

# Forest Citizenship in Acre, Brazil

*Convening lead author: Marianne Schmink*

*Contributing authors: Amy Duchelle, Jeffrey Hoelle, Flávia Leite, Marcus Vinício d'Oliveira, Jacqueline Vadjunec, Judson Valentim, and Richard Wallace*

**Abstract:** Since 1998, the western Amazonian state of Acre has been the site of ambitious policies to support sustainable forest-based development initiatives. The result is a long-term successful experiment in transformation of the state from an outsider-driven development based on conversion of forest to pasture and agriculture to an endogenous, participatory process of development focused on sustainable use and valorisation of environmental, economic, social, and cultural assets of the local populations. Both successes and challenges of this unique experience provide valuable lessons in the search for forest-based development approaches. The sections in this chapter trace the innovations in laws, institutions, public administration, and policy to promote forest-based development, alongside the opening of policy-making to citizen input. Data presented from government reports outlining policies, supplemented by available empirical research, show impressive gains in stabilising deforestation, expanding forest production, and favourable but uneven socio-economic impacts of the state's forest development programs. The chapter documents the successes in transformative institutional and policy development at the state level, remaining challenges, and lessons learned in Acre for potential application of sustainable development policies over the long term.

Keywords: Acre, Brazil, Amazon, florestania, forests

---

### 1.1 Introduction: Key contributions of Acre case

Since 1998, the western Amazonian state of Acre has been the site of ambitious policies to support sustainable forest-based development initiatives. The result is a long-term successful experiment in transformation of the state from an outsider-driven development model based on conversion of forest to pasture and agriculture to an endogenous, participatory process of development focused on sustainable use and valorisation of environmental, economic, social, and cultural assets of the local populations. Both successes and challenges of this unique experience provide valuable lessons in the search for forest-based development approaches. This chapter documents the success in transformative institutional and policy development at the state level, impacts on deforestation and forest-based livelihoods and industries, and the challenges to ensuring the long-term continuity of these initiatives in an equitable and sustainable way.

A remote state, small in both area (164 128 km<sup>2</sup>, 63 370 square miles) and population (733 559 in 2010), and lacking in minerals and potential for great hydroelectric power, Acre never was a focus of Brazil's ambitious Amazon development policies of the 1970s and 1980s, nor did the state suffer the massive in-migration typical of other Amazonian states. Acre was home to a relatively endogenous population with strong social capital and historic cultural ties to traditional forest-based livelihoods centred on rubber tapping, dating from the turn of the 20th century. In the absence of strong economic elites, and with a largely discredited political class, it was from Acre's forest-dwelling communities that innovative land-tenure proposals emerged from successful grass-roots movements in the 1970s and 1980s to defend forested areas from outside cattle ranchers (Keck 1995, Allegratti 2007, Cronkleton et al. 2008). Three successive governors (1998–present) built on these successes and invested in infrastructure, training, institutions, market supports, technological innovations, and proposals for transformational policy

initiatives aimed at sustainable, forest-based development. The innovative, comprehensive statewide forest-based development model that emerged was called *florestania*, a neologism meaning “forest citizenship;” it combined market-oriented forest-based development strategies with a strong commitment to citizenship and participation (Kainer et al. 2003, Schmink and Cordeiro 2009, Schmink 2011).

The sections in this chapter emphasise the remarkable connection between Acre’s unique local cultural history and the transformative policies stimulated by the activism and vision of its forest communities – the rubber tappers. Data presented from government reports outlining policies, supplemented by available empirical research, show impressive but uneven socio-economic impacts of the state’s forest development programs. The chapter documents the successes in transformative institutional and policy development at the state level, remaining challenges, and lessons learned in Acre for potential application of sustainable development policies over the long term.

## I.2 Policies, institutions and governance

### I.2.1 Land tenure and rights to forests and trees

The comprehensive forest-development initiatives under *florestania* were inspired by the rubber tapper social movement in the 1980s, led by union organiser and visionary Chico Mendes (Keck 1995, Allegretti 2007). The rubber tappers’ key achievement was the national adoption of their proposal to create sustainable-use reserves known as the Federal Extractive Reserve System (RESEX), which recognised tapper communities’ rights to forests where traditionally they had lived and worked. RESEX represented a solution to the land conflict with cattle ranchers and a recognition of land and resource rights previously expressed in the unique institution of the *seringal* (rubber concession), which was controlled by the rubber barons during the rubber boom. Rubber tapping (Figure II 1.1) became part of a new common property regime to be co-managed first by local residents in partnership with the state (Allegretti 1990, Esteves 1999, Cardoso 2002, Allegretti and Schmink 2009) and later by a management committee representing diverse stakeholders.

The new form of land and forest tenure soon expanded to diverse areas across Amazonia and throughout Brazil (forest, grassland, and marine) and became a model for sustainable-use areas in other parts of the world (Gomes 2009). The addition of extractive reserves and sustainable-development re-



Figure II 1.1 Rubber extraction. ©Judson Valentim

serves to indigenous territories, and new state forests created since 2003, have left 48% of the territory of Acre under some form of protection. The innovative land reform policy was later incorporated into Brazilian federal law under the National System of Conservation Units (SNUC), and inspired other nations to recognise collective land rights for traditional peoples in sustainable-use areas.

Despite secure land rights and protected forests, traditional rubber-based livelihoods in RESEX were undermined by the removal of federal rubber subsidies and declining market prices for rubber starting in the 1990s. The Acre state government invested in new subsidies and support programs seeking to harness new markets for non-timber forest products (NTFPs) and to provide improved infrastructure and services to remote communities; some forests extractivists succeeded in shifting their livelihoods to off-farm labour, access to social transfer programs, agriculture and cattle, and Brazil nuts. With the exception of Brazil nuts, which have established markets and strong prices, progress in development of other non-timber markets has lagged, and some forest communities face the choice between risky timber-management initiatives and expansion of agriculture and cattle raising. Although Acre’s forests are still largely intact, increasing deforestation driven by land-use change, along with changing identities and aspirations of new generations that are more urban-oriented, are changing the cultural and livelihood bases of *florestania* policies.

**Box II 1.1 Achievements reported by Acre government, 1998–2009**

- ◆ More than 200% increase in native rubber production
- ◆ Acre emerging as Brazil's second-largest Brazil nut producer, producing 14 035 tons in 2011 (one-third of national production) and supporting about 5000 families
- ◆ Development of management protocols for 21 NTFPs (non-timber forest products)
- ◆ Increased value-added capacity of two new Brazil nut processing factories (in Xapuri and Brasília) from 5% to 50%
- ◆ Production in 2008, by more than 400 rubber tappers of about 103 000 litres of latex for the Natex Condom Factory (the only one in the world to use latex from native rubber stands)
- ◆ Lowest deforestation rate in the state for past nine years (0.19%) achieved in 2008, well below the 1998–2008 average of 0.43%
- ◆ 373% increase in Tax on Circulation of Goods and Services (ICMS)
- ◆ Average annual GDP increase of 6% and accumulated growth of 26.5% from 2002–2006, the sixth highest in Brazil
- ◆ 400% increase in net value of forest production

Sources: GoA 2009, Embrapa 2012.

An important legacy of the rubber tapper social movement of the 1970s and 1980s was the vision of an alternative development paradigm for the region, which was carried forward through alliances with local professionals and activists who supported the rubber tapper movement. Several key Acrean leaders subsequently were able to translate their vision into political mandates at local, state, and national levels. Acrean rubber tapper Marina Silva, a close ally of Chico Mendes, was elected Rio Branco town council member in 1988, state deputy in 1990, and federal senator in 1994, serving in the senate until 2003. That year she was named Brazil's environmental minister, the first cabinet appointment by President Luís Inácio (Lula) da Silva, a former labour organiser who once was arrested by the military government alongside Chico Mendes in Acre. The Forest Government of Acre was favoured by this broader political momentum at national and state levels.

### 1.2.2 Public administration

The successive "Forest Governments" of Acre invested heavily in revamping the public administration of the state to address the complex challenges of forest-based development: community forest management; state public forests; expansion of the forest-product market chains; forestry education; and technical assistance (Kainer et al. 2003, Stone 2003, Schmink and Cordeiro 2009). The pre-existing semi-autonomous Acre State Technological Foundation (FUNTAC), created in 1987, already administered the Antimary State Forest, created in 1988 with massive financial support from the International Tropical Timber Organization (ITTO); Antimary would become a laboratory for the state's experiments with

sustainable forest management (SFM) (Shaeff 1998). Beginning in 2002, the state government built on these existing programs to develop a complex forest-oriented infrastructure, supported by large amounts of funding from the Inter-American Development Bank, the World Bank, and national sources of funding in Brazil. These investments provided the basis for an impressive growth of forest-based enterprises in Acre, based on existing evidence. Key achievements reported by the government for 1998–2009 are listed in Box II 1.1.

