# 5

# PATHWAYS TO COMMUNITY TIMBER PRODUCTION

## A comparative analysis of two well-established community-based forest enterprises in Mexico and Brazil

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### Introduction

Timber is one of the most challenging resources for forest-based communities to access, manage, and sustainably harvest. Powerful political and economic forces steadily exert significant pressure to keep lucrative logging rights under government control (Sunderlin et al., 2005), despite persistent land grabbing and illegal logging and the difficulty of monitoring and protecting these often-remote assets. While multiple forest rights (of the diverse rights bundle) have been devolved to tropical communities across the globe (RRI, 2018), legal access to timber and effective participation in timber management may be the last to be ceded to or shared with communities (Larson & Ribot, 2007). And when timber rights are granted, managing natural forests to sustain timber harvests is technically difficult and tends to be capital- and skill intensive (Sunderlin et al., 2005), particularly in diverse tropical systems. Even in the best cases, research suggests that timber yields decline by almost half following the first harvest of old growth tropical forests, although the vast majority of forest carbon and diverse taxa may be retained (Piponiot et al., 2019; Putz et al., 2012). Once communities obtain forest rights, a host of internal and external challenges, e.g., related to regulatory frameworks, internal governance, financial and technical capacity, business management, and market access, can make it difficult to continue operating (Badini, Hajjar, & Kozak, 2018; Hajjar, McGrath, Kozak, & Innes, 2011; Molnar, 2007). Indeed, several analyses of inhibiting and enabling factors for community-based forest enterprises (CFEs) over different time frames and across diverse countries of the global South have been published (Badini, Hajjar, & Kozak, 2018; Ellis et al., 2015; Humphries et al., 2012; Macqueen, 2013; Oyono, Biyong, & Samba, 2012; Radachowsky et al., 2012; Valdez, Hansen, & Bliss, 2012), and all suggest that permanence is challenging for CFEs.

Nonetheless, despite these manifold challenges, CFEs for timber production have emerged around the globe under very diverse conditions (Gilmour, 2016), and mounting evidence indi-

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cates some are able to generate environmental and socioeconomic benefits (see review by Hajar et al., 2020). Research shows that tropical lands under community and Indigenous control, including forests where timber is sustainably harvested, tend to retain forest cover better than many protected areas (see Ellis & Porter-Bolland, 2008; Porter-Bolland et al., 2012; Seymour, La Vina, & Hite, 2014). Livelihood benefits of community timber management have also been confirmed, especially regarding income generation and/or poverty mitigation (Antinori & Bray, 2005; Humphries et al., 2012, 2020; see review by Miller & Hajjar, 2020). In addition, some – but not all – communities involved in timber production invest a part of timber revenues in community-level benefits (e.g., infrastructure, education, health care) and other productive activities (Gnych, Lawry, McLain, Monterroso, & Adhikary, 2020; Humphries et al., 2020) that contribute to overall community well-being.

In cases where CFEs for timber production have persisted and provided benefits, there has been limited examination of how these communities have built, over time, the significant timber management and community-based enterprise capitals and expertise necessary to do so. Herein, we explore in detail two forest-rich communities, one in Brazil and one in Mexico, who – against conventional odds – have taken control of logging on their communal lands and developed enduring CFEs that provide multiple benefits for residents. Centring a detailed analysis of dynamics at the community level reflects the growing awareness that local context is decisive in resource management outcomes (Butler, 2021a, 2021b; Carias Vega, 2019; Sick, 2008). We ask the following questions: (1) What pathways did these communities take to develop CFEs for timber production? (2) How do these CFEs implement community forest management (CFM) and timber production? (3) What investments have been made to strengthen community capacity (i.e., community capitals) to implement these activities by supporters and community members themselves? (4) How have these investments in community capitals over time contributed (if at all) to different types of well-being for both communities?

## Conceptual frameworks and methodological approach

We have adopted the community capitals framework (CCF), an action-oriented structure that conceptualises and categorises the resources, or capitals, communities have at a certain time, the processes or actions to improve those capitals, and the resulting changes in capital. The CCF builds on earlier work by Scoones (1998) to develop a framework for analysing rural livelihoods and highlights seven community capitals (natural, cultural, human, social, political, financial, and built) as defined by Flora, Flora, and Fey (2004) (Table 5.1). Community capitals consist of both stocks and flows; they are fluid and greatly influenced by interactions with external actors, government policies, and markets, which also change over time (Emery & Flora, 2006). Examples of the use of the CCF framework in the context of CFM include research by Butler (2021a, b) on CFEs in the Maya Biosphere Reserve, and Kanel and Niraula (2004) and Maharjan, Dhakal, Thapa, Schreckenberg, and Luttrell (2009) of Nepalese community forestry user groups. In addition, Baynes, Herbohn, Smith, Fisher, and Bray (2015) emphasise the importance of social capital specifically in CFE success based on an extensive review of literature. Finally, Gnych et al. (2020) provide an in-depth look at investments in and by CFEs in different types of community capitals for timber production in Mexico, Guatemala, and Nepal.

The CCF examines how changes in community capitals help achieve sustainable livelihoods, including community well-being. Because of its multi-dimensionality, we accept the suggestion by Stiglitz, Sen, and Fitoussi (2009) to conceptualise well-being pluralistically, exploring three broad dimensions: material, relational, and subjective well-being (Biedenweg & Gross-Camp, 2018). For our analysis, material well-being includes secure livelihoods, sufficient income, sat-

*Table 5.1* Conceptual model of the relationship between seven types of community capital and three types of well-being

| *Types of capital* | | *Types of well-being* |
|---|---|---|
| Social (internal and external relationships) | Political (access to power, capacity to improve community) | Relational (fulfill needs, achieve goals) |
| Human (skills and abilities) | Built (roads, ports, industry) | Material (income, skills, infrastructure, services) |
| Financial (cash, credit) | Natural (forests, water, wildlife) | |
| Cultural (world view, traditions) | | Subjective (feelings, perceptions) |

Source: Created by the authors.

isfactory living conditions, and forest quality. Relational well-being refers to how individuals within a community relate to one another and with outsiders to meet their needs and achieve goals. Subjective well-being encompasses how people feel about their situation and the cultural and social norms that influence them (Gough & McGregor, 2007). The multi-dimensional and dynamic nature of well-being seems particularly suited for assessing outcomes aligned with CFE capitals (Table 5.1). Miller and Hajjar's (2020) extensive literature review on forests and livelihoods concludes that most studies have focused on aspects of poverty mitigation rather than on broader dimensions of well-being.

To answer our research questions we drew on the extant peer-reviewed and grey literature as well as our collective decades of scholarly knowledge and practical experiences with these two cases and other forest-based communities in these two countries. Regarding community capitals, we use the CCF to categorise the different types of investments in the communities and their CFEs related to timber management. However, we acknowledge there were likely other concurrent community-centred activities and/or projects that also contributed to and/or detracted from these capitals. For well-being, we rely heavily on reflections of the co-authors to identify specific examples of contributions to well-being related or likely related to community timber management, especially for the subjective dimension of well-being, recognising that these are only a few of likely multiple perspectives.

## Pathways to community forest management and timber production

Both southern Mexico and the Brazilian Amazon serve as international references for community-based tropical forest management (Bray, Antinori, & Torres-Rojo, 2006; Sabogal, Pokorny, Pokorny, & Louman, 2008). Each region has significant forested areas under hard-won community control and a number of CFEs focused on non-timber forest products (NTFPs) and timber. The two innovative cases profiled here have been managing their forests for timber for substantial time periods: Noh-Bec in Mexico for 36 years, and Arimum in Brazil for 14 years. We chose these cases because we know them well on the ground, and studies have been published about them that provide supporting information.

Both Noh-Bec and Arimum were settled by migrants attracted by commercially viable tree exudates: chicle from the chicozapote tree (*Manilkara zapota*), used for chewing gum, in the case

of Noh-Bec; and primarily rubber (e.g., *Hevea brasiliensis*) in the case of Arimum (Noh-Bec, 2015; COOMNSPRA, 2016). Noh-Bec, in the Mexican State of Quintana Roo on the Yucatan Peninsula, was founded in 1936 (Figure 5.1a). In 1943, it was formally recognised through a presidential decree as an *ejido*,[1] and land rights were ceded to ejido members, most of whom were originally from Veracruz state (Noh-Bec, 2015).

The population of Noh-Bec was 2,052 in 2010, with 28 per cent under the age of 14 (PueblosAmerica.com, n.d.). Only 219 were ejido members (descendants of the original founding families and primarily men; upon death, a spouse or one child inherits membership), and the rest were considered *avecindados*. *Avecindados* are residents without formal voting privileges for community decisions or legal rights to land, but they can farm certain areas for subsistence. *Avecindados* include residents of the nearby town of Cuahtemoc, who are originally from Yucatan, Tabasco, and other states of southern Mexico, and people of the Indigenous ethnic groups of Tzotziles and Tzeltales who fled Chiapas following the 1982 eruption of the Chichon volcano (Noh-Bec, 2015). Today, timber harvesting and processing are the main income source, as is employment at a privately owned poultry farm (INEGI, 2010). Few ejido members farm the 35 ha they are allotted for personal use (personal observation).

The community of Arimum is located in the Extractive Reserve Verde para Sempre (ERVS) in the state of Pará, in the Brazilian Amazon (Figure 5.1b). Arimum was founded in 1967, but many of its approximately 260 residents descend from families that have lived in the area for over 100 years. Residents make a living from livestock, subsistence agriculture (mostly manioc), NTFPs (historically rubber and Brazil nut, *Bertholletia excelsa*, and more recently açaí, *Euterpe oleracea*), hunting, and fishing (da Silva Medina & Barbosa, 2016). Logging historically has been an economically important activity in the region and was conducted illegally by outsiders who enlisted locals as day labourers and degraded the forest by harvesting the most valuable trees. As a clear signal to keep land grabbers and illegal loggers at bay, residents of Arimum and other local communities successfully fought to create a federal extractive reserve in 2004 on the lands they inhabited. Within this new conservation unit, each original family was given a 100-ha lot along the Arimum River, which has been subdivided over the years into smaller family lots.

