et al.* 2008, Guariguata *et al.* 2010, Panayotou and Ashton 1992), there is evidence that in Madre de Dios, multiple-use management approaches could be viable. For example, both Nunes *et al.* (2012) and Kirby *et al.* (2010) estimated that Brazil nut harvesting in Madre de Dios, if associated with ecotourism and/or sustainable logging, could compete economically with small-scale agriculture. Another study in Madre de Dios further suggests that at low timber harvesting intensities, the fruit production of Brazil nut trees may not be compromised (Rockwell *et al.* 2015). However, there is also evidence that the regenerative potential of Brazil nut tree populations in concessions outside of protected areas is naturally low – the abundance of pre-reproductive individuals (10–40 cm in diameter) is, on average, one per every 10 ha of forest (Rockwell *et al.* 2017) – suggesting that large-scale enrichment planting may be needed to sustain Brazil nut production over time.

To conclude, if the Brazil nut concession system (particularly outside protected areas) is to enter into the next phase, this may only be possible by formally recognizing a multiplicity of land uses, implementing and validating integrated forestry approaches, minimizing land-use and management trade-offs aligned with local aspirations, and establishing effective negotiation and/or knowledge exchange platforms with different productive sectors and government agencies.

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