Available data clearly show that state and federal policies are being successful in promoting a decoupling of the agriculture and cattle production systems as deforestation drivers. Annual deforestation has decreased in Acre from 107 900 ha in 2003 to 28 000 ha in 2011 (INPE 2012). Meanwhile, the cattle herd grew from 1.87 million to 2.55 million head in the same period and showed a trend towards stabilisation and even a small decrease in the herd between 2010 and 2011 (IBGE 2012). This was accomplished mainly by farmers' intensification of cattle production systems using improved grass and legume cultivars, improved breeds, reclamation of degraded pastures, and improved pasture management. This was supported by the state government's Ecologic and Economic Zoning Plan, the newly created State Institute of Plant and Animal Health, and campaigns that led the state to be recognised in 2005 by the World Organisation for Animal Health as free of foot and mouth disease practicing vaccination (Valentim and Andrade 2009). Also, logging activities that were previously unsustainable were mostly converted to sustainable precision-forest-management systems (Modelflora, see Box II 1.6 and Figure II 1.2), and many cattle ranchers now practice SFM activities in the areas of forest in legal reserves that the Brazilian Forest Code requires them to maintain. Nearly 30 000



**Figure II 1.2 Low-impact community forest management.** ©Judson Valentim

ha of forests were managed in Acre using Modeflora in 2011, generating an economic benefit of USD 1.94 million. The data on agriculture also show large decreases in deforestation and a declining proportion of deforestation in relation to the area cultivated in agriculture (IBGE 2012).

The Forest Governments implemented a complex of new laws and institutions that provided support and incentives for private sector investment in SFM. These included establishing a state environmental policy, biodiversity and forestry laws, ecological-economic zoning, and other supportive policies, including a new forest secretariat and a 2006 Science, Technology, and Innovation Plan (GoA 2006a, 2009). The state supported the development of a network of cooperatives for smallholders (Cooperacre, see Box II 1.5), designed to organise producers into regional groups for marketing of different forest products, and an association of entrepreneurial forest managers (Assimanejo). The existing agricultural extension service was restructured as an agroforestry extension service, and the existing agricultural college was converted to a forestry college to train technicians recruited from throughout the state, most coming from families of small farmers and extractive communities. The Federal University of Acre (UFAC) added a new forestry degree program, complete with innovative forest residencies (the first in Brazil) that placed students in industrial or community management programs to gain experience. With support from the Worldwide Fund for Nature (WWF) and

other organisations, the state government created a state forest certification program, pioneering with certification of the first state public forest and the first community forest management project in Brazil (Stone 2003).

The Acre state government also undertook ambitious institutional development to support payments for environmental services (PES) programs of diverse types (see Boxes II 1.2 and II 1.3).

Building on the experience of a federal pilot program called Proambiente (DiGiano 2006, Bartels 2009), in 2008 the state created a comprehensive program called Valorization of Environmental Assets, which sought to support both the development of sustainable product chains and protection of the standing forest, including a statewide deforestation target for 2020 that conformed with international standards defined by the European Union and Kyoto Protocol (EDF n.d.).

The Certification for Sustainable Rural Properties Project, written into state law in 2008, provided agricultural equipment and training for small producers who were voluntarily certified in more sustainable agricultural practices, along with an annual monetary bonus of about USD 250 per family based on conditional compliance with sustainable agricultural practices and fire reduction. Extensionists contracted through a network of eight local NGOs were responsible for visiting approximately 17 000 Acrean farm families four to five times each year (Santos et al. 2012). Certified producers were required to

**Box II 1.2 Proambiente: Integrated smallholder social and environmental development**

Proambiente was an integrated social and environmental development program for smallholder households in rural Amazonia. It was originally envisioned by colonist farmers along the Tranzamazon Highway, also supported by rural unions in Acre, and adopted as federal government policy in 2003. In many ways Proambiente was an innovative policy because it was originally defined, in part, by local stakeholders (Fearnside 2008). In Acre, a total of 400 rural households were involved in the program, which proposed to pay half a minimal salary per month (USD 95) as a payment for environmental services, as well as to offer training and support for household farm and extractive activities (Hall 2008).

During the 2003–2008 period, technical and community field agents made monthly visits to Acre rural communities involved in Proambiente. Households created individualised management plans that focused on environmental issues (i.e. deforestation prevention, sustainable pasture management, protection of water bodies, reforestation projects); health (i.e. household water and waste treatment); production (i.e. training in

green manure use, agroforestry, and green certification); education; and organisational support.

Despite such innovations, however, Proambiente experienced difficulties such as frozen funds and organizational and monitoring issues (Bartels 2009). To make matters worse, Brazilian law had to be rewritten (while funding came to a halt) in order to recognise the economic value of avoided deforestation and other environmental services provided by standing forests in the tropics. In the end, households received drastically reduced payments totalling approximately USD 325 (Hall 2008). The federal program ended in 2010. During times of frozen federal funding, state and local agencies in Acre continued to support the program in some fashion. Without a monthly payment, most families still remained in the program (in fact, there was a waiting list to join the program as late as 2008, long after payments had stopped), citing technical assistance, training, and outreach as the main benefits of the program (Vadjunec 2011).

**Box II 1.3 State System of Incentives for Environmental Services**

Acre's State System of Incentives for Environmental Services (SISA) was passed into law on November 11, 2010. It focuses on the conservation and recuperation of seven environmental services: 1) carbon sequestration and enhancement of stocks through forest conservation and management; 2) natural scenic beauty; 3) socio-biodiversity; 4) water and hydrological services; 5) climate regulation; 6) appreciation of cultures and traditional ecological knowledge; and 7) conservation and recuperation of soils (GoA 2010b, Duchelle et al. 2013). SISA is based on the State Policy for the Valuation of Forest Environmental Assets, which involves recuperation of degraded lands (through reforestation and revitalised agricultural production) and valuation of standing forests (through forest management, the Certification for Sustainable Rural Properties Project, and payments for environmental services). A new state entity – the Institute for Climate Change and Regularization of Environmental Services – was created to approve, register, and monitor sub-projects within SISA.

During the construction of SISA, the draft law was published and made available through Acre's state government website, in addition to being sent to 120 people from more than 72 national and international organisations for evaluation and feedback. The state

environment secretariat also held public consultation meetings with a total of 174 people to discuss the document and achieve a fair and efficient structure of benefit sharing; five meetings were held with technical staff from local NGOs, three workshops brought together potential beneficiaries (indigenous people, extractivists, and rural producers); and a technical seminar included 10 national and international organisations that represented civil society as well as representatives of seven state secretariats (GoA 2010b).

The objective of the Integrated Science Assessment (ISA) carbon component of SISA, which is recognised internationally as a sub-national REDD+ program, is to promote the reduction of greenhouse gas emissions from deforestation and degradation, following the State Plan for Control and Prevention of Deforestation. Acre is an important partner in the Governors' Climate and Forests Task Force, a sub-national collaboration between 16 states and provinces from the United States, Brazil, Indonesia, Nigeria, Mexico, and Peru. Acre's ISA-Carbon was chosen as the task force's Brazilian pilot REDD+ initiative.

*Source: GoA 2010b.*

stop burning agricultural plots and to use a legume (*Mucuna* spp.) as a cover crop to fix nitrogen and reclaim soil fertility, thus allowing the farmers to grow subsistence crops and to reduce the need for slash and burn of additional areas of forest. Along with *Mucuna* seeds, producers received an agricultural kit (grass cutter, machete, planter, scythe) to help them implement and maintain these alternative production activities over a period of one to eight years.

The valorisation program later was expanded to include an elaborate new infrastructure for the State System of Incentives for Environmental Services (SISA, see Box II 1.3) with regulatory, monitoring, capacity-building, and enforcement mechanisms (GoA 2010b, Santos et al. 2012). Four communities in the priority zone for initial implementation of SISA were starting to benefit from territorial planning, including official demarcation of customary landholdings as well as technical assistance and direct cash payments for sustainable agricultural practices (Duchelle et al. 2013). The comprehensive SISA program is the most ambitious and complete Brazilian initiative for environmental services regulation, providing important learning opportunities as the nation moves towards developing federal laws (Santos et al. 2012). Additionally, under the multi-use umbrella of SISA, in 2010 Acre signed a historic, sub-national memorandum of understanding (MOU) with the state of California as part of an agreement on future cap and trade emissions trading (TFG 2010). In 2012 the state signed an agreement with the German KFW Development Bank in the amount of EUR19 million as payment for reductions in carbon emissions already achieved due to avoided deforestation, the first state-level REDD initiative of its kind in the world. These resources will be used to promote practices that reduce deforestation, such as sustainable production, forest management, and environmental conservation (<http://www.agencia.ac.gov.br/index.php/noticias/governo/21891-banco-alemao-aposta-na-biodiversidade-do-acre.html>).

### **1.2.3 Participation and stakeholder cooperation**

The state government's concept of florestania, linking the forest with citizenship, and its proposal for an open form of policy-making with a commitment to the strengthening of organised civil society in Acre represented a major departure from previous practices that lacked dialogue with communities (GoA 2000). This commitment to participatory governance was initially put into practice in the implementation of the Ecological and Economic Zoning (ZEE) Plan to regulate activities and plan different land uses throughout

the state (GoA 2000, Schmink and Cordeiro 2009). The state was mapped first in 1999 at 1:1 000 000 scale (GoA 2000) and then at the 1:250 000 scale in 2006 (GoA 2006b), producing a set of thematic maps and land-use plans as the result of a pact among the different groups of rural stakeholders. As a federally ratified state law, the ZEE Plan provides the legal basis for management of protected areas and forests and for regulation of economic activities in the 12% of the state that is already deforested (EDF n.d.). A commission with broad representation from the government, private sector, and civil society guided a process of consultation with approximately 150 local and regional leaders and through public forums in every municipality of the state (GoA 2000, Santana 2004). A similar participatory discussion process was later conducted in 2010 in the development of the SISA program (GoA 2010b) related to the public consultation regarding socio-economic indicators for REDD+ (June–September 2011) and a training and exchange workshop for indigenous leaders in January–February 2012 (Santos et al. 2012).