Both states, Quintana Roo (QR), Mexico and Pará, Brazil, retain high levels of forest cover and are important timber producers. Over 80 per cent of QR's 5.1 million hectares (Mha) are covered with forest (Ellis et al., 2015), while Pará, with 124.8 Mha, has about 72 per cent forest cover (Pereira, Santos, Vedoveto, Guimarães, & Veríssimo, 2010). Of the 279 ejidos in Quintana Roo, 171 are categorised as having forests appropriate for timber management (CONAFOR, 2015). However, only 87 have been involved in forest management— since ejidos obtained timber rights in the mid-1980s (Ellis et al., 2015). Although even fewer (about 35) commercialise timber on an annual basis (Rodriguez-Ward, Blanco Reyes, Sills, & Lubowski, 2016), almost all timber production in QR emanates from ejido community forests.

Pará, Brazil's largest tropical timber-producing state (Costa et al., 2018; Pereira et al., 2010), produced 3.25 million $m^3$ of tropical timber in 2018 (IBGE, 2018). The state's 42 community forestry initiatives, which operate in national forests, extractive reserves, Quilombola territories, and settlement areas, have a total authorised annual harvest area of 9,223 ha and an estimated annual production of 545,163 $m^3$ (Costa et al., 2018; Miranda, Amaral Neto, Sousa, & Coelho, 2020), which represents 17 per cent of the state's total production. Notably, in 2017–2018, an estimated 70 per cent of timber harvesting in the state was illegal (Cardoso & Souza, 2020), including in Indigenous territories (12 per cent) and conservation units (5 per cent) like extractive reserves. While Miranda et al. (2020) estimated that the communal forests in Brazil's conservation areas could potentially produce 24 million $m^3$ of logs per year, this is very unlikely given CFEs' many challenges (e.g., bureaucratic, financial, access to markets).

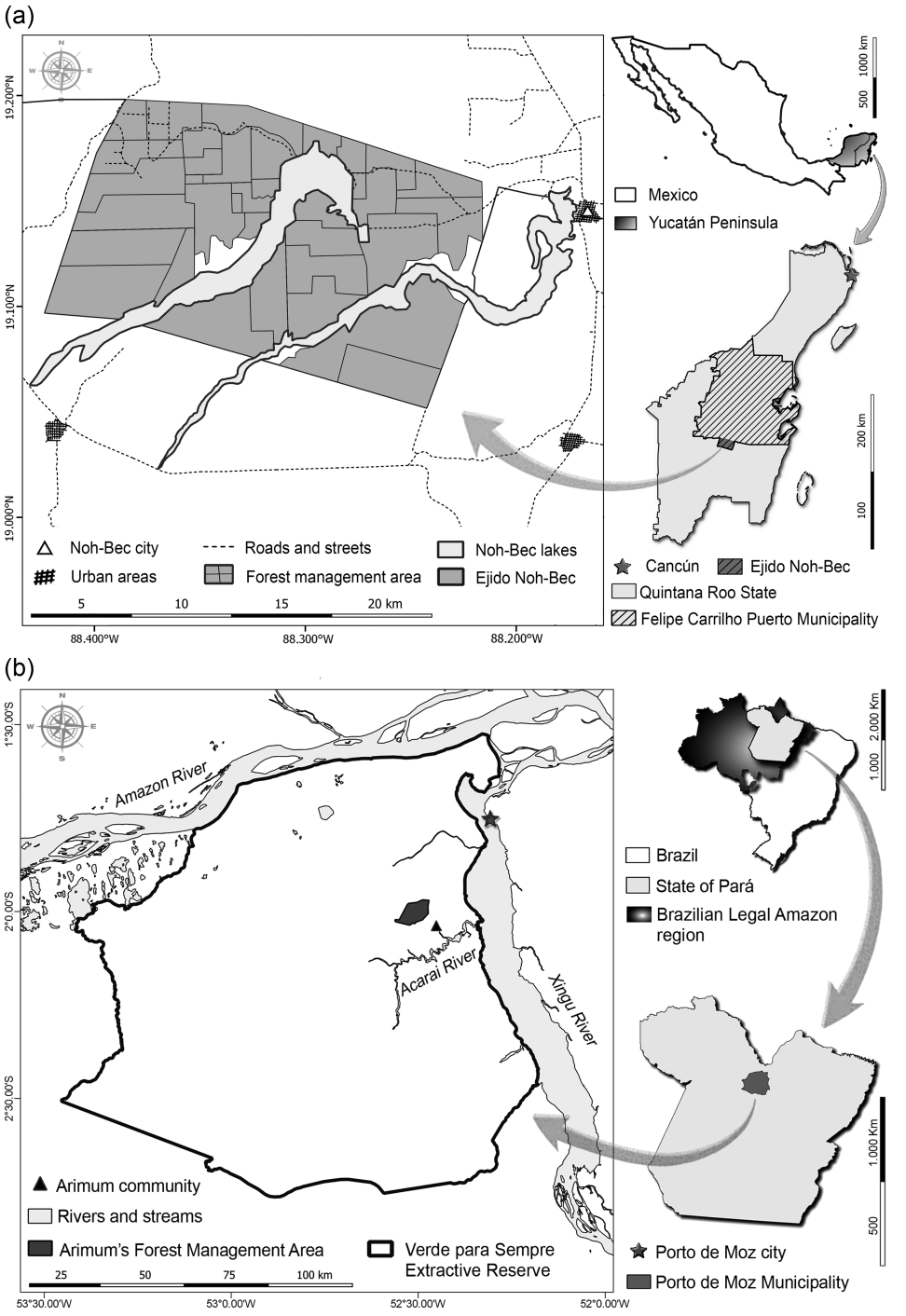


*Figure 5.1* Maps of two forest-based communities with community-based forest enterprises producing timber: (a) Noh-Bec in Quintana Roo, Mexico. Source: Created by Daniel de Almeida Papa for the authors. (b) Arimum in Pará, Brazil.

## *Early history and struggles to achieve tenure and timber rights*

Forests in Mexico's Yucatan peninsula were heavily exploited by Spanish, British, and American companies for timber and chicle in the 19th and early 20th centuries, and were the site of many wars (Ellis et al., 2015). Chicle extraction was arduous and often exploitative work. Land reform and ejido creation came after the Mexican Revolution of 1910–1917. Noh-Bec and other large ejidos (averaging 35,000 ha each) were established in the 1930s–1940s to accommodate chicle production by both native Maya and migrants from other parts of Mexico (Barsimantov, Racelis, Biedenweg, & DiGiano, 2011; Galletti, 1998). The ejidal land system put 75 per cent of forests under communal tenure (Merino-Perez, 2013).

In the Brazilian Amazon, native rubber was an enormous source of wealth in the 19th and until the mid-20th centuries (Schmink & Wood, 1992). Similar to the case of chicle in Mexico, a mixture of native and immigrant labour (mostly from drought-stricken northeast Brazil) formed the workforce for 'tapping' rubber. Vast areas of natural forest were divided into rubber estates, and rubber barons were brought in and assigned families 300–450 ha each to produce rubber under harsh and exploitative conditions (Allegretti, 1994).

In the 1950s and 1960s, the national governments in Mexico and Brazil turned their sights on tropical forests as sources of commercial wealth and import substitution. In Mexico, commercial timber concessions were granted to third parties on communal lands throughout the country (Merino-Perez, 2004). In QR, Maderas Industrializadas de Quintana Roo (MIQROO) aggressively harvested mahogany (*Swietenia macrophylla* King) and Spanish cedar (*Cedrela odorata* L.) from Noh-Bec's and other ejidal forests to produce veneer, plywood, and other products for international markets (Forster et al., 2003; Galletti, 1998). Some benefits trickled down to communities, such as hiring locals as loggers (Richards, 1992) and residual logs (personal observation), but most economic benefits went to the company.

In Brazil, a military dictatorship from 1964 to 1985 encouraged Amazonian 'development' with investments in infrastructure (e.g., roads, dams), migratory settlement, and large-scale production of cattle, agriculture, mining, and timber extraction (Bunker, 1984; Hecht & Cockburn, 1990). In both study cases, widespread environmental damage ensued with little benefit for local communities, sowing discontent that spawned grassroots social movements (Bray et al., 2006; Hall, 1997; Schmink & Wood, 1992). By the 1970s, these social movements called for improved land and/or forest resource rights for communities.

In Mexico, ejido members (including those from Noh-Bec) and their supporters led protests around the country to end forestry concessions, demanding rights to harvest timber and other resources on ejidal lands. In Brazil, families (known as 'rubber tappers') that had been living in rubber estates, in many cases for generations, and were not aware of and had not documented their squatters' rights to the land, began finding their forests and livelihoods under attack by ranchers and land speculators bent on clearing and burning forests (Almeida, 2002; Hecht & Cockburn, 1990). A movement of rubber tappers emerged in the 1970s and joined forces with environmental and social movements that portrayed the tappers as defenders of the forest with legitimate land rights (Hall, 1997; Hecht & Cockburn, 1990; Keck, 1995).

A paradigm shift in the 1980s and 1990s, moving away from central control and loosely regulated resource exploitation and towards local governance and environmental conservation, paved the way for community forestry. This change was institutionalised in new legislation and supported by large foreign aid projects and domestic programmes in both countries, but occurred more quickly in Mexico. When Mexico's 1986 Forestry Law ended timber concessions in communal lands and gave communities timber rights, ten CFEs in QR were already harvesting

and selling their own timber and three had obtained machinery and sawmills (Galletti, 1998; Wilshusen, 2005), including Noh-Bec.

In contrast, in Brazil, it was not until the early 1990s that non-Indigenous forest-based communities began receiving long-term use rights to the federal lands they inhabited (Allegretti, 1994). Social movements with widespread local engagement, including the frontline martyrs Chico Mendes in Acre state in the 1970 and 1980s and Sister Dorothy Stang in Pará state in the early 2000s, helped garner international support for tenure reform that established and protected community rights to forests. This included the creation of extractive reserves (Villas-Bôas et al., 2018) – a novel type of protected area in which government-owned land is designated for sustainable use by traditional residents (Allegretti, 2008). The Brazilian government was also slow to adopt the concept of community-based forestry for timber, and the first timber CFEs did not appear until the mid-1990s (Amaral & Amaral Neto, 2005). Only in 1998 did it recognise forest management plans (FMP) at the community level and allow simplified documentation for these operations.

## *Support for CFEs*

A series of largely externally funded projects were very influential in helping communities in both regions set up their CFEs for timber production. *Plan Piloto Forestal* (1983–1986) in Mexico was financed by the German government (GTZ) and the Mexican Forest Service (Richards, 1992). *ProManejo* (1999–2007) was funded by the World Bank, Germany, and the United Kingdom as part of Brazil's Pilot Programme for the Protection of Tropical Forests (known as PPG-7). These two programmes provided technical and financial assistance to build capacity for forest management and timber production to pilot CFEs in 10 ejidos in QR (Richards, 1992; R. Guttierez, personal communication) and 14 communities across the Brazilian Amazon (IBAMA, 2007). Substantial investments also targeted local CFE partner organisations – non-governmental organisations (NGOs) in Brazil and producer societies in Mexico – to improve their capacities to provide continued CFE assistance. An additional project, *Floresta em Pé* (2006–2011), provided further support to pilot CFEs and their partners in Pará state, and was funded by the federal government and the French Fund for the Environment in co-operation with several Brazilian and French NGOs (Cruz, Sablayrolles, Kanashiro, Amaral, & Sist, 2011).

While governments have continued to back CFEs, support in Mexico has been much more substantial and consistent than in Brazil. QR's 1989 five-year State Forestry Plan (*Plan Forestal Estatal*) helped develop additional producer societies and expand CFE development (Wilshusen, 2005), while QR's State Forestry Plans (1999–2005, 2006–2011) subsidised forest certification (Rodriguez-Ward, 2013; Weaver, 2000). At the federal level, Mexico's National Development Plan (1995–2000) gave priority to sustainable economic development, environmental protection, and natural resource management. The National Forestry Commission (CONAFOR) initiated the Program for the Conservation and Sustainable Management of Forest Resources (PROCYMAF) to ensure CFE economic viability. In QR, from 2004 to 2008, PROCYMAF funded certification and related costs (e.g., reforestation, environmental impact assessments, EIAs). Even today, Noh-Bec benefits from competitive CONAFOR grants (e.g., to cover costs for certification fees, technical reports, timber inventories, nurseries), though Noh-Bec is not dependent on these funds.

In Brazil, federal technical and financial assistance is available for CFEs but is spread over several agencies and institutions, and financial support has significantly waned in recent years due to a lack of prioritisation and funding. The Community and Forest Management Program was established in 2009 (Decree No. 6,874/2009) within the Brazilian Forest Service (SFB) to coordinate management and promote CFM in public forests (SFB, 2016). It co-ordinated with the National Forest Development Fund (FNDF) for a few years to disburse grants for financial

and technical assistance to CFE partner organisations. Other federal sources of support to CFE support organisations have included grants from the National Development Bank (BNDES) and Brazil's *Fundo Amazônia*. In 2020, despite having a mandate to help CFM for several years, the federal program *Pronaf Floresta* finally gave a CFE, Arimum's COOMNSPRA, a loan to finance its annual timber harvest operations (which it promptly repaid) due to the ground-breaking work of several agencies and NGOs to help the *Banco da Amazonia* (which distributes *Pronaf* funds) understand the costs and income involved. With respect to technical assistance, SFB and the Chico Mendes Institute for Biodiversity Conservation (ICMBio, created in 2011) have provided direct technical support to CFEs within federal conservation units (e.g., extractive reserves) as needed, and EMBRAPA (a government research agency) has aided community and family forest management initiatives on all types of lands. At the state level, Amazonas state has offered family forest owners assistance since the time of *ProManejo* (Miranda et al., 2020), and Acre state offered CFEs assistance until recently. In contrast, the Pará state government has failed to implement its 2019 policy to support community and family forest management (IDEFLOR-Bio, 2019). This means that CFEs in Pará, other than the 12 currently operating in federal conservation units (Miranda et al., 2020), have relied more on NGOs for technical support and on companies who provide advance payments for timber than on government agencies.

Partner organisations have been critical sources of CFE support in both countries. In QR, seven producer societies offer technical assistance to member forestry ejidos in return for a share of timber revenues. These societies also set minimum timber prices among members to ensure transparency and avoid competition, help them apply for government subsidies, facilitate learning among members, and represent CFE interests to governments and other organisations (Hajjar & Kozak, 2017). Noh-Bec belonged to such a producer society for 14 years, and then secured technical assistance from another NGO before hiring its own forest engineer. In recent years, NGOs such as The Nature Conservancy and Rainforest Alliance and multilateral organisations such as the Small Grants Fund of the UNDP have also supported ejidal forestry in QR.

In contrast, in Brazil, NGOs provide free technical assistance, although CFEs often provide in-kind repayment by hosting training workshops and publicly recognising the important role of NGOs for CFEs. The NGOs that have most actively supported CFM in the Brazilian Amazon over the last 20 years include the *Instituto Florestal Tropical* (IFT) for technical forestry training; the *Instituto Internacional de Educação do Brasil* (IEB) for capacity building, mostly on governance and markets; and the *Instituto do Homem e Meio Ambiente da Amazônia* (IMAZON) for research and knowledge sharing about CFM. Other supportive organisations include EMBRAPA, universities, workers' unions, and religious organisations. NGO assistance has varied over time depending on funding availability from governmental programmes and foundations. Unlike Mexico's producer societies, explicitly or not, these Brazil-based NGOs also have worked to develop CFE technical and financial independence, though few have achieved it. Some Amazonian examples of arrangements akin to Mexico's producer societies exist and could become more popular in the future, including COOPERFLORESTA, a co-operative in Acre state that provides fee-based technical and marketing assistance to members. An important commonality, nonetheless, is that partner NGOs in Brazil also lobby for improved CFE policies and programmatic support.

## *Forestry laws and regulations*

Although Mexico's first forestry law was passed in 1926, it had a little regulatory effect (Bray & Wexler, 1996). Robust and meaningful federal guidance only emerged with the Forestry Law of 1986, the General Law of Ecological Equilibrium and Environmental Protection of 1988 (LGEEP), and the General Law for Sustainable Forest Development (LDGFS) in 1993. These laws provided

regulations and guidelines for management plans for harvesting, environmental protection and restoration, EIAs, and sustained economic development (Weaver, 2000). In particular, the 1986 Forestry Law ended private timber concessions on community lands, emphasised the environmental consequences of timber harvesting, and supported the development of CFEs (Wilshusen, 2010).

In Brazil, the Forest Code (Law 12.651/2012), which was first passed in 1934 and has been revised many times, addresses sustainable timber management on private and public lands. In 2006, Law 11.284/2006 established directives to manage public lands, including the multiple use of these forests through timber concessions, biodiversity conservation, tourism, and other land uses. Particularly significant to our Arimum case, a multi-stakeholder process resulted in Normative Instruction No. 16/2011 (hereafter Norm 16/2011), which defines specific rules for authorising community timber management in three categories of federal protected areas: extractive reserves, sustainable development reserves, and national forests. Because of long turnaround times and bureaucratic complexity in approving and overseeing timber production by community actors, Norm 16/2011 also transferred responsibility for regulating community timber production from the federal Brazilian Institute of the Environment and Renewable Resources (IBAMA) to the newly established government agency, ICMBio (Espada & Serejo, 2016; Santos, 2017). ICMBio's national office approves forest management plans for community initiatives in federal conservation units, while its local offices are responsible for the day-to-day management of their respective conservation unit, including providing technical support to the CFEs operating within them.

In both regions, communities must have FMPs endorsed by a forestry professional and approved by a government agency: the Secretary of the Environment and Natural Resources (SEMARNAT) in Mexico and the ICMBio for extractive reserves in Brazil. Requirements include detailed maps and inventories of trees, road building plans, EIAs, environmental precautions, and reforestation commitments. The plans usually cover 35 years in Brazil and can be for 5–25 years in Mexico. In addition, communities must get approval for annual operating plans with tree harvest details and request and must secure government-issued timber transportation documents. Timber sales are tracked in Mexico by SEMARNAT, and state and federal police frequently stop and review the transit documents for timber transporting vehicles. In Brazil, federal and state agencies track timber transportation information, but in practice, they rarely stop and inspect trucks and boats/rafts transporting timber. CFEs in both regions must comply with international (e.g., CITES), federal, state, and local regulations.

Finally, both of our cases pursued Forest Stewardship Council (FSC) certification for external recognition of good forestry and potential market benefits (i.e., price premia, interest from discerning timber products' buyers), while also recognising that certification can help communities access local, national, and international resources (e.g., grants, partnerships). Noh-Bec was one of the first CFEs globally to be FSC certified in 1991, and Arimum was certified in 2016. To date, Noh-Bec has made a few sales of certified wood to international buyers, but continues to sell almost exclusively to local buyers who provide critical cash advances during harvesting operations, but do not pay certification premiums. Arimum, which operates in a market dominated by illegal timber, recently sold to a certified company in the state capital.

## Implementation of community-based forest enterprises

### *CFE goals*

Noh-Bec and Arimum pursued CFEs as part of a long-term trajectory to control decisions over and access to the forests that sustain their communities. Both communities' FMPs articulate goals of responsibly managing forest resources over the long term and generating income and

other benefits from logging for their community members. In addition, informal conversations with Arimum's leaders and other residents revealed that securing land rights and improving local health care for community members were also expected CFE benefits; other studies have found similar expectations (see Marin, 2014; Miranda, 2019; Pacheco, 2017).