The state formed strong partnerships with local non-governmental organisations (NGOs) such as the Group for Research and Extension in Agroforestry Systems of Acre (PESACRE) and the Center for Amazonia Workers (CTA) to support extension outreach with rural communities related to agroforestry and forest management. This included the participation of six local NGOs in the six-year, USD 150 million Program of Social Inclusion and Sustainable Economic Development (PROACRE), which began in 2007. Focused on education, health, and sustainable production, the program used a participatory approach to the development of community development plans in remote and vulnerable regions, linked to growth-pole strategies in rural and urban areas. State-level councils on environment, science, and technology; forestry; and sustainable rural development provided ongoing mechanisms for input and monitoring of state policies, although the councils often were perceived to lack the capacity and independence for effective participation, in part because of the growing dependence of NGOs and social movements on state funding. The absorption of grass-roots and NGO leaders and organisations into the state governance system contributed to weakening the potential for political pressure on the government by the social movement.

### **1.2.4 Issues of power and representation**

Even with a favourable political conjuncture and considerable financial resources, the Forest Government still faced considerable challenges, including maintaining the support of social-movement and grassroots constituencies. Some movement leaders worried that the dynamism of state policies weakened the movement because its role was no longer clear and because some policies – such as forest management and green marketing – were controversial and challenging new ideas for communities to accept after years of struggle against outside loggers. The state and municipal governments absorbed many of the most talented leaders in universities and NGOs as well as social-movement leaders themselves, many of whom became more distanced from their base in the rural areas (Sant’Ana 2004, Ehringhaus 2005).

The apparently favourable inclusion of RESEX in Brazil’s National System of Conservation Units (SNUC) also undermined the autonomy of reserve residents in the management of their common property, previously their responsibility in collaboration with the federal agency in charge of RESEX. By placing the co-management responsibility in the hands of a broader committee of stakeholders, the shift undermined the previously central decision-making role of the local RESEX association (Ehringhaus 2005, Pacheco 2010).

Acre’s public defenders’ office (Ministério Público) took an active watchdog role, forcing the government to enforce burning prohibitions starting in 2009 and demanding that the government provide small farmers with alternative production practices that did not require the use of fire. In 2012, the state government appealed to federal courts to allow up to 3 ha of burning for subsistence crops, arguing that achieving alternative sustainable practices would require investment in equipment and technical assistance over many years (Machado 2012). The Acre public defenders also pursued complaints about irregularities in forest management procedures and complaints about relations between loggers and communities (Ministério Público do Acre 2012; see also Torres and Quadros 2011).

As a result of the public defenders’ burning prohibition, in subsequent years many small farmers were forced to practice illegal deforestation in order to grow subsistence crops to ensure their food security, and some were notified by the state and federal environmental agencies of fines amounting to dozens of thousands of dollars, many times higher than their total land value. This forced the state government to shift the focus of its policies towards providing the more than 20 000 families of small farmers with agricultural machinery (tractors and plows), farm

inputs (such as lime), and technical assistance to help them produce food in the areas already deforested. In 2012 the state government invested more than USD 25 million from a Brazilian National Economic and Social Development Bank (BNDES) loan to buy more than 140 tractors for the Program of Degraded Land Reclamation for Food Production by Small Farmers.

### **1.2.5 Long-term societal commitment to SFM**

State-level investments in permanent infrastructure and incentives programs seem likely to sustain most of these SFM programs for the long-term, but the forestry sector must continue to compete with other state government development sectors – each with its social constituencies and political interest groups – for public resources and attention. One of the indications of the potential loss of importance of the forest sector in state policies is the merger of the Secretary for Forests with others under the umbrella of the Secretary for Sustainable Forest Development, Industry, Trade, and Sustainable Services (SEDENS). With all the policies and programs related to these sectors now under the responsibility of one secretary, the forest sector may shift from the focus on forestry in favour of other more urban sectors that are more organized and have more political power.

An incipient State Forest Fund has been created to compensate small farmers, although not yet fully funded (Santos et al. 2012). The certification and SISA programs, aimed at small producers, have developed plans over several years to gradually support the transition to sustainable productive practices while providing incentives and technical assistance. The state government’s Sustainable Extractive Reserve Project, launched in 2010, spells out a comprehensive set of objectives to address the long-term needs of the extractive reserves. The government’s 2011–2015 development plan contains ambitious targets for the state’s carbon economy: 1) approximately USD 45 million worth of project investments to directly and indirectly generate 11 000 jobs benefitting 5000 small producers; 2) 25 000 ha of planted forests (fruit, rubber, timber), and 3) community-managed forests expanded to 300 000 ha. The aim is to bring a projected increase of USD 7.5 million/year in net forest production to benefit 1500 families (GoA 2011). How realistic these goals are remains to be seen.

SFM, especially for communities, remains a controversial and experimental proposal among technicians, academics, policy-makers, civil society, and communities both inside and outside the government

**Box II 1.4 Changing livelihoods in Acre's extractive reserves**

Studies by Wallace (2004) and Wallace and Gomes (forthcoming) have demonstrated the continued importance of forests to rubber tapper livelihoods in the Chico Mendes Extractive Reserve. However, a longitudinal study of 24 households including household data from 1996, 2001, and 2006 (Wallace 2009) found extraction as a percentage of household market-based income to be falling. While the standing forest, through extraction of rubber, Brazil nuts, and other fruits and fibres continued to play an important role in the market-based income of households, the study documented a rise in the value and percentage of total household income from other income sources, such as large animal trade (cattle) and off-farm income. Off-farm income came through positions such as health agents and teachers as well as through labour opportunities, such as carpentry work (i.e. home construction), as households moved from traditional homes built of palm slats and fronds to sawn-wood homes. In addition, state government programs such as feeder road construction and the building of storage units to support the state government's latex program had created new income-earning opportunities for the region's inhabitants. Thus, while households had seen growth in average income over this 10-year period, including growth in average per household extractive income, extraction contributed less as a percentage of total household income among the 24 study households, while cattle trade and off-farm labour had grown in terms of the overall percentage of the total contribution. In addition, households reported increased income

from government social programs, such as pensions, maternity payments, health disability payments, and the Bolsa Familia program, which provided monthly payments to families with children in school.

While extraction remained an important income source for households more generally, for lower per capita-income households, extractive activities were critical. Of 13 households that received no rural pension payments over the study period, those with higher per capita income mainly earned income from cattle sales and off-farm labour opportunities, rather than from extractive activities. Other evidence suggesting the growth of cattle production as a productive activity include the recent growth in the average pasture area and number of cattle owned by households (Gomes et al. 2012). Furthermore, research from these and other studies shows that certain areas of the reserve have significantly different levels of both cattle ranching and pasture development, leading to variable rates of deforestation (Vadjunec et al. 2009). Vadjunec and Rocheleau (2009) suggest that rubber tappers have distinct, often regional, livelihood preferences based on either agriculture and/or traditional extractive land-use trajectories – these need to be acknowledged by policy-makers. Overall, research suggests that paths of development among households in the reserve are quite divergent, and future management needs to consider the diverse paths and preferences of development being followed and how each may require distinct types of management (Vadjunec et al. 2009, Wallace 2009).

(Sant'Ana 2004, Zimmerman and Kormos 2012). Government technicians recognise the urgency of establishing functioning forest market chains connected to rural communities, but many forest producers have resisted the government's perceived imposition of timber management programs (Stone 2003, Humphries 2005, Humphries and Kainer 2006, Fantini and Crisóstomo 2009, de Paula 2012).

### ***1.2.6 Influences of regional/global processes on forest-related policies and behaviour***

Acre's forest-based development program has been strongly and directly influenced by global and regional policies, institutions, and resources since the rubber tapper social movement received crucial support from international environmentalists concerned with the impact of World Bank policies in the 1980s (Rich 1985). The 1992 UN Conference

on Environment and Development in Rio legitimated the focus on local communities and social benefits of forests through such documents as Agenda 21. From that conference emerged the massive Pilot Program for Protection of the Brazilian Rain Forest (PPG-7), which supported widespread experimentation in forest-based development in Acre and across the basin, including the 2003 Promanejo program to support community forest management.

In this same period, partly responding to these international influences and pressures, the Brazilian environmental agency (IBAMA) began serious enforcement of deforestation regulations as well as to develop policies to support community-based certified forest management (Stone 2003). The 2004 Action Plan for Protection and Control of Deforestation in the Amazon (PPCDAM) called for territorial planning in forest areas and the promotion of sustainable and productive forestry management. New Brazilian legislation passed in 2006 included a Management of Public Forests Law, a new national forest service, and a National Forest Development Fund (Stone 2003).





**Figure II 1.3 The Natex condom factory, a public-private-community partnership, purchases latex from approximately 650 households.** ©Judson Valentim

International NGOs and researchers also have been influential in the development of forest-based policies and behaviours in Acre. The University of Florida helped to form the NGO PESACRE in 1990, which took a lead role in supporting community-oriented policies and technical extension work with rural communities; Acre's long-established Center for Amazonian Workers also redirected much of its work to community forest management. The WWF chose Acre as the site for a regional office and provided strong support to Acre's efforts to certify forests. Most recently, Acre has positioned itself well for REDD initiatives (reduced emissions from deforestation and forest degradation), including the sub-national Governors Climate and Forests Taskforce (GCF), which selected Acre as a pilot site.