## *CFE institutions*

Both communities have community-level governance organisations with elected officials: Noh-Bec's ejido leadership team and Arimum's community association. In addition, both created institutions specifically to implement forest management, production, and timber sales activities: a Forestry Office for Noh-Bec and a co-operative for Arimum, both of which also have elected officials. Timber production is the primary activity, but both institutions also oversee and support the production and sale of NTFPs (as well as ecotourism in Noh-Bec).

Ejidos in Mexico are governed by an ejido leadership team elected by ejido members. For the majority of ejidos in Quintana Roo, the leadership team manages timber production and sales decisions, often with little transparency (Rodriguez-Ward, 2013). Noh-Bec's Forestry Office is an innovation among QR ejidos that helps separate forestry decisions from political decisions, which reduces opportunities for conflict of interest and streamlines communications with buyers. The Forestry Office is led by a periodically elected Forestry Technician and employs forest guards. The Forestry Office's performance (i.e., sales, expenses) is reviewed by the ejido leadership and the General Assembly of ejido members on a monthly basis to further ensure transparency.

Arimum's CFE has had several institutional permutations. With support from ProManejo, it began as a pilot CFE in 2005 (called *Projeto Maçaranduba*), designed as a 15-year community–company partnership in which infrastructure and machinery ultimately would be devolved to the community. This agreement ended prematurely due to Norm 16/2011, which prohibited companies from leading forest management operations in protected areas, like extractive reserves. Thus, in 2011, the community's association (ACDESRA: *Associação Comunitária do Desenvolvimento Sustentável do Rio Arimum*) assumed responsibility for the FMP and entered into a co-management agreement with ICMBio (described later in more detail). Then, in 2014, due to regulations that prohibit associations from issuing invoices and distributing profits to community members, the community formed a co-operative (COOMNSPRA: *Cooperativa Mista Agroextrativista Nossa Senhora do Perpétuo Socorro do Rio Arimum*) to co-manage Arimum's forest. ACDESRA maintained a role in deciding how to utilise the net income from timber (Miranda, 2019). This new power arrangement created confusion regarding organisational roles, some discontent about power shifts among community leaders, and resistance to changes in how timber benefits were distributed – from individual cash payments to largely community-level investments (Arimum community member, personal communication). These issues, however, were resolved through community dialogue with the assistance of partner organisations. COOMNSPRA members must be active in the community, a member of the community association for at least two years, and capable of implementing forestry-related activities; residents of nearby communities can also join if their labour is needed. The co-operative's executive board members mostly live in the nearby urban area of Porto de Moz, where the co-operative's office is located.

## *CFE operation*

Both communities ended up adopting industrial forest management models (Table 5.2) but operate differently. Noh-Bec owns its forest, counts on a highly skilled forestry team, and has full

*Table 5.2* Key timber production parameters for CFEs in the communities of Noh-Bec in Quintana Roo, Mexico and Arimum in Pará, Brazil

| *CFE timber production parameters* | *Noh-Bec* | *Arimum* |
|---|---|---|
| First forest management plan approved | 1984 | 2006 |
| Year CFE logging began | 1984 | 2007 |
| Total designated timber management area (ha) | 18,000 | 4,255 |
| Average annual harvest area (ha) | 1,000 | 100 |
| Cutting cycle (years) | Originally 25; currently 15[a] | 35 |
| Average estimated annual production volume ($m^3$) | 7,000 | 1,700 |
| Average volume harvested per hectare (m3/ha) | 7 | 17 |
| Number of community members employed in timber production | 110<br>Male: 90<br>Female: 20 | 46<br>Male: 40<br>Female: 6 |
| Type of transport to market | Trucks | Ferry |
| Product | Sawnwood, roundwood, polewood | Roundwood |
| Species | Timber: mainly mahogany (*Swietenia macrophylla*), chicozapote (*Manilkara zapota*), tzalam (*Lysiloma bahamensis*), and chechem (*Metopium browneii*)<br>Polewood: various | 25 species, including these high value species: cumaru (*Dipteyx odorata*), ipê amarelo (*Handroanthus albus*), ipê roxo (*Handroanthus impetiginosus*), itauba (*Mezilaurus itauba*), and jatobá (*Hymenaea courbaril*. |

Source: Created by the authors.
[a]Critical salvage harvesting triggered by Hurricane Dean in 2007 led Noh-Bec to temporarily adopt a 15-year cutting cycle.

control over management activities. Arimum, in contrast, co-manages its federally owned forest with ICMBio and relies on technical assistance from NGO partners.

Noh-Bec has a vertically integrated timber operation that runs year-round, utilising its own field machinery and sawmill. CONAFOR grants in the early 2000s were important to replace some machinery and update sawmill parts, especially given the ejidos' irregular access to credit. All forestry-related jobs are first offered to ejido members who demonstrate adequate skills

in the position. If no ejido member is available, the position is then offered to ejido members' children, and then to other non-ejido members. Frustration among other ejido residents over this arrangement is discussed in the section on contributions to well-being. Income from timber sales is first used to cover operational costs not already paid by buyer advances and then to cover some services for ejido members (e.g., health insurance) and the larger community (e.g., road maintenance, internet). Net income is distributed biannually to ejido members in a payment referred to as *utilidades*.

Arimum's co-management arrangement with ICMBio effectively means that ICMBio monitors forest management activities and approves FMPs and annual operating plans, while COOMNSPRA is responsible for implementing and keeping ICMBio apprised of forestry activities. Co-operative members implement most activities directly (e.g., tree inventories and cutting, road planning, log measurements, permanent plots monitoring), while contractors are hired when heavy machinery (e.g., skidding, loading, transporting logs) is required. A forest engineer is contracted to write the FMP (updated every five years) and the annual production plan. Usually, the forest engineer employs a forest technician that accompanies the community members in some activities, especially tree inventories. COOMNSPRA also receives technical support from NGOs, the Brazilian Forest Service (SFB), the Federal University of Pará, and Embrapa. Net income from timber sales is allocated according to the following system (based on another successful system established by the Pará co-operative): 45 per cent for capital for the next timber harvest; 10 per cent for an emergency reserve; 5 per cent for educational and social assistance; and 5 per cent for a health fund. The use of the remaining 35 per cent is for community development, including 15 per cent for community investments and 20 per cent which COOMNSPRA members decide how to use, and can distribute directly to co-operative members (COOMNSPRA, 2018).

Common challenges for both CFEs include connecting with buyers interested in lesser-known species; a reliance on buyers' monetary advances to finance timber operations, which creates a dependence on buyers and lessens CFEs' negotiating power for sales; and finding buyers willing to pay premiums for certified products. To improve the visibility of certified products in QR, in 2010 Noh-Bec co-founded – with five large, certified forestry ejidos – the Maya Forest Alliance (*Alianza Selva Maya U.E. de R.L.*), which sells FSC-certified timber products at a premium, including flooring and kitchen products. Another opportunity Noh-Bec and other ejidos have seized is to sell smaller diameter trees (polewood), fulfilling the growing regional market demand for touristic and residential construction of *palapas* (thatched roof, open-sided structures) (Racelis & Barsimantov, 2008). Arimum has recently had some important advances both in obtaining a loan in 2019 (described further in the next section), which disrupted its previous dependence on cash advances from its buyers, and, in 2020, finding a buyer willing to pay a premium for certified wood.

## Investments in Community Capitals

Noh-Bec and Arimum have relatively successful and enduring CFEs that both started as pilots associated with discrete regional projects to promote CFM for timber production. Project implementers chose to work with these communities because of their various assets, which we describe here in terms of the community capitals framework (Emery & Flora, 2006). Partner organisations and communities themselves persisted in investing in these communities' capitals over time (especially social and built capital), which helped lead to improvements in other capitals (especially human, built, and financial capital).

Emery and Flora (2006, p. 3) describe social capital as 'the connections among people and organisations or the social "glue" to make things, positive or negative, happen'. Other studies

have identified investments in social capital as key to building other assets that allow CFEs to successfully attain their goals (Baynes et al., 2015; Gnych et al., 2020). Indeed, among the first steps for each CFE was strengthening their internal organisations (bonding social capital) for CFM implementation. They then reached out to external actors to build partnerships (bridging social capital) to improve their human and other capitals. Both benefited from past membership in organisations with other CFEs: a producer society for ejidos in Noh-Bec, and the Trans Amazonian Community Forestry Working Group (GT-MFC) for Arimum. Today, both Noh-Bec's Forestry Office and COOMNSPRA are leaders in CFE networks: a CFE joint venture in Quintana Roo and a Forest Management Group (GGF) composed of younger CFEs in the Verde Para Sempre Extractive Reserve (Espada, 2021).

*Human capital* refers to peoples' skills and abilities (Emery & Flora, 2006). Both cases originally benefited from significant partner investments to build human capital in technical and managerial skills. After an almost 14-year relationship with its original producer society, Noh-Bec relinquished its membership and procured technical services from a local NGO. In 2015, after 30 total years of timber management experience, Noh-Bec became fully technically independent by selecting a trained community member to serve as its Forestry Technician. Today, Noh-Bec supports ejido members to attend forestry-related training around the state and globe, and frequently hosts and leads training programmes for others. Many ejido members have post-secondary education, including seven (male and female) who have obtained their bachelor's degree in forestry (at their own expense). Arimum has made significant strides, but still benefits from partners' assistance and continued capacity building. Similarly, Arimum is also emerging as a role model for younger CFEs, which are learning from its experiences and from other established CFEs, particularly the Pará co-operative, COOMFLONA.

Both CFEs began with significant *natural capital*. Despite histories of predatory logging, each still had forests with enough commercial tree stocks to receive state approval for commercial logging using reduced-impact forest management regimes. To aid in tree stock recovery, Noh-Bec reduced mahogany cutting volumes when the community took over management from the parastatal company MIQROO, and then began restoring cutover forest areas and introducing lesser-known species to the market.

*Financial capital* and good financial management are among the biggest challenges for CFEs (Humphries et al., 2020; Radachowsky, Ramos, McNab, Baur, & Kazakov, 2012). Industrial timber operations are extremely expensive due to requisite labour, machinery, and supplies. Communal land tenure models negate the use of land for collateral (Gnych et al., 2020), making loan acquisition difficult. Many communities, including Noh-Bec and (until recently) Arimum, depend on buyers for cash advances to cover up-front costs of bureaucratic fees, labour, supplies, and machinery rentals or maintenance, which has many disadvantages. Notably, in 2019, Arimum secured with help from its CFM partner organisations (and repaid) a low-interest loan from *Banco da Amazônia S.A.* (BASA) to cover its operating costs through an innovative arrangement: the FMP served as the loan guarantee, and each co-operative member was personally responsible for a proportional share of the loan amount (Observatorio MFCF, 2020). Until credit is regularly accessible and CFEs prioritise reinvestment over disbursing net revenues (a concern identified for ejidos in Mexico by Frey et al. [2019]), buyer advances and grants will likely continue to play an important role for both organisations.

*Political capital* refers to peoples' access to power and their ability to engage in activities that benefit their community (Emery & Flora, 2006). Access to government partners who hold the power of approving FMPs and regulating forestry activities is especially important. Noh-Bec has developed and maintained good relationships over the years with the state offices of SEMARNAT and CONAFOR. CFE representatives are frequently invited to represent forestry

ejidos in various state councils and workshops. Arimum's efforts to cultivate and sustain a close working relationship with ICMBio as a forest co-manager have helped facilitate communication and approval of forestry-related documents.

*Built capital* involves the infrastructure related to implementing an activity (Emery & Flora, 2006). Noh-Bec's main CFE-related infrastructural investments have been for processing wood with two sawmills and for maintaining a network of logging roads. Community members have in turn (with some ejido support) made private investments in processing equipment to turn lumber into finished products (e.g., in carpentry equipment for making doors and furniture). In Arimum, CFM-related investments in built capital have included port improvements to facilitate timber transportation and the purchase of a co-operative office in Porto de Moz. Additionally, partner investments in communication capacities (including radio and internet) enable online generation and signature of timber transportation documents and communication with field workers and the co-operative office. To facilitate workers' lodging, as well as community gatherings and training sessions, a communal kitchen, sleeping quarters, and piped water have been installed. Arimum is also working with partners to negotiate government permission to install wood processing facilities in the community – a significant challenge given its extractive reserve status.

*Cultural capital* 'reflects the way people know the world and how they act within it, as well as their traditions and language' (Emery & Flora 2006, p. 3). The identities of residents of both communities are historically and traditionally tied to the forest, and undertaking timber management seems to have reinforced community forest relationships (personal observations). Noh-Bec residents are well-known as descendants of *chicleros* (chicle producers) and currently identify as living in a 'forestry ejido'. Locations of historical chicle camps in Noh-Bec remain revered cultural areas. Residents of Arimum identify themselves as descendants of *seringueiros* ('rubber tappers') and are known as 'Traditional Peoples' for their long-term subsistence lifestyles in their natural landscapes. Forestry continues after 36 years to be the main source of community jobs in Noh-Bec, along with other employment sources. For families in Arimum, forestry is the primary source of livelihoods and helps families to stay in the community instead of migrating to urban areas for work.

## Contributions to well-being

The concept of well-being is difficult to delimit as there are no generally accepted theoretical models to guide analyses of how people identify and integrate the important domains of their lives (Wish, 1986). We follow the development economist Amartya Sen, who argues that well-being depends upon the opportunities available to people and what they are able to accomplish given their opportunities (Sen, 1993). Because the suite of opportunities available to people living in forest-dependent communities depends upon evolving local innovations, the capacity of communities to pursue new opportunities influences individual and community well-being (Kusel, 2001). We built on Gutierrez-Montes' (2005, p. 121) and Emery and Flora's (2006, p. 4) work and illustrations of how community assets can spiral up (or down). Figure 5.2 illustrates our observation that our study communities built on their initial assets by taking advantage of opportunities related to forest management for timber production. We suggest those realised opportunities led to new skills, knowledge and experience, which continued to build over time and contributed to an upward trajectory of improvements to well-being.

We provide examples of contributions to three types of well-being – material, relational, and subjective – that emerged at least partially from investments in community capitals related to community forest management, as well as exceptions (Table 5.3). This analysis is informed by

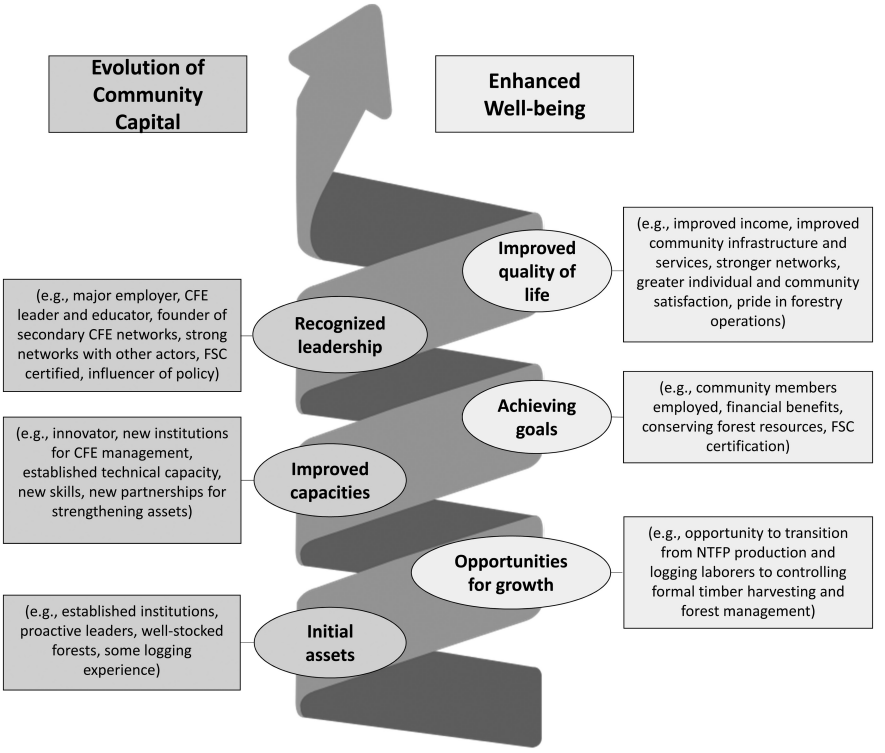


*Figure 5.2* Illustration of suggested dynamic relationship between community capitals and well-being, whereby each build on one another and contribute to improvements over time. Source: created by the authors and inspired by Gutierrez-Montes (2005, p. 121) and Emery and Flora's (2006, p. 4) illustrations of how community assets can spiral up or down for a community.

scholarship on the multi-dimensionality of well-being by Stiglitz et al. (2009), Biedenweg and Gross-Camp (2018), and Gough and McGregor (2007).

For both communities, their forests are critical to the communities' *material well-being*. Timber is a major source of income and other benefits for both communities. Hajjar et al. (2012) also found that employment and income were common and highly valued benefits for CFEs in their study in Mexico and Brazil. Similarly, Cooper and Kainer (2018) reported that extractive reserve residents in Brazil reported that economic benefits were one of the highest-ranked benefits expected from an anticipated logging project. Many communal investments in infrastructure for forestry operations benefit the entire community, such as improvements in communication services in both communities, as well as community meeting spaces in Noh-Bec and worker facilities and a generator in Arimum (Table 5.3). A contribution to well-being in both communities has been the sustainable management of their forests. Remarkably, a study by Ellis and Porter-Bolland (2008) found lower rates of deforestation in the municipality where Noh-Bec is located, where forests are managed by CFEs for timber and other products, than in a neighbouring area within a biosphere reserve (a type of protected area). The authors attributed the lower deforestation rate largely to communities' forestry institutions and land zoning practices.

*Relational well-being* has to do with how individuals within a community relate to one another and with outsiders to meet their needs and achieve goals. It therefore involves social assets and

*Table 5.3* Relationships between the types of well-being and the types of community capital that align with each, and examples of contributions to well-being for two CFEs in the communities of Noh-Bec in Quintana Roo, Mexico and Arimum in Pará, Brazil

| *Types of well-being and contributing capitals* | *Contributions to well-being for each case* | |
|---|---|---|
| | *Noh-Bec* | *Arimum* |
| *Material* well-being | | |
| – Financial capital | Wages for workers, payments to ejido members, medical coverage for ejido members | Wages for workers, contributions to community funds, payments to co-operative members |
| – Natural capital | Healthy, intact forests | Healthy, intact forests, improved community waste management |
| – Built capital | Improved community access to infrastructure for transport (better roads), communication (internet service), communal gatherings (meeting rooms), potable water, alternative income (ecotourism restaurant, bird watching tower) | Improved community access to infrastructure for transporting products (port improvements), communication (internet and radio service), electricity (community generator), potable water service. Improvements at family level in housing, refrigeration, and transportation |
| – Human capital | New skills and knowledge, investments in new businesses (ecotourism, carpentry) | New skills and knowledge, emphasis on women receiving training and participating in CFE administration |
| *Relational* well-being | | |
| – Social capital | Support for CFE activities, community members work well together, efforts to increase employment for non-ejido members; good relationships with other CFEs, support organisations, and buyers | Support for CFE activities, community members work well together, community acceptance of power balance between co-operative and association, good relationships with other CFEs and support organisations |
| – Political capital | Strong internal governance organisations, good relationships with governmental organisations | Strong internal governance organisations, good relationships with governmental organisations |
| *Subjective* well-being | | |
| – Cultural capital | Pride in having internationally recognised forestry operation, FSC certification, providing opportunities for maintaining forest-based livelihoods (NTFP and timber), serving as role model and source of knowledge; the community identifies as a forestry ejido; youth are pursuing degrees in forestry | Pride in having a legal, FSC-certified operation, providing opportunities for maintaining forest-based livelihoods (NTFP and timber), serving as role model and source of knowledge; youth are migrating less |

Source: Created by the authors.

governance. Both communities have achieved well-established and functioning political and forestry-related organisations, and community members work well enough together to produce timber. Nonetheless, Antinori and Bray (2005) describe common tensions in Mexico that have arisen between long-standing community traditions and the community-based timber management model that emerged after the 1986 Forestry Law, including elite capture and the lack of women who are legal ejidatarios and therefore voting members of their communities. Noh-Bec is not immune to these kinds of critiques, as detailed earlier. The limit on ejido member numbers serves to maintain indefinitely these inequalities and continued support for the current system by non-ejido members is potentially at risk if discontent over the system increases. In Arimum, we perceived general support for the current division of power and responsibilities between the community's co-operative and its association. Notably, Arimum has not struggled with similar equity issues, perhaps because populations levels are lower and anyone from the community or neighbouring communities can apply to be a co-operative member, which qualifies them for forestry-related employment and a share of timber profits. Both communities have extensive networks of partnerships with governmental agencies, NGOs, and universities that have brought many benefits.