### **1.3 Livelihoods, capacities, and cultural and socio-economic aspects**

#### **1.3.1 Contribution of forests and forest resources and services to livelihoods**

Acre's experience in forest citizenship is anchored in the state's history of forest dependence and cultural identification with the forest: until the 1990s, the vast majority of the state's economy and population depended on forests. This is now changing rapidly, due to shifting federal policies such as removal of the longstanding national rubber subsidy for producers,

which was replaced by a new state subsidy; new lines of credit that favoured expansion of agriculture and cattle; declining prices for rubber; and the paucity of other non-timber income-earning alternatives aside from Brazil nuts and, to a lesser extent, forest oils such as *copaiba* and *andiroba*. Forests continue to be important sources of livelihoods in Acre, especially for the poorest rural households, but rising incomes were associated less with forest extractivism and more derived from cattle, off-farm employment, and government social programs transfers (see Box II 1.5).

The state's Chico Mendes Law, a 1999 subsidy to rubber producers combined with technical assistance and other measures, proved effective in reaching more than one-third of Acre's rubber tapper families, especially the poorest (Wallace 2009, Sills and Saha 2011). Along with the new condom factory and other support programs, these programs have helped to sustain extractive livelihoods and curb rural-to-urban migration by some families. However, by 2011, rubber tapping was so limited that programs were being developed to promote expansion of cultivated rubber trees in pure stands and in agroforestry systems as part of the state Program of Reclamation of Degraded Lands, in order to assure future production of condoms (Figure II 1.3).

Although highly variable in productivity due to ecological differences and management practices, Brazil nuts, with their established global markets, have provided communities in eastern Acre with an important source of income over centuries (Wadt et al. 2005, Kainer et al. 2006, 2007). Acre is second only to the state of Amazonas in Brazil nut produc-

**Box II 1.5 Institutions to support forest-product marketing**

The FLORA Fair, a forest products fair held annually in Rio Branco from 1994 to 2005, was established to provide communities and artisans an opportunity to sell forest products directly to consumers, promote community forest ventures, and raise public awareness about the strong regional extractive culture (Wallace et al. 2000). FLORA grew from the 1994 participation of 17 communities and artisans with retail sales of approximately USD 6000 to the 2005 participation of 78 sellers (some from outside the state) and sales of USD 67 000 (Wallace et al. 2008). In 2001 FLORA expanded its activities to promote greater market opportunities for communities and artisans seeking markets beyond market fairs stands, to include a *rodada de negócios*, or business round table. This event provided a space for communities and entrepreneurs in Acre to meet and negotiate contracts with commercial organisations from Acre as well as other states (Wallace et al. 2008). More recently, FLORA has been absorbed into the Panamazonia Fair, which took place in Rio Branco in 2007 and 2010 (Agencia de Notícias do Acre n.d.). While FLORA focused on Acre and more broadly the Brazilian Amazon, the Panamazonia Fair has a strongly international character with participants from eight other countries including Mexico and countries from Central and South America. Forest-based initiatives also are featured at the annual Expoacre, Acre's week-long annual exposition, but they represent a minor component of the event's main focus on cattle, complete with rodeos and national country and western stars (Hoelle 2011).

Cooperacre, a cooperative composed of numerous rural cooperatives in Acre and now the largest cooperative in the Amazon region, has also played an important

role in strengthening regional market systems. Established in 2001 with state support, Cooperacre is heavily involved in the state's Brazil nut trade through the purchase and processing of nuts, selling more than 4000 tons in 2011 (Almeida et al. 2012), as well as managing a recently constructed Brazil nut-processing plant in Xapuri. In addition, Cooperacre manages the logistics of supply and transport of liquid rubber, or latex, sold to Natex, the condom factory located in the municipality of Xapuri, as well as development of new products made from chemically processed rubber. Opened in 2008, Natex is a public-private-community partnership that now purchases latex from approximately 650 households. The state further supports latex trade by providing a subsidy payment of USD 2.10 per litre to households. Natex sells approximately 100 million condoms per year through a contract with the National Health Agency. In addition, Cooperacre also has begun processing diverse regional fruits into pulps, including *açaí* (*Euterpe precatoria*) and *cajá* (*Spondias mombin*) at a small plant located in Rio Branco.

A cooperative of community forest managers, COOPERFLORESTA, was formed in 2005 with support from the state government, the local NGO CTA, and WWF and has grown to represent 10 communities and six local associations, representing 140 approved community timber management plans (Joaquim Meier-Doernberg, personal communication).

COOPERFLORESTA's leadership has developed an entrepreneurial vision, adapting to changes in markets and economic viability by experimenting with different forms of partnership with private logging companies, with continued support from the state and NGOs.

tion, most of which is concentrated in the municipalities of Rio Branco, Xapuri, Brasiléia, and Sena Madureira, where the natural groves are most plentiful (and markets most accessible). Twenty cooperatives and associations represent 1500 producers of Brazil nuts, rubber, or *copaiba* in their sales to European importers, some of them interested in nuts certified to follow social and environmental standards. Despite continuing challenges in quality control and management, by 2006 the government, in partnership with WWF, had certified 260 Brazil nut-producing families in nine municipalities of Acre (Martins et al. 2008). Production rose from only 3629 tons in 1997–98 to 14035 tons in 2011, a record volume (Martins et al. 2008, Embrapa 2012). A differentiated state tax on sales of processed Brazil nuts (removed from inner shells) to other states or for export provided a competitive advantage to local Brazil nut-processing plants, while adequate credit provided by the Amazon Bank, and training for cooperative

and extractive families in good practices for collection, storage, and processing, stimulated expansion of industrial capacity in Acre. As a result, sales of shelled Brazil nuts from Acre decreased from 2410 tons in 2008 to 375 tons in 2011, while sales of shelled Brazil nuts increased from 638 to 858 tons in the same period (Embrapa 2012). Another important change was the growth of demand for processed Brazil nuts in the Brazilian domestic market, which absorbed 100% of the processed product from Acre in 2011 and led to importation of an additional 150 tons from Bolivia (Embrapa 2011).

A number of initiatives have been implemented to facilitate access to markets by forest households and communities, at both the local and national levels (see Box II 1.5). A project to develop management plans for *copaiba* oil begun in 1998 by researchers at UFAC, in collaboration with the state, produced the first NTFP management plan approved by IBAMA, reaching approximately 500 families in nine munic-

palities of the state (Leite 2004). Despite the potential pharmaceutical and cosmetics markets for NTFPs, connecting these markets to forest producers and products has been challenging (Schmink 2004). For example, *copaiba* oil shows substantial promise as a well-known “natural pharmacy” with many medicinal uses, but production is low and highly variable, and the oils themselves vary widely in colour and quality, making commercialisation more difficult (Leite 2004). Global prices for NTFPs may vary widely; Brazil nut prices ranged from as little USD 1.75 or USD 2.25 to USD 5 per can in 2000 but sold for as much as USD 8.50 per can in late 2005 (Cymerys et al. 2005, Martins et al. 2008). Moreover, smallholder cooperatives in Acre have often struggled to survive and to balance political, social, and economic agendas.

Alongside efforts to support NTFP production, state and international organisations have invested heavily in promoting community timber management, including inside the extractive reserves, beginning in 2012. A departure from traditional forest extractive traditions, timber management by communities is often costly and has uncertain returns, especially after the first harvests, and requires additional supporting state investments (Stone 2003, Rockwell 2005, Humphries and Kainer 2006, Rockwell et al. 2007, Fantini and Crisóstomo 2009). Models of future resource use among agricultural colonists in Acre suggest significant limits to timber markets as a source of income at the individual level (Vosti et al. 2002).

In the past decade, many rubber tappers have shifted their forest extractivist production strategies to include cattle raising, even inside the extractive reserves (Salisbury and Schmink 2007, Toni et al. 2007, Gomes 2009, GoA 2010a). In the upper Acre region, political and economic changes and positive cultural perceptions of cattle-based livelihoods have contributed to this expansion among rubber tappers and other rural groups (Hoelle 2011). A recent study in the Chico Mendes Extractive Reserve shows that deforestation rates have increased in some more accessible areas, approaching the 10% upper limit allowed, although the reserve area still is only 8% deforested and continues to provide a clear buffer against the deforestation pressures around its borders (GoA 2010a). More details on changing livelihoods in Acre’s extractive reserves are reported in Box II 1.5. The increasing diversity of livelihoods within RESEX threatens to undermine the rationale for these sustainable-use units, and weaken the link between forest livelihoods and forest-based development policies.

### **1.3.2 Technical, managerial leadership**

A new public institutional infrastructure has been created for forestry and smallholder production, technical assistance, small business development, and technology (SEF, SEAPROF, FUNTAC, SEBRAE) and new training programs developed at technical and professional levels. A study carried out in 2006 found that the state’s extension programs were undergoing a transition (Cosson Mota 2006). Based on producers’ social concerns about resource availability for future generations, an incipient dialogue with extensionists was emerging about environmental issues in production and support for practices such as maintenance of forests and recuperation of degraded areas. This dialogue was reinforced through the Proambiente program (Bartels 2009, Vadjunec 2011, see Box II 1.2). New technologies for SFM began to emerge from partnerships between the state government and forestry research institutions in Acre, including Embrapa (see Box II 1.6).

The comprehensive and intersectoral nature of the reforms undertaken in Acre far surpassed the limited talent pool of the state’s small population to provide the necessary technical and social expertise in so many sectors and activities, a continuing obstacle to sustainability. Given the experimental and pioneering nature of many of the policies undertaken to support sustainable timber and non-timber management, and to implement participatory programs with communities throughout the state, few models are available; Acreans are heroically innovating in their approaches by drawing on whatever resources they can. Trained staffing of successive state and local governments, and of numerous new large statewide programs as well as the NGOs and civil society groups that support them remains a continuing challenge for the florestania proposal.

### **1.3.3 The role of industrial forestry**

Acre state forest policies have focused with increasing emphasis and clearer successes on industrial forestry compared to community forestry. Until 1999, an estimated 90% of logging activities in Acre were carried out illegally (Brilhante 2000). Major resources have been invested by the state government in developing the local forest industry, attracting outside companies and developing certified timber management in the Antimary State Forest and in private forested areas through public-private partnerships. In 2006 a private timber company was recognised by winning second place in the Chico Mendes sustainable businesses prize awarded by Brazilian Ministry of the Environment, as well as the Planeta Cláudia Prize, based on its timber partnership with the rubber tapper com-

**Box II 1.6 Technologies being developed and used for sustainable forest management in Acre**

- ◆ *Model flora*: In this planning method, permanent protection zones in which no harvesting is allowed are established around riparian areas and for areas with slopes greater than 20%. Individual trees (DBH $\geq$ 35 cm) that will be harvested are identified during the forest inventory process. The locations of the protection zones and harvest trees are collected using global positioning system (GPS) receivers. The protection zone maps and GPS tree coordinates are then used in planning and execution of harvest operations
- ◆ *LIDAR for forest planning and monitoring*: The use of LIDAR (Light Detection and Ranging, an optical remote-sensing technology) in forest management is not new. It has been successfully used in temperate forests with similar restrictions to those of the Amazon. The experience obtained in those regions indicates that LIDAR is an efficient technology for producing high-quality ground information at relatively low cost. The technology has been used in managed areas in the Antimary State Forest. With the data obtained from these LIDAR flights, researchers developed a regression equation and generated digital models for: forest coverage, logging impacts, aboveground biomass and carbon stocks, determination of permanent preservation areas, watersheds, and high-resolution topography.

munity of São Luiz do Remanso, in the municipality of Capixaba (Xangai 2006). The Xapuri Industrial Complex, including a flooring factory, has adapted to shifting global markets by seeking new products such as doors and windows; meanwhile Xapuri carpenters producing furniture for local markets were reduced to illegality due to the state's focus on high-end export products (de Araújo 2011, 2012). Acre's designation as an Export Production Zone (ZPE) is designed to attract Brazil's logging companies interested in new markets such as China (GoA 2011). In 2011 sales by Acre's forestry sector to other states amounted to USD 33 million, with processed wood and Brazil nuts representing 70% and 26% of the total, respectively (GoA 2012.). From 2009 to 2011 the Natex factory produced 60 million condoms that were absorbed by the National STD/AIDS Program of the Brazilian Ministry of Health.

### **1.3.4 Trees outside forests, including agroforestry**

Agroforestry programs have been promoted by both local and national NGOs and the state government's extension agency (Nobre 1998, de Araújo 2010). In 1998, the Rio Branco municipal government began planning a series of agroforestry poles to resettle rural-to-urban migrants and recuperate degraded lands through production for urban consumers (Slinger 1997, 2000), which were expanded throughout the state after 2000. Since 2011, state

programs have been developed to promote planting of 25 000 ha of trees, including rubber trees to serve as a future source of supply for the state's condom factory (which uses regionally produced local latex) and to increase the potential to capture environmental services payments (GoA 2011).

Current government support programs focus on developing markets for aquaculture and for fruit pulps. In 2010 the state government launched a very ambitious USD 125 million aquaculture program involving small, medium, and large farmers that aims at producing, processing, and exporting 20 000 tons per year of fish products to other regions of Brazil and to other countries. This project includes a fish seed production unit and a fish processing and packing plant.

Since 2003 Embrapa Acre and the government of Acre, with the financial support of the Ministry of Agriculture, Livestock, and Food Supplies, in partnership with local NGOs and farmers, has developed a program to integrate trees into pastures (Arbopasto Program) that planted more than 50 000 trees into pastures to provide shade and improve live weight gains of crossbred Nelore x Aberdeen steers (Pereira 2004). Since 2001, Embrapa has also been developing an on-farm research program in partnership with the Federation of Rural Workers of Acre (FETACRE) aimed at developing integrated crop-livestock-forestry production systems adapted to the socio-economic and environmental conditions of small farmers in Acre. This research program is supported by the Brazilian National Environmental Fund (de Oliveira et al. 2012).

## 1.4 Research and monitoring

### 1.4.1 Research programs

Acre's SFM efforts have been supported by technological research carried out by Technology Foundation of the State of Acre (FUNTAC) and Embrapa, as well as research by professors and students at UFAC and by international collaborators. WWF had a regional office in Acre and has provided important supports to the Acre programs on SFM, especially certification. The University of Florida has collaborated with UFAC, PESACRE, CTA, and Embrapa since 1987 on interdisciplinary research and training (Schmink 1992), producing more than 100 research publications by 2012, including new research on methods for estimating Acre's carbon stocks (Salimon et al. 2011) and on the impacts of the paving of the Interoceanic Highway (Southworth et al. 2011, Perz et al. 2012).

Since 1995, Embrapa has carried out research and training activities to develop and adapt new techniques and sustainable production systems of wood and non-wood tree forest products designed for small-scale production (Stone 2003). These efforts resulted in recommendation and adoption by Cooperacres of good production and processing practices for Brazil nut production that reduced aflatoxin contamination, which previously restricted exports of the product, thus adding value and ensuring product safety. Embrapa Acre also recommended precision forest management (already adopted in more than 80 000 ha of managed forests by large producers) and low-impact forest management systems for small farmers (with limited adoption by settlers and extractive families). The latter program included research on forest dynamics of logged areas; ergonomic and economic studies on forest operations, logs processing and transportation; and portable sawmill and microtractors use and adaptation. Training was provided to smallholders in forest inventory; chainsaw and portable sawmill use and maintenance; handicrafts and woodworking; rural business; and community organisation. The Chico Mendes Institute of Conservation of Biodiversity (ICMBio) is considering applying this method in RESEX, in order to avoid using heavy machines. In other areas, community forest management is performed through contracts between the community and forest companies.

### 1.4.2 Monitoring programs

The monitoring and evaluation of SISA will be based on a variety of institutional partnerships. FUNTAC tracks deforestation, fires, and forest degradation through National Institute for Space Research (INPE)

remote sensing technology, as well as using more accurate higher-resolution images of the state (EDF n.d). In terms of measurement, reporting, and verification (MRV) of carbon emissions, Acre is using the baseline created for the State Plan for Control and Prevention of Deforestation, which is based on historical deforestation and emissions-reduction targets. The second version of the baseline will include future projections based on a scenario without governance, to be validated through the use of data from the Basin Restoration Program (PRODES), the ZEE Plan database, and state vectors of deforestation. Monitoring emissions reductions over time will involve partnerships with Woods Hole Research Center (to monitor land use), Amazon Environmental Research Institute (IPAM) (to monitor forest degradation), and Embrapa (to elaborate a forest biomass inventory), among others. Acre also is purchasing a LIDAR-equipped airplane (see Box II 1.6) and has signed an agreement with the Carnegie Airborne Observatory for training in the use of CLAS-lite systems to measure forest carbon and forest cover change (EDF n.d). Additionally, Acre's government is conducting a social-environmental monitoring and evaluation initiative in the Zone of Priority Assistance (ZAP) BR-364, between Feijó and Manoel Urbano, through a partnership with the WWF Sky project.

## 1.5 Projected future trends in the conditions considered

Stabilisation of deforestation is a key achievement in Acre, which was possible due to several interacting policy factors at federal and state levels. These included: 1) the increased governmental (both federal and state) capability to monitor, identify, and penalise farmers who deforest illegally; 2) the decision of the National Monetary Council to prohibit public credit for farmers on the list of illegal deforesters; 3) the legal actions of the federal and state public defenders offices prohibiting the use of fire in Acre; and 4) the social policies implemented by the federal government that supply low-income families' with monthly cash transfers through programs such as Bolsa Familia and Bolsa Floresta. With the effective prohibition of new deforestation, and the support of a multitude of new programs and technologies, a promising sustainable development scenario has been launched in Acre. The challenge now is to ensure its continued sustainability and equity.

Projected increased demand for wood in national and international markets provides opportunities for Acre's timber exports in the future through the continued management of certified public forests (SFB and IPAM 2011), still controversial as a sustainable project (Zimmerman and Kormos 2012). Signifi-

cant advances have been made in establishing and supporting innovative approaches to forest-based development in Acre, but significant challenges remain. The ongoing emphasis in national policy on agricultural and infrastructural expansion through the Growth Acceleration Program (PAC) (de Castro 2012, Salas 2012) is mirrored in modernising efforts in Acre. Land-use and livelihood shifts from forest product extraction to agriculture and cattle, even among smallholders, have triggered deforestation in many areas, raising questions about the long-term viability of RESEX as a sustainable-use reserve. Expansion of larger clearings in Amazonia has been effectively halted by Brazil's Forest Code (which requires that 80% of each holding be kept in forest), whose terms were approved by the National Congress and sanctioned by the president of Brazil in 2012, with many parts pending further regulation by the federal government. Climate extremes such as Acre's drought in 2005 and heavy flooding in 2012 could exacerbate the environmental effects of changing land-use trends. The recent completion of the Interoceanic Highway, which connects Brazil with Peruvian ports via Acre, presents new challenges and opportunities for the state (Hamilton 2006, Southworth et al. 2011, Perz et al. 2012).