*Subjective well-being* encompasses how people feel about their situation and the cultural and social norms that influence them (Gough & McGregor, 2007). Leaders of both communities have expressed pride to be generating forest-based employment and income for their residents while protecting forests from deforestation and degradation. We also have observed pride among residents of both communities for achieving internationally recognised FSC forest certification, and legal timber production in itself in is an accomplishment for Arimum in a region and country plagued by illegal, destructive logging. Other positive indicators of subjective well-being are some young people in Noh-Bec pursuing degrees in forestry and returning to work for the Forestry Office, and a perception in Arimum that youth are increasingly staying in the community to work in forestry, and that some young people from other communities are moving to Arimum to work in this field (personal observation).

## Discussion and conclusions

In the face of much resistance, Noh-Bec and Arimum achieved the rights for their forest-dependent residents to formally manage forests for commercial timber production, and have since leveraged their initial assets (i.e., natural, human, cultural capitals) to obtain additional investments from projects and partners over the years in other community capitals (i.e., in social, financial, human, and built capital). As a result, both have well-established community-based forest enterprises (CFEs) that are a primary source of employment and communal benefits for residents, contribute in diverse ways to the well-being of the communities, and are important role models for other forest-based communities interested in forest management.

For both of our CFEs' pathways, an alliance of social and environmental activists in each country was instrumental to obtain tenure reform and community rights to forests, while pilot CFM support projects were key to getting started. An important distinction between the two cases is their main contemporary sources of support. First, the government of Mexico has been much more active and consistent in providing national-level funding to CFEs than in Brazil. This is likely because since the early 20th century, it has been accepted in Mexico that communities own and manage their land, while this concept is still new and frequently challenged and/or undermined in the Brazilian Amazon (Ianova, 2020; Vale et al., 2021). Second, CFE partnerships with NGOs, the primary source of technical assistance in both regions, operate under very different frameworks. In Mexico, producer societies were set up to provide continuous techni-

cal and other types of assistance in exchange for a share of member ejidos' timber sale income (Wilshusen, 2005). Most members in Quintana Roo have long-term relationships with their societies, but some, like Noh-Bec, end up leaving when they are technically prepared to operate independently. In Brazil, in contrast, NGOs provide assistance through time- and resource-limited projects under the assumption, explicit or not, that CFEs will acquire the skills necessary to become independent. In practice, many Brazilian CFEs continue to need technical and other types of assistance, but the NGOs they depend on are themselves dependent on donors. This linking of CFE assistance with donor funding cycles can generate a general environment of instability or insecurity and vulnerability for CFEs (Pokorny et al., 2010), which may discourage long-term investments by community members or others.

Regarding CFM implementation, both CFEs created institutions with similar goals to run their industrial-model forest management and commercial timber production activities in a sustainable way, provide timber-related jobs, and support the production and/or sale of other forest products and services (e.g., NTFPs, ecotourism). FSC certification was also a goal achieved by both CFEs over time. Furthermore, because Noh-Bec owns its forest, it can manage it directly, while Arimum only has user rights to its federally owned forests and co-manages them with the government agency ICMBio. Finally, Noh-Bec has industrial sawmills that create additional jobs and add value to its timber products, while Arimum's aspiration to purchase processing equipment is hampered by bureaucratic bottlenecks related to its location within a federal multi-use protected area.

Initial community assets were certainly helpful in the selection of our two communities for participation in the early pilot support projects in each region. These include active leaders, established local institutions, strong ties to and knowledge of the forest from a history of forest-based livelihoods, some experience with logging, and sufficiently stocked forests. We describe how the CFEs continued to both leverage these human, cultural, and natural assets to attract new partners and investments to help build the skills and knowledge (social capital), relationships, infrastructure (built capital), and financial resources necessary to implement sustainable commercial timber production. Each invested their own timber income in their communities to help facilitate forestry and other productive activities. Some notable differences in capital identified are likely related at least partially to Noh-Bec's CFE having operated nearly three times as long as Arimum's. This is especially true for human capital, where Noh-Bec has obtained higher levels of technical capacities, and for natural capital, where Arimum has not perceived the need to restore its forests and indeed is harvesting much higher volumes of timber per hectare than Noh-Bec.

We suggest various ways in which these community forestry–related investments, in combination with others, likely contributed to notable improvements in community members' well-being, including income for families and community funds, new knowledge and skills, and improvements to living conditions. Relational benefits of strong community-supported local institutions and good partnerships with external partners were also identified. Gnych et al. (2020) also describe a process by which forest-based communities in several countries invested their existing capitals in commercial timber management and engaged supportive partnerships to do the same. The developing CFEs attracted further investments such that, over time, both community and external stakeholders gained assurance that respective obligations would be met, and the CFE were able to deliver socioeconomic and environmental returns. Similarly, Hajjar et al. (2020) identify that when communities and others (e.g., government and NGO partners) actively engage in CFM over time, greater resources are attracted, leading to both improved income and environmental outcomes.

The issue of unequal access to forests and material benefits from timber is certainly an important issue for Noh-Bec residents who are not formal ejido members, and one that Arimum

could potentially face in the future. Indeed, the previously mentioned Hajjar et al. (2020) study also found that environmental and income benefits can be accompanied by decreased forest access and resource rights.

Our examination of the different paths taken by Noh-Bec and Arimum highlight similarities and differences regarding how communities in southern Mexico and the Brazilian Amazon obtained the rights to manage their forests for timber and the support and policy reforms that facilitated the development of the two communities' CFEs. We provide important insights based on our own experience and the scientific literature on ways in which forestry-related investments in community capitals made by these communities and their partners likely helped these CFEs to endure and improve community well-being. Nonetheless, further research is needed to capture the diversity of perspectives that surely exist within each community regarding the changes in community capitals and fluctuations of well-being for different actors, as well as other factors that may have influenced these in addition to community timber management activities.

## Note

1 Community that received communal ownership of lands as part of agrarian reform in the 20th century.

## References


Allegretti, M. (1994). Reservas extrativistas: Parâmetros para uma política de desenvolvimento sustentável na Amazônia. In R. A. Arnt (Ed.), *O destino da floresta: Reservas extrativistas e desenvolvimento sustentável na Amazônia*. Rio de Janeiro, Brazil: Relume Dumará.

Allegretti, M. (2008). A construção social de políticas públicas. Chico Mendes e o movimento dos seringueiros. *Desenvolvimento e meio ambiente*, *18*, 39–59.

Almeida, M. B. D. (2002). The politics of Amazonian conservation: The struggles of rubber tappers. *Journal of Latin American Anthropology*, *7*(1), 170–219.

Amaral, P., & Neto, M. A. (2005). Manejo florestal comunitário: Processos e aprendizagem na Amazonia brasileira e na America Latina. *CEP*, *71606*, 900.

Antinori, C., & Bray, D. B. (2005). Community forest enterprises as entrepreneurial firms: Economic and institutional perspectives from Mexico. *World Development*, *33*(9), 1529–1543.

Badini, O. S., Hajjar, R., & Kozak, R. (2018). Critical success factors for small and medium forest enterprises: A review. *Forest Policy and Economics*, *94*, 35–45.

Barsimantov, J., Racelis, A., Biedenweg, K., & DiGiano, M. (2011). When collective action and tenure allocations collide: Outcomes from community forests in Quintana Roo, Mexico and Petén, Guatemala. *Land Use Policy*, *28*(1), 343–352.

Baynes, J., Herbohn, J., Smith, C., Fisher, R., & Bray, D. (2015). Key factors which influence the success of community forestry in developing countries. *Global Environmental Change*, *35*, 226–238.

Biedenweg, K., & Gross-Camp, N. D. (2018). A brave new world: Integrating well-being and conservation. *Ecology and Society*, *23*(2), 32.

Bray, D. B., Antinori, C., & Torres-Rojo, J. M. (2006). The Mexican model of community forest management: The role of agrarian policy, forest policy and entrepreneurial organisation. *Forest Policy and Economics*, *8*, 470–484.

Bray, D. B., & Wexler, M. B. (1996). Forest policies in Mexico. In L. Randall (Ed.), *Reforming Mexico's Agrarian reform* (pp. 217–228). Armonk, NY: M.E. Sharpe.

Bunker, S. G. (1984). Modes of extraction, unequal exchange, and the progressive underdevelopment of an extreme periphery: The Brazilian Amazon, 1600–1980. *The American Journal of Sociology*, *89*, 1017–1064.

Butler, M. (2021a). Analyzing community forest enterprises in the Maya Biosphere Reserve using a modified capitals framework. *World Development*, *140*, 105284.

Butler, M. (2021b). Relationship between community capitals and governance: The perspective of local actors in the Maya Biosphere Reserve. *World Development Perspectives*, *21*, 100294.