Rapid socio-political changes also pose new challenges, including the political weakening of the rubber tapper social movement, the decline in rubber tapping and of the rubber tapper identity, the lack of interest in tapping rubber by younger rural populations, continued rural-to-urban migration, and the growing influence of urban and "cowboy" cultures over the forest-based identity, still kept alive by the government's strong emphasis on Acrean cultural pride (Wallace et al. 2008, Schmink and Cordeiro 2009, Hoelle 2011, Schmink 2011, Vadjunec et al. 2011, Gomes et al. 2012). Ironically, the government's embrace of the goals and ideals of the rubber tapper social movement and involvement of key leaders in government positions and councils has weakened the social movement itself, contributing to the changes in perspective between older activists and younger generations. Despite strong potential for carbon marketing and for new pharmaceutical products (Martins et al. 2008), proposals for environmental services programs, and other market-based mechanisms remain controversial, criticised by some for "commodifying nature" (Conant 2012, Lang 2012, Letter from the State of Acre... 2012, Paula 2012).

## 1.6 Conclusions

Acre's experiments in forest citizenship policies have been designed to encompass a comprehensive approach to building institutional capacity, linking policies across sectors, and involving civil society in decisions. Tensions remain both inside and outside the government between politically popular "developmental" measures, such as road building and industrial development, and environmental enforcement and attention to small producer needs (Sant'Ana 2004), especially with the weakening of the rubber tapper social movement. These tensions underscore the ongoing difficulty of balancing long-term sustainability against the changing short-term demands of electoral cycles and the need to provide immediate social benefits.

The Acre experiment with long-term investment in forest-based development, implemented in close synchrony with national and international policies and pressures for SFM over the past two decades, represents the most sustained and comprehensive approach to sustainable development in the Amazon basin; it is an important example for understanding the local impacts of global issues and policies focused on forest management. An impressive new set of laws and institutions have regularised, strengthened, and expanded forestry production and state economic development. Modernisation of public administration and the opening of policy-making to citizen input, as well as improved infrastructure and institutions, all contributed to the impressive gains in expansion and improvement of forest-product market chains in the state, stabilisation of deforestation, and measurable improvements in life quality for many Acreans, despite many remaining gaps and weaknesses. The state constitutes a laboratory for experimentation with many forms of forest-based development currently being proposed by international and national actors.

Several factors have favoured success in Acre, including its intact forests, strong social capital, and manageable size. The mobilisation of forest-dwelling communities and their strong alliances with environmental and human rights activists provided the impetus and the vision of an alternative development approach based on the forest. An enduring favourable political conjuncture (over a decade) and capable leaders were able to place Acre at the centre of new proposals for sustainable development in the tropics, with all the inherent risks and uncertainties – not least of which is the impact of the very changes unleashed by development on Acre's changing society and landscape.

Given the rapid socio-economic and environmental changes underway in Acre, the remaining challenge is to sustain these impressive achievements – both the commitment to curbing deforestation and to

forest-based development, as well as the strong social compact based on equitable participation that underlies it. Both depend on maintaining political support and collaboration between state leaders and the social groups they represent within the reality of new generations of Acreans living in cities and removed from the historic battles and victories that changed Acre's history. To continue to build and sustain technical and political support for Acre's Forest Government experiments will require a sustained refocus on the forest sector and continuing long-term investments in the development of human and technical capacity in public, private, and community sectors.

**Acknowledgements:** The authors wish to thank Eduardo Borges, Magna Cunha, Arthur Leite, Joaquim Meier-Doernberg, Stephen Perz, and Lúcia Wadt for their assistance with this paper.

## References

- Agencia de Notícias do Acre. n.d. [Internet site]. Feira Pan-amazônia extrapolou as fronteiras do Acre, afirma Angelim. Available at: [http://www.agencia.ac.gov.br/index.php?option=com\\_content&task=view&id=14061&Itemid=26](http://www.agencia.ac.gov.br/index.php?option=com_content&task=view&id=14061&Itemid=26) [Cited 8 Apr 2012].
- Allegretti, M. 1990. Extractive reserves: An alternative for reconciling development and environmental conservation in Amazonia. In: Anderson, A.B. (ed.). *Alternatives to deforestation: Steps toward sustainable use of the Amazon rain forest*. Columbia University Press, New York. p. 252–264.
- Allegretti, M. 2007. *A Construção social de políticas ambientais: Chico Mendes e o movimento dos seringueiros*. Ph.D. dissertation, University of Brasília, Brazil. 827 p.
- Allegretti, M. & Schmink, M. 2009. When social movement proposals become policy: Experiments in sustainable development in the Brazilian Amazon. In: Deere, C.D. & Royce, F.S. (eds.). *Rural social movements in Latin America: Organizing for sustainable livelihoods*. University Press of Florida, Gainesville, Florida. p.196–213.
- Almeida, D. Alves, F.B. & Pires, L. 2012. *Governança em cadeias de valor da sociobiodiversidade: Experiências e aprendizados de grupos multi-institucionais da Castanha-do-Brasil e Borracha- FDL no Acre*. GIZ, Núcleo Maturi, IUCN, WWF-Brazil, Brasília. 106 p.
- Araújo, A.A. 2010. *Alternatives to slash-and-burn agriculture: Potential alternative technologies for limited resource family farms in Acre, Brazil*. Ph.D. Dissertation. University of Florida, Gainesville, Florida. 158 p.
- Bartels, W-L. 2009. *Participatory land use planning in the Brazilian Amazon: Creating learning networks among farmers, non-governmental organizations, and government institutions*. Ph.D. dissertation. University of Florida, Gainesville, Florida. 167 p.
- Brilhante, S.H.C. 2000. *Recurso madeireiro do estado do Acre: Quanto e como é explorado*. Master's Thesis. Federal University of Acre, Acre, Brazil. 57 p.
- Cardoso, R.C.S. 2002. *Extractive reserves in Brazilian Amazonia: Local resource management and the global political economy*. Ashgate, Burlington, Vermont. 259 p.
- Conant, J. 2012 [Internet site]. The rubber tappers of Sao Bernardo, Brazil: struggling still in the memory of Chico Mendes. *Climate Connections*. Available at: <http://climate-connections.org/2011/page/28/> [Cited 5 Sep 2012].
- Cosson Mota, N.L. 2006. *Florestania, Mateiros, Varadouros, Ramais, Igarapés: A extensão rural no pólo agroflorestal Dom Moacir, Bujari, Acre*. Master's Thesis. Federal University of Pernambuco. Pernambuco, Brazil. 113 p.
- Cronkleton, P., Taylor, P.L., Barry, D., Stone-Jovicich, S. & Schmink, M. 2008. *Environmental governance and the emergence of forest-based social movements*. CIFOR Occasional Paper No. 49. Bogor. 36 p.
- Cymerys, M., Wadt, L., Kainer, K. & Argolo, V. 2005. *Castanha: Bertholletia excelsa H.&B.* In: Shanley, P. & Medina, G. (eds.). *Frutíferas e plantas úteis na vida Amazônica*. CIFOR and Imazon, Belém, Brazil. p. 61–74.
- de Araújo, J.M. 2011. *Novas contradições do desenvolvimento na Amazônia brasileira: a indústria florestal e a invisibilidade dos trabalhadores do setor madeireiro de Xapuri*. Presentation in Conferência do Desenvolvimento, IPEA: Anais do Circuito de Debates Acadêmicos. 23–25 November, 2011. Brasília, Brazil.
- de Araújo, J.M. 2012. *Expropriados no campo e na cidade: As consequências do desenvolvimento para os trabalhadores da Amazônia acreana*. Presentation in II Congresso Amazônico de Desenvolvimento Sustentável. 24–26 October, 2012. Palmas, Tocantins, Brazil.
- de Castro, F. 2012. *Multi-scale environmental citizenship: Traditional populations and protected areas in Brazil*. In: Latta, A. & Wittman, H. (eds.). *Environment and citizenship in Latin America: Natures, subjects and struggles*. CEDLA Latin America Studies 101. Bergahn Books, New York. p. 39–58.
- de Oliveira, T.K., da Luz, S.A., dos Santos, F.C.B., de Oliveira, T.C. & Lessa, L.S. 2012. *Experiências com implantação de unidades de integração lavoura-pecuária-floresta (ILPF) no Acre*. Documentos 126, Embrapa Acre. Rio Branco, Acre, Brazil. 43 p.
- de Paula, E.A. 2012 [Internet site]. *The two faces of tropical forest destruction in Latin America and the Caribbean: Revelations of the "green economy" in Acre, Brazil*. Available at: [http://wrm.org.uy/countries/Brazil/The\\_two\\_faces\\_of\\_tropical\\_forest\\_destruction.pdf](http://wrm.org.uy/countries/Brazil/The_two_faces_of_tropical_forest_destruction.pdf) [Cited 15 Dec 2012].
- DiGiano, M. 2006. *The potential impacts of environmental service payments on smallholder livelihood systems in Brazil's Western Amazon*. Master's Thesis. University of Florida, Gainesville, Florida.
- Duchelle, A., Cromberg, M., Gebara, M.F., Guerra, R., Melo, T., Larson, A., Cronkleton, P., Borner, J., Sills, E., Wunder, S., Bauch, S., May, P. & Selaya, G. 2013. *Linking forest tenure reform, environmental compliance, and incentives: Lessons from REDD+ initiatives in the Brazilian Amazon*. World Development. In press.
- EDF n.d. [Internet site]. *Ready for REDD: Acre's state programs for sustainable development and deforestation control*. EDF. Available at: [http://www.edf.org/sites/default/files/Acre\\_Ready\\_for\\_REDD\\_EDF.pdf](http://www.edf.org/sites/default/files/Acre_Ready_for_REDD_EDF.pdf) [Cited 9 Apr 2012].
- Ehringhaus, C. 2005. *Post-victory dilemmas: Land use, development and social movements in Amazonian extractive reserves*. Ph.D. dissertation. Yale University, New Haven, CT. 868 p.
- Embrapa 2011 [Internet site]. *Balanco Social 2011*. Available at: [http://bs.sede.embrapa.br/2011/balanco/tabelas\\_dinamicas.php?pesquisa\\_id=2](http://bs.sede.embrapa.br/2011/balanco/tabelas_dinamicas.php?pesquisa_id=2) [Cited Nov 2012].
- Embrapa 2012. *Boletim de preços de produtos agropecuários e florestais do estado do Acre*. 5(1) October.
- Esteves, B.M.G. 1999. *Do "manso" ao guardião da floresta: Estudo do processo de transformação social do sistema seringueiro a partir do caso da reserva extrativista Chico Mendes*. Ph.D. dissertation. Federal University of Rio de Janeiro. Rio de Janeiro, Brazil.
- Fantini, A.C. & Crisóstomo, C.F. 2009. *Conflitos de interesses em torno da exploração madeireira na reserva extrativista Chico Mendes, Acre, Brasil*. Boletim do Museu Paraense