Cardoso, D. & Souza, C. (2020). *Sistema de Monitoramento da Exploração Madeireira (Simex): Estado do Pará 2017–2018*. Belém, PA: Imazon.

Carías Vega, D. (2019). Community-based forestry and community forestry enterprises in Quintana Roo, Mexico and Petén, Guatemala: How have policies, history, and culture shaped their trajectories?. *Journal of Sustainable Forestry*, *38*(7), 651–669.

CONAFOR. (2015). *Padron ejidos tipo productor*. Chetumal, MX: CONAFOR.

COOMNSPRA. (2016). *Plano de manejo florestal sustentável de uso múltiplo comunitário*. Brasilia, Brazil: Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio).

COOMNSPRA. (2018). *Regimento interno da Cooperativa Mista Agroextrativista Nossa Senhora do Perpetuo Socorro do Rio Arimum (COOMNSPRA)*. Porto de Moz: COOMNSPRA.

Cooper, N., & Kainer, K. (2018). To log or not to log: Local perceptions of timber management and its implications for well-being within a sustainable-use protected area. *Ecology and Society*, *23*(2).

Costa, P. M., Costa, M. M., del Giudice, R., Santos, R. C., Mello, L., Mayer, B., Godoy, F., de Bastos, C. T., Escaquete, D., & Planello, M. (2018). *Comercialização de produtos madeireiros de manejos florestais comunitários: Diagnósticos, opções e recomendações para o setor*. BVRio and IMAFLORA. https://www.bvrio.org/view?type=publicacao&key=publicacoes/7e56b7c0-3998-42f7-9f6f-4c5fe437c48e.pdf

Cruz, H., Sablayrolles, P., Kanashiro, M., Amaral, M., & Sist, P. (2011). *Relação empresa comunidade no contexto do manejo florestal comunitario e familiar: um contribuição do projeto Floresta em Pé*. Brasília: IBAMA.p. 318

da Silva Medina, G., & Barbosa, C. W. S. (2016). A questão produtiva nas Reservas Extrativistas. *Novos Cadernos NAEA*, *19*(2), 69–88.

Ellis, E. A., Kainer, K., Sierra-Huelsz, J. A., Negreros-Castillo, P., Rodriguez-Ward, D., & DiGiano, M. (2015). Endurance and adaptation of community forest management in Quintana Roo, Mexico. *Forests*, *6*, 4295–4327.

Ellis, E. A., & Porter-Bolland, L. (2008). Is community-based forest management more effective than protected areas? A comparison of land use/land cover change in two neighboring study areas of the Central Yucatan Peninsula, Mexico. *Forest Ecology and Management*, *256*(11), 1971–1983.

Emery, M., & Flora, C. (2006). Spiraling-up: Mapping community transformation with community capitals framework. *Community Development*, *37*(1), 19–35.

Espada, A. L.V. (2021). *Collaborative community timber management; A Comparative analysis of actors' roles and perceptions, power dynamics, and women's empowerment in the Brazilian Amazon*. Gainesville, FL: University of Florida.

Espada, A. L.V., & Serejo, E. (2016). *Reflexões sobre a execução do Projeto de Apoio ao Desenvolvimento do Manejo Florestal Comunitário e Familiar em Florestas Públicas da Amazônia Brasileira*. Belém: IFT. https://issuu.com/ift_boletim_florestal/docs/reflex__es_sobre_projeto_-_ift

Flora, C., Flora, J., & Fey, S. (2004). *Rural communities: Legacy and change* (2nd ed.). Boulder, CO: Westview Press.

Forster, R., Albrecht, H., Belisle, M., Caballero, A., Galletti, H., Lacayo, O., Ortiz, S., & Robinson, D. (2003). *Forest communities and the marketing of lesser-used tropical hardwoods in Mesoamerica*. Mexico City, MX: UQroo, USAID & USFS.

Frey, G. E., Cubbage, F. W., Holmes, T. P., Reyes-Retana, G., Davis, R. R., Megevand, C., Rodríguez-Paredes, D., Kraus-Elsin, Y., Hernández-Toro, B., & Chemor-Salas, D. N. (2019). Competitiveness, certification, and support of timber harvest by community forest enterprises in Mexico. *Forest Policy and Economics*, *107*, 101923.

Galletti, H. (1998). The Maya Forest of Quintana Roo: Thirteen years of conservation and community development. In R. Primack, D. Bray, H. Galletti, & I. Ponciano (Eds.), *Timber, Tourists, and Temples: Conservation and development in the Maya Forest of Belise, Guatemala, and Mexico* (pp. 33–46). Washington, DC: Island Press.

Gilmour, D. (2016). Forty years of community-based forestry: A review of its extent and effectiveness. FAO forestry paper (176). Rome: FAO

Gnych, S., Lawry, S., McLain, R., Monterroso, I., & Adhikary, A. (2020). Is community tenure facilitating investment in the commons for inclusive and sustainable development? *Forest Policy and Economics*, *111*, 102088.

Gough, I., & McGregor, J. A. (Eds.). (2007). *Wellbeing in developing countries: from theory to research*. Cambridge, UK: Cambridge University Press.

Gutierrez-Montes, I. (2005). *Healthy communities equals healthy ecosystems? Evolution (and breakdown) of a participatory ecological research project towards a community natural resource management process, San Miguel Chimalapa (Mexico)*. PhD Dissertation. Ames, IA: Iowa State University.

Hajjar, R., & Kozak, R. A. (2017). The evolution of Forest Producer Associations and their current role in REDD+: Case studies from Quintana Roo, Mexico. *Land Use Policy*, *60*, 373–383.

Hajjar, R. F., Kozak, R. A., & Innes, J. L. (2012). Is decentralization leading to "real" decision-making power for forest-dependent communities? Case studies from Mexico and Brazil. *Ecology and Society*, *17*(1).

Hajjar, R., McGrath, D. G., Kozak, R. A., & Innes, J. L. (2011). Framing community forestry challenges with a broader lens: Case studies from the Brazilian Amazon. *Journal of environmental management*, *92*(9), 2159–2169.

Hajjar, R., Oldekop, J. A., Cronkleton, P., Newton, P., Russell, A. J., & Zhou, W. (2020). A global analysis of the social and environmental outcomes of community forests. *Nature Sustainability*, *4*(3), 216–224.

Hall, A. L. (1997). *Sustaining Amazonia: Grassroots action for productive conservation*. Manchester, UK: Manchester University Press.

Hecht, S., & Cockburn, A. (1990). *The fate of the forest: Developers, destroyers and defenders of the Amazon*. Chicago, IL: University of Chicago Press.

Humphries, S., Holmes, T., Fernandes, D., Andrade, C. De, Mcgrath, D., & Batista, J. (2020). Searching for win-win forest outcomes: Learning-by-doing, financial viability, and income growth for a community-based forest management cooperative in the Brazilian Amazon. *World Development*, *125*, 104336. doi:10.1016/j.worlddev.2018.06.005

Humphries, S., Holmes, T. P., Kainer, K., Koury, C. G. G., Cruz, E., & de Miranda Rocha, R. (2012). Are community-based forest enterprises in the tropics financially viable? Case studies from the Brazilian Amazon. *Ecological Economics*, 77, 62–73.

Ianova, A. (2020). Betting on impunity: Brazilian Amazon under attack despite logging crackdown. *Mongabay*. Retrieved from https://news.mongabay.com/2020/06/betting-on-impunity-brazilian-amazon-under-attack-despite-logging-crackdown/

IBAMA. (2007). *Relatório Técnico-Financeiro Final do ProManejo*. Brasília: IBAMA.

IBGE. (2018). Quantidade produzida e valor da produção dos produtos extrativos, segundo a Unidade da Federação, suas Mesorregiões, Microrregiões e Municípios: Tabela 3 – Quantidade produzida e valor da produção na extração vegetal, por tipo de produto extrativo, Tipo de produto extrativo - 7.3 - Madeira em tora. Brasilia: IBGE. Retrieved from https://www.ibge.gov.br/estatisticas/economicas/agricultura-e-pecuaria/9105-producao-da-extracao-vegetal-e-da-silvicultura.html?edicao=25472&t=resultados

IDEFLOR-Bio. (2019). *Minuta do Decreto de Criação da Política Estadual de Manejo Florestal Comunitário e Familiar do Pará*. Belém: Instituto de Desenvolvimento Florestal e da Biodiversidade do Pará.

INEGI. (2010). *Censo de Población y Vivienda 2010*. Aguas Calientes, MX: INEGI.

Kanel, K. R., & Niraula, D. R. (2004). Can rural livelihood be improved in Nepal through community forestry? *Banko janakari*, *14*(1), 19–26.

Keck, M. E. (1995). Social equity and environmental politics in Brazil: Lessons from the rubber tappers of Acre. *Comparative Politics*, *27*, 409–424.

Kusel, J. (2001). Assessing well-being in forest dependent communities. *Journal of Sustainable Forestry*, *13*(1–2), 359–384.

Larson, A. M., & Ribot, J. C. (2007). The poverty of forestry policy: Double standards on an uneven playing field. *Sustainability science*, *2*(2), 189–204.

Macqueen, D. (2013). Enabling conditions for successful community forest enterprises. *Small-scale forestry*, *12*(1), 145–163.

Maharjan, M. R., Dhakal, T. R., Thapa, S. K., Schreckenberg, K., & Luttrell, C. (2009). Improving the benefits to the poor from community forestry in the Churia region of Nepal. *International Forestry Review*, *11*(2), 254–267.

Marin, T. I. S. (2014). *Manejo florestal em unidades de conservação na Amazônia: uma avaliação de impactos na RESEX Verde para Sempre – PA e na RDS Rio Negro – AM*. Master's thesis. Belém: Universidade Federal do Pará.