- Emílio Goeldi. Ciências Humanas 4(2) May-August. Belém, Brazil. p. 231–246.
- Fearnside, P. 2008. Amazon forest maintenance as a source of environmental services. *Anais da Academia Brasileira de Ciências* 80(1): 101–114.
- GoA (Government of Acre) 2000. Zoneamento ecológico-econômico do Acre: O uso da terra acreana com sabedoria. SEMA, Rio Branco, Acre, Brazil. 77 p.
- GoA 2006a. Plano estadual de ciência, tecnologia, e inovação. FUNTAC, Rio Branco, Acre, Brazil. 58 p.
- GoA 2006b. Zoneamento ecológico-econômico do Acre fase II. SEMA, Rio Branco, Acre, Brazil.
- GoA 2009. Payments for environmental services – carbon project guidelines. SEMA, Rio Branco, Acre, Brazil.
- GoA 2010a. Diagnóstico socioeconômico e cadastro da reserva extrativista Chico Mendes. SEMA, Rio Branco, Acre, Brazil.
- GoA 2010b. Sistema de incentivo a serviços ambientais. SISA, Rio Branco, Acre, Brazil.
- GoA 2011. Desenvolver e servir: Plano plurianual - PPA, 2011–2015. Governo do Estado do Acre. Acre, Brazil. 210 p.
- GoA 2012. Safa de Mercadorias do Estado do Acre em 2011. SEFAZ, Rio Branco, Acre, Brazil.
- Gomes, C.V. 2009. Twenty years after Chico Mendes: Extractive reserves' expansion, cattle adoption and evolving self-definition among rubber tappers in the Brazilian Amazon. Ph.D. dissertation, Department of Geography, University of Florida, Gainesville, Florida. 231 p.
- Gomes, C.V., Perz, S. & Vadjunec, J.M. 2012. Convergence and contrasts in the adoption of cattle ranching: Comparisons of smallholder agriculturalists and forest extractivists in the Amazon. *Journal of Latin American Geography* 11(1): 99–120. DOI:10.1353/lag.2012.0018.
- Gomes, C.V., Vadjunec, J.M. & Perz, S.G. 2010. Rubber tapper identities: Political-economic dynamics, livelihood shifts, and environmental implications in a changing Amazon. *Geoforum* 43(2): 260–271.
- Hall, A. 2008. Better RED than dead: Paying the people for environmental services in Amazonia. *Philosophical Transactions of the Royal Society*. 363(1498): 1925–1932.
- Hamilton, R. 2006 [Internet site]. Bridging the last frontier. IDB América. Available at: <http://www.iadb.org/idbamerica/index.cfm?thisid=3773> [Cited 20 Jun 2013].
- Hoelle, J. 2011. Convergence on cattle: Political ecology, social group perceptions, and socioeconomic relationships in Acre, Brazil. *Culture, Agriculture, Food and Environment* 33(2): 95–106.
- Humphries, S. 2005. Forest certification for community-based forest enterprises in Brazil's Western Amazon: Local stakeholders' perceptions of negative and positive aspects of certification and how to improve the certification process. Master's Thesis. University of Florida, Gainesville, Florida. 63 p.
- Humphries, S.S. & Kainer, K.A. 2006. Local perceptions of forest certification for community-based enterprises. *Forest Ecology and Management* 235: 30–43.
- IBGE 2012 [Internet site]. Pesquisa pecuária municipal. Available at: <http://www.sidra.ibge.gov.br/bda/acervo/acervo2.asp?e=v&p=PP&z=t&o=24> [Cited 13 Jan 2013].
- INPE 2012 [Internet site]. Estimativas anuais desde 1988 até 2011: Taxa de desmatamento anual (km<sup>2</sup>/ano). Available at: [http://www.obt.inpe.br/prodes/prodes\\_1988\\_2011.htm](http://www.obt.inpe.br/prodes/prodes_1988_2011.htm) [Cited 13 Jan 2013].
- Kainer, K., Schmink, M., Leite, A.C.P. & Fadell, M.J.S. 2003. Experiments in forest-based development in Western Amazonia. *Society and Natural Resources* 16(10): 869–886.
- Kainer, K.A., Wadt, L.H.O., Gomes-Silva, D.A.P. & Capanu, M. 2006. Brazil nut-liana relations in the Western Brazilian Amazon. *Journal of Tropical Ecology* 22: 147–154.
- Kainer, K.A., Wadt, L.H.O. & Staudhammer, C.L. 2007 Explaining variation in Brazil nut fruit production. *Forest Ecology and Management* 250(3): 244–255.
- Keck, M. 1995. Social equity and environmental politics in Brazil: Lessons from the rubber tappers of Acre. *Comparative Politics* 27(4): 409–424.
- Lang, C. 2012 [Internet site]. Continued destruction of forests and biodiversity in the state of Acre, considered a model of the “green economy” in the Brazilian Amazon. Available at: <http://wrm.org.uy/bulletin/183/Brazil.html> [Cited 20 Jun 2013].
- Leite, A.C.P. 2004. Neoextrativismo e desenvolvimento no estado do Acre: O caso do manejo comunitário do óleo de copaíba na reserve extrativista Chico Mendes. Master's thesis. Federal University of Santa Catarina, Florianópolis, Santa Catarina, Brazil. 124 p.
- Letter from the State of Acre (Brazil): In defense of life and the integrity of the peoples and their territories against REDD and the commodification of nature. 2012 [Internet site]. Climate Connections. Available at: <http://climate-connections.org/2011/page/28/> [Cited 5 Sep 2012].
- Machado, A. 2012 [Internet site]. Uso do fogo na agricultura é necessidade insuperável, diz governo do Acre. Blog da Amazônia. Available at: <http://terramagazine.terra.com.br/blogdaamazonia/blog> [Cited 5 Sep 2012].
- Mertins, L., Gouveia e Silva, Z.P. & Silveira, B.C. 2008. Produção e comercialização da castanha do Brasil (Betholletia Excelsa, H.B.K) no estado do Acre-Brasil, 1998-2006. Presentation in XLVI Congresso de Sociedade Brasileira de Economia, Administração e Sociologia Rural 20–23 June, 2008. Rio Branco, Acre, Brazil.
- Ministério Público do Acre. 2012 [Internet Site]. Cases 06.3022.00000702-8 (irregularities in the Antimary State Forest) and 06.2011.00000233-5 (Porto Dias Agro-Extractive Project). Available at: <http://webserver.mp.ac.gov.br/consulta/> [Cited 31 Jul 2012].
- Nobre, F.R.C. 1998. Agroforestry systems in Acre, Brazil: Variability in local perspectives. Master's Thesis. University of Florida, Gainesville, Florida. 154 p.
- Pacheco, L. 2011. Arising from the trees: Achievements, changes, and challenges of the rubber tappers movement in the Brazilian Amazon. Master's Thesis. University of Florida, Gainesville, Florida.
- Pereira, S. 2004 [Internet site]. Novo caminho para a Amazônia. *Jornal Pagina 20 Especial*. Available at: <http://pagina20.uol.com.br/18042004/especial2.htm> [Cited 11 Jan 2013].
- Perz, S.G., Cabrera, L., Carvalho, L.A., Castillo, J., Chacacanta, R., Cossio, R., Solano, Y.F., Hoelle, J., Perales, L.M., Puerta, I., Rojas, D., Camacho, I.R. & Silva, A.C. 2012. Regional integration and local change: Road paving, community connectivity, and social-ecological resilience in a tri-national frontier, Southwestern Amazonia. *Regional Environmental Change* 12(1): 35–53.
- Rich, B.M. 1985. The multilateral development banks, environmental policy and the United States. *Ecology Law Quarterly* 12: 681–745.
- Rockwell, C.A. 2005. Community-based timber management in Acre, Brazil and its implications for sustainable forest management. Master's Thesis. University of Florida, Gainesville, Florida. 94 p.
- Rockwell, C., Kainer, K.A., Marcondes, N. & Baraloto, C. 2007. Ecological limitations of reduced-impact logging at the smallholder scale. *Forest Ecology and Management*. 238: 365–374.
- Salas, V. 2012 [Internet site]. In the wake of Rio+20, will Brazil walk the talk? Council on Hemispheric Affairs. Available at: <http://www.coha.org/in-the-wake-of-rio20-will-brazil-walk-the-talk/> [Cited 2 Aug 2012].
- Salimon, C.I., Putz, F.E., Menezes-Filho, L., Anderson, A., Silveira, M., Brown, I.F. & Oliveira, L.C. 2011. Estimating state-wide biomass carbon stocks for a REDD plan in Acre, Brazil. *Forest Ecology and Management* 262(3): 555–560.



- Salisbury, D. & Schmink, M. 2007. Cows versus rubber: Changing livelihoods among Amazonian extractivists. *Geoforum* 38(6): 1233–1249.
- Sant'Ana Júnior, H.A. 2004. Florestania: A saga acreana e os povos da floresta. Edufac, Rio Branco, Acre, Brazil.
- Santos, P., Brito, B., Maschietto, F., Osório, G. & Monzoni, M. 2012. Marco regulatório sobre pagamentos por serviços ambientais no Brasil. IMAZON/FGV, Belém, Brazil. 76 p.
- Schmink, M. 1992. Building institutions for sustainable development in Acre, Brazil. In: Redford, K.H. & Padoch, C. (eds.). *Conservation of neotropical forests: Working from traditional resource use*. Colombia University Press, New York. p. 276–297.
- Schmink, M. 2004. Communities, Forests, Markets, and Conservation. In: Zarin, D.J., Alavalapati, J.R.R., Putz, F.J. & Schmink, M. (eds.). *Working forests in the tropics: Conservation through sustainable management?* Columbia University Press, New York, USA. p. 119–129.
- Schmink, M. 2011. Forest citizens: Changing life conditions and social identities in the land of the rubber tappers. *Latin American Research Review* 46(4): 141–158.
- Schmink, M. & Cordeiro, M.L. 2009. Rio Branco: A cidade da Florestania. Federal University of Pará and Federal University of Acre Presses, Belém and Rio Branco, Brazil. 185 p.
- SFB & IPAM 2011. Florestas Nativas de Produção Brasileiras. Relatório. SFB and IPAM, Brasília, Brazil. 24 p.
- Shaeff, G. 1998. Antimari: Socioeconomic adaptation among Amazonian rainforest extractivists. Ph.D. Dissertation. University of Florida, Gainesville, Florida. 452 p.
- Sills, E. & Saha, S. 2011. Subsidies for rubber: Conserving rainforests while sustaining livelihoods in the Amazon? *Journal of Sustainable Forestry* 29(2–4): 152–173.
- Slinger, V.A.V. 1997. Analysis of a planned agroforestry system in Amazon urban resettlement: A case study of the “pólo municipal de produção agroflorestal” of Acre, Brazil. Thesis. University of Florida, Gainesville, Florida. 182 p.
- Slinger, Vanessa A.V. 2000. Peri-urban agroforestry in the Brazilian Amazon. *The Geographical Review* 90(2): 177–190.
- Stone, S. 2003. From tapping to cutting trees: Participation and agency in two community-based timber management programs in Acre, Brazil. Ph.D. Dissertation. University of Florida, Gainesville, Florida. 394 p.
- Southworth, J., Marsik, M., Qiu, Y., Perz, S., Cumming, G., Stevens, F., Rocha, K., Duchelle, A. & Barnes, G. 2011. Roads as drivers of change: Trajectories across the tri-national frontier in MAP, the Southwestern Amazon. *Remote Sensing* 3(5): 1047–1066.
- TFG 2010 [Internet site]. Text of the California, Chiapas, Acre MOU on REDD (11/16/2010). Available at: <http://www.tropicalforestgroup.blogspot.com/2010/11/text-of-ca-chiapas-acre-mou-on-redd.html> [Cited 8 Apr 2012].
- Toni, F., dos Santos, J.C., Sant'Ana de Menezes, R., Wood, C.H. & Sant'Anna, H. 2007. Expansão e trajetórias da pecuária na Amazônia: Acre, Brasil. Editora Universidade de Brasília, Brasília, Brazil. 119 p.
- Torres, I. & Quadros, V. 2011 [Internet site]. O golpe verde. IS-TOÉ No. 2188. Available at: [http://www.istoe.com.br/reportagens/168170\\_O+GOLPE+VERDE](http://www.istoe.com.br/reportagens/168170_O+GOLPE+VERDE) [Cited 24 Jun 2013].
- Vadjunec, J.M. 2011. Proambiente: Initial lessons from an environmental service program in the Brazilian Amazon. *GLP News* 2(7): 22–24.
- Vadjunec, J.M., Gomes, C.V. & Ludewigs, T. 2009. Land-use/cover-change among rubber tappers in the Chico Mendes extractive reserve, Acre, Brazil. *Journal of Land-Change Science* 4(4): 249–274.
- Vadjunec, J.M. & Rocheleau, D. 2009. Beyond forest cover: land use and biodiversity impacts in rubber trail forests of the Chico Mendes extractive reserve. *Ecology and Society* 14(2): 29.
- Vadjunec, J.M., Schmink, M. & Gomes, C.V. 2011. Rubber tapper citizens: Emerging places, policies, and shifting identities in Acre, Brazil. *Journal of Cultural Geography* 28(1): 73–98.
- Valentim, J.F. & de Andrade, C.M.S. 2009. Tendências e perspectivas da pecuária bovina na Amazônia brasileira. *Amazônia: Ciência & Desenvolvimento* 4(8): 9–32.
- Vosti, S.A., Witcover, J. & Carpentier, C.L. 2002. Agricultural intensification by small-holders in the Western Brazilian Amazon: From deforestation to sustainable land use. Research report no. 130. International Food Policy Research Institute, Washington DC. 135 p.
- Wadt, L.H.O., Kainer, K.A. & Gomes-Silva, D.A.P. 2005. Population structure and nut yield of a *Bertholletia excelsa* stand in Southwestern Amazonia. *Forest Ecology and Management* 211: 371–384.
- Wallace, R. 2004. The effects of wealth and markets on rubber tapper use and knowledge of forest resources in Acre, Brazil. Ph.D. dissertation. University of Florida, Gainesville, Florida. 303 p.
- Wallace, R. 2009. Changes in household livelihood strategies among rubber tapper households in the Chico Mendes extractive reserve in Acre, Brazil in Southwest Amazonia: 1996 to 2006. Paper presented at the 108th Annual Meeting of the American Anthropological Association. 2–6 December, 2009. Philadelphia, Pennsylvania, USA.
- Wallace, R., Daly, D., & Silveira, M. 2000 [Internet site]. Developing regional markets for forest products in Southwestern Amazonia. The New York Botanical Garden. Universidade Federal do Acre. Available at: <http://www.nybg.org/bsci/acre/www1/markets.html> [Cited 8 Apr 2012].
- Wallace, R. & Gomes, C.V. Forthcoming. O sistema de comércio de produtos florestais não madeireiros numa Reserva Extrativista no Acre: Revisitando o passado para pensar no futuro do extrativismo” In *Etnobotânica e Botânica Econômica do Acre*, Rio Branco, Brazil: UFAC/Embrapa.
- Wallace, R., Portela da Silva, M.J., Lopes de Nascimento, F. & Schmink, M. 2008. A feira de produtos florestais do Acre: Fortalecendo espaços para integração de comunidades e mercados. In: Bensusan, N. & Armstrong, G. (eds.). *O manejo da paisagem e a paisagem do manejo*. Brasília, Brasil: IEB, Brasília, Brazil. p. 265–291.
- Xangai, J. 2006 [Internet site]. IIBA - Um novo conceito na floresta. Pagina 20, Rio Branco, Acre. Available at: [http://www.gvces.com.br/index.php?r=noticias/view&id=64563&0%5Bidioma\\_id%5D=&0%5Bidnoticia%5D=&0%5Bidusuario%5D=&0%5Btitulo%5D=&0%5Btexto%5D=&0%5Bdatacad%5D=&0%5Bdatapub%5D=&0%5Bpublicado%5D=1&0%5Bfonte%5D=&0%5Bautor%5D=&0%5Bidfonte%5D=&0%5Bidtipo%5D=&0%5Bidio%5D=&0%5Burl\\_referencia%5D=&0%5Bdestaque%5D=1](http://www.gvces.com.br/index.php?r=noticias/view&id=64563&0%5Bidioma_id%5D=&0%5Bidnoticia%5D=&0%5Bidusuario%5D=&0%5Btitulo%5D=&0%5Btexto%5D=&0%5Bdatacad%5D=&0%5Bdatapub%5D=&0%5Bpublicado%5D=1&0%5Bfonte%5D=&0%5Bautor%5D=&0%5Bidfonte%5D=&0%5Bidtipo%5D=&0%5Bidio%5D=&0%5Burl_referencia%5D=&0%5Bdestaque%5D=1) [Cited 24 Jun 2013].
- Zimmerman, B.L. & Kormos, C.F. 2012. Prospects for sustainable logging in tropical forests. *BioScience* 62: 479–487.