Merino-Pérez, L. (2004). Las políticas forestales y de conservación en México y en Quintana Roo. In N. Armijo & C. Llorens (Eds.), *Uso, conservación y cambio en los bosques de Quintana Roo* (pp. 14–42). Chetumal: Universidad de Quintana Roo.

Merino-Perez, L. (2013). Conservation and forest communities in Mexico: Experiences, visions, and rights. In L. Porter-Bolland, I. Ruiz-Mallén, C. Camacho-Benavides, & S. R. McCandless (Eds.), *Community action for conservation* (pp. 25–44). New York, NY: Springer.

Miller, D. C., & Hajjar, R. (2020). Forests as pathways to prosperity: Empirical insights and conceptual advances. *World Development*, *125*, 104647. doi:10.1016/j.worlddev.2019.104647

Miranda, K. A. F. N. (2019). *Verde para Sempre: o protagonismo das comunidades na gestão e manejo da floresta na Amazônia*. Master's thesis. Belém: Ministério de Educação & Instituto Federal de Educação Ciência e Tecnologia do Pará.

Miranda, K. F., Amaral Neto, M., Sousa, R. da P., & Coelho, R. de F. (2020). Manejo Florestal Sustentável em Áreas Protegidas de uso comunitário na Amazônia. *Sociedade & Natureza*, *32*, 778–792. doi:10.14393/SN-v32-2020-51621

Molnar, A., Liddle, M., Bracer, C., Khare, A., White, A., & Bull, J. (2007). *Community based forest enterprises in tropical forest countries: Status and potential*. Washington, DC: ITTO, RRI and Forest Trends.

Noh-Bec. (2015). *Programa de Manejo Forestal Avanzado para el Proyecto: Aprovechamiento Forestal Maderable y No Maderable en El Ejido Noh-Bec, Municipio De Felipe Carrillo Puerto, Quintana Roo*. Noh-Bec, Mexico: Ejido Noh-Bec.

Observatorio MFCF. (2020). *Cooperativa de manejo florestal comunitário quita crédito bancário*. Retrieved from https://observatoriomfcf.org.br/observatorio/cooperativa-de-manejo-florestal-comunitario-quita-credito-bancario

Oyono, P. R., Biyong, M. B., & Samba, S. K. (2012). Beyond the decade of policy and community euphoria: The state of livelihoods under new local rights to forest in rural Cameroon. *Conservation and Society*, *10*(2), 173–181.

Pacheco, J. S. (2017). *Análise da autonomia das populações tradicionais no manejo comunitário de recursos florestais madeireiros em unidade de conservação da Amazônia*. Master's thesis. Belém, Pará: Universidade Federal do Pará.

Pereira, D., Santos, D., Vedoveto, M., Guimarães, J., & Veríssimo, A. (2010). *Fatos Florestais*. Belém, Pará: Imazon.

Piponiot, C., Rödig, E., Putz, F. E., Rutishauser, E., Sist, P., Ascarrunz, N., Blanc, L., Derroire, G., Descroix, L., Guedes, M. C., Coronado, E. H., Huth, A., Kanashiro, M., Licona, J. C., Mazzei, L., d'Oliveira, M. V. N., Peña-Claros, M., Rodney, K., Shenkin, A., de Souza, C. R., Vidal, E., West, T. A. P., Wortel, V., & Hérault, B. (2019). Can timber provision from Amazonian production forests be sustainable? *Environmental Research Letters*, *14*(6), 064014.

Pokorny, B., Sabogal, C., Jong, W. D., Pacheco, P., Porro, N., Louman, B., & Stoian, D. (2010). Challenges of community forestry in tropical America. *Bois et forêts des tropiques*, *303*, 53–66.

Porter-Bolland, L., Ellis, E. A., Guariguata, M. R., Ruiz-Mallén, I., Negrete-Yankelevich, S., & Reyes-García, V. (2012). Community managed forests and forest protected areas: An assessment of their conservation effectiveness across the tropics. *Forest ecology and management*, *268*, 6–17.

PueblosAmerica.com. (n.d.). *Noh-Bec*. Retrieved from https://en.mexico.pueblosamerica.com/i/noh-bec/. Accessed on: 06/30/2021.

Putz, F. E., Zuidema, P. A., Synnott, T., Peña-Claros, M., Pinard, M. A., Sheil, D., Vanclay, J. K., Sist, P., Gourlet-Fleury, S., Griscom, B., Palmer, J., & Zagt, R. (2012). Sustaining conservation values in selectively logged tropical forests: The attained and the attainable. *Conservation Letters*, *5*(4), 296–303.

Racelis, A. E., & Barsimantov, J. A. (2008). The management of small diameter, lesser-known hardwood species as polewood in forest communities of central Quintana Roo, Mexico. *Journal of Sustainable Forestry*, *27*(1–2), 122–144.

Radachowsky, J., Ramos, V. H., McNab, R., Baur, E. H., & Kazakov, N. (2012). Forest concessions in the Maya Biosphere Reserve, Guatemala: A decade later. *Forest Ecology and Management*, *268*, 18–28.

Richards, E. M. (1992). *The forest ejidos of South-East Mexico: A case study of participatory natural forest management*. Network Paper 13c. London, UK: Rural Development Forestry Network, Overseas Development Institute.

Rodriguez-Ward, D. (2013). *Why Should we certify our forests? Factors that influence the adoption and maintenance of forest certification in Quintana Roo, Mexico*. Doctoral dissertation. Gainesville, FL: University of Florida.

Rodriguez-Ward, D., Blanco Reyes, P., Sills, E., & Lubowski, R. (2016). *Socioeconomic costs and benefits of forest management in the Yucatan Peninsula*. Final report. Washington, DC: USAID, The Nature Conservancy, Alianza México REDD+.

RRI. (2018). *At a crossroads: Consequential trends in recognition of community-based forest tenure from 2002–2017*. Washington, DC: Rights and Resources Initiative.

Sabogal, C., Pokorny, W., Pokorny, B., & Louman, B. (2008). *Manejo forestal comunitario en América Latina: experiencias, lecciones aprendidas y retos para el futuro*. Belém, Brazil: CIFOR.

Santos, C. E. N. dos. (2017). Proposta de normativa técnica para elaboração de Plano de Manejo Florestal Sustentável Comunitário em unidades de conservação federais das categorias Resex, RDS e Flona. Rio de Janeiro: Instituto de Pesquisas Jardim Botânico do Rio de Janeiro.

Sen, A. (1993). Capability and well-being. In M. C. Nussbaum & A. Sen (Eds.), *The quality of life* (pp. 30–53). Oxford, UK: Clarendon Press.

Schmink, M., & Wood, C. H. (1992). *Contested frontiers in Amazonia*. New York, NY: Columbia University Press.

Scoones, I. (1998). Sustainable rural livelihoods: A framework for analysis. IDS Working Paper 72. Brighton, UK: University of Sussex.

Seymour, F., La Vina, T., & Hite, K. (2014). *Evidence linking community-level tenure and forest condition: An annotated bibliography*. San Francisco, CA: Climate and Land Use Alliance. Retrieved from http://www.climateandlandusealliance.org/wp-content/uploads/2015/08/Community_level_tenure_and_forest_condition_bibliography.pdf

Sick, D. (2008). Social contexts and consequences of institutional change in common-pool resource management. *Society and Natural Resources*, *21*(2), 94–105.

SFB. (2016). Programa Federal de Manejo Florestal Comunitário e Familiar. MMA. Retrieved from http://www.florestal.gov.br/florestas-comunitarias/68-fomento-florestal/602-programa-federal-de-manejo-florestal-comunitario-e-familiar

Stiglitz, J. E., Sen, A., & Fitoussi, J.-P. (2009). *Report by the Commission on the Measurement of economic performance and social progress*. Paris, France: Commission on the Measurement of Economic Performance and Social Progress. Retrieved from http://ec.europa.eu/eurostat/documents/118025/118123/Fitoussi+Commission+report

Sunderlin, W. D., Angelsen, A., Belcher, B., Burgers, P., Nasi, R., Santoso, L., & Wunder, S. (2005). Livelihoods, forests, and conservation in developing countries: An overview. *World development*, *33*(9), 1383–1402.

Valdez, G.V.V., Hansen, E. N., & Bliss, J. (2012). Factors impacting marketplace success of community forest enterprises: The case of TIP Muebles, Oaxaca, México. *Small-Scale Forestry*, *11*(3), 339–363.

Vale, M. M., Berenguer, E., Argollo de Menezes, M., Viveiros de Castro, E.B., Pugliese de Siqueira, L., & Portela, R. de C. Q. (2021). The COVID-19 pandemic as an opportunity to weaken environmental protection in Brazil. *Biological Conservation*, *255,* 108994. doi:10.1016/j.biocon.2021.108994

Villas-Bôas, A., Junqueira, R., Salazar, M., Postigo, A., Straatmann, J., Velásquez, C., Doblas, J., Goveia, E., Torres, M. A., Lima, V. C., Silva, F. A. M. da, Moura, L. de, & Rezende, R. (2018). The extractive reserves of terra do meio: An experience of alternative development for the Amazon. *Desenvolvimento e Meio Ambiente*, *48*, 214–235. https://doi.org/10.5380/dma.v48i0.59017

Weaver, T. (2000). Changes in forestry policy, pollution and the environment in Northern Mexico: 1960–2000. *Journal of Political Ecology*, 7, 1–18.

Wilshusen, P. R. (2005). ITTO Country Case Study: Petcacab. In A. Molnar, M. Liddle, C. Bracer, A. Khare, A. White, & J. Bull (Eds.), *Community-based forest enterprises in tropical forest countries: Status and potential*. Washington, DC: ITTO, RRI and Forest Trends.

Wilshusen, P. R. (2010). The receiving end of reform: Everyday responses to neoliberalism in Southeastern Mexico. *Antipode*, *42*(3), 767–799.

Wish, N. B. (1986). Are we really measuring the quality of life? Wellbeing has subjective dimension, as well as objective one. *American Journal of Economics and Sociology*, *45*(1), 93–99.