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Chapter 1

Forest Products, Livelihoods and Conservation: Case Studies of Non-Timber Forest Product Systems

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INTRODUCTION

One of the most intriguing and challenging aspects of non-timber forest products (NTFPs) is their complexity and multidimensionality. Forest products are not only natural resources used to meet subsistence needs, or mere economic resources traded among different kinds of social actors. Forest resources are also embedded in the political, institutional, and cultural life of people involved in their collection and consumption. The multidimensionality of NTFPs is evident in the myriad of processes, actors, and factors that shape their management, processing, and commercialisation. The diversified subsistence strategies of producers and the constantly changing interactions among local producers, processors, traders, markets, and forests—all dynamic entities—means that forest products have distinct, often long and complex, historical trajectories.

In recent years, this historical trajectory has been marked by a renewed interest in NTFPs as tools to promote socially equitable and environmentally sustainable economic development (Nepstad and Schwartzman 1992; Plotkin and Famolare 1992; Clement *et al.* 1999; Viera 2002). This interest is evident not only in the rapidly growing volume of literature, but in the number of government and private interventions directed at this sector, particularly in tropical forests (Ruiz-Pérez and Arnold 1996; Neumann and Hirsch 2000). As Belcher and Ruiz-Pérez (2001:3) note, however:

> Much of this investment is based on the premise that improving prices for producers, adding value locally through increasing post-harvest processing and improving local organizations, can lead to long-term economic and political gains for these groups. Some also argue that these kinds of interventions can lead to forest conservation. And yet, understanding of the true role and potential of forest product development to contribute to human development or conservation,

based as it is on untested theory and scattered and inconsistent case-based research, remains limited.

The Center for International Forestry Research (CIFOR) "Assessment of the potential for non-timber forest products based development" initiative is an attempt to address this problem and to improve our understanding of NTFP systems through a comparative and formal analysis of a wide range of cases of forest product development.[3] A standardised set of descriptors has been developed to capture the key ecological, technological, social, economic, and institutional aspects of forest production, processing, and trade.

The goal of the case comparison is to
- create typologies or groups of similar cases;
- identify conditions associated with particular kinds of development and conservation outcomes; and
- develop and test hypotheses about forest product development.

Collaborators from 47 institutions in 27 countries in Africa, Asia, and Latin America were identified and recruited, contributing over 60 cases. The criteria for selecting cases included:
1. The forest product has significant demonstrated commercial or trade value; that is, the product is traded in the cash economy.
2. The production, processing, and marketing system has been researched and documented with data available on approximately 70% of the variables.
3. An individual or team of experts is available and willing to collect additional data to complete the case documentation and to participate in the comparative analysis.
4. A suitable range of cases is represented in the study.

Representativeness of cases

The lack of basic information regarding NTFPs is clearly a limiting factor when attempting to compile site-specific case studies, particularly given the need to include detailed economic and social information on the different stakeholders along the trade chain. A dearth of even basic ecological and biological information on key forest resources is endemic in the American tropics (Peters 1994), and it is particularly acute for some of the more vulnerable forest species, for example, the rarer, long-lived, and slow-growing large trees with low rates of regeneration, such as *Endopleura uchi* Cuatrec (chapter 11). Even some highly utilised and ecologically and economically important species, such as Brazil nut (*Bertholletia excelsa* H.B.K., chapter 5) and chicle (*Manilkara zapota* (L.) van Royen), are poorly understood in terms of their natural history or ecology (Ortiz 2002). In other cases, such as asaí (*Euterpe precatoria* Mart., chapter 6), ecological data do exist with regards to such important variables as recruitment and growth, but these vary among research sites and according to the methods employed.

The unequal distribution of scientific knowledge among different taxa, types of forest products, production systems, countries, and regions

helps explain some of the biases in the case studies selected. The fact that ecological data are more easily gathered in the case of short-lived species and that more economic data are available in the case of widely commercialised forest products, for example, often contributes to a research bias against slow growing species (Cunningham 2000) or against those with limited market value. Thus, of the 22 plant case studies included in this volume, 19 correspond to fast-growing species with a short reproductive life span, mostly herbs, shrubs, and palms, which in turn are generally more easily brought into cultivation. Indeed, cultivation involves the main form of production for seven of the cases presented in this volume, and it is recognised as a highly viable option in another eight cases.

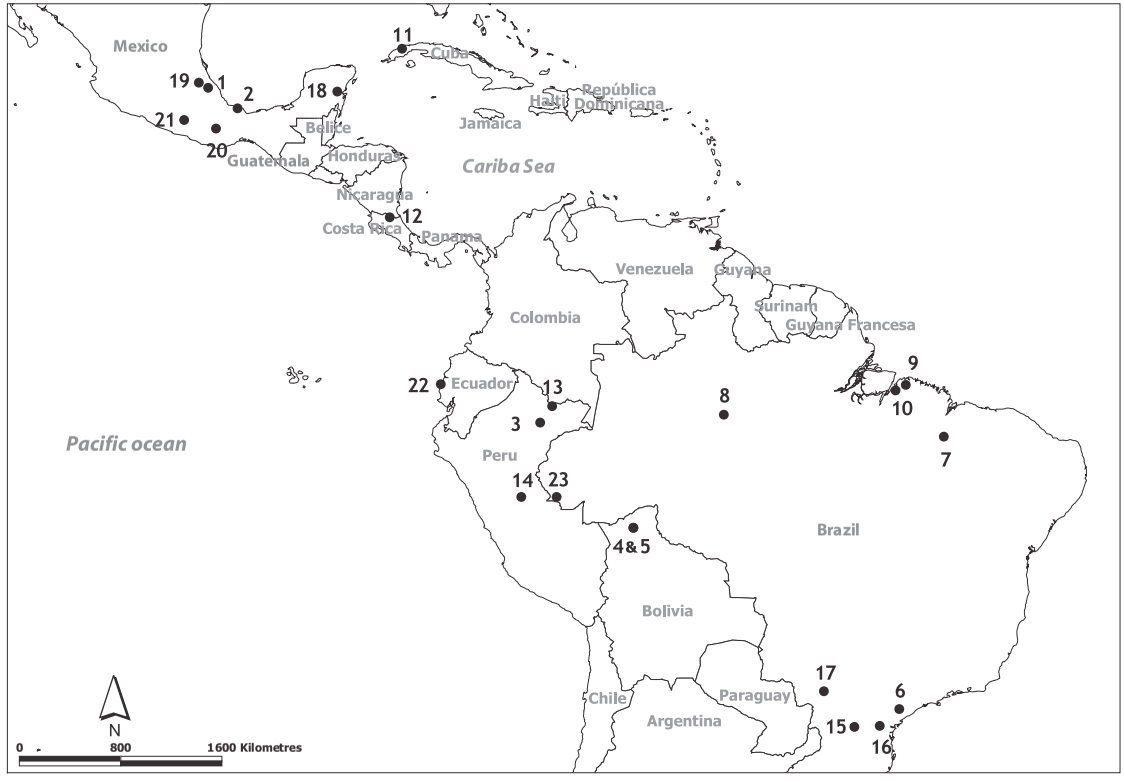
Geographical bias is also evident in the selection of cases presented, with one third of the sample originating from Brazil and one quarter from Mexico. This distribution, in part, reflects a long history and interest in ethnobotanical research as well as active training in universities and botanical gardens in these two countries. In spite of these biases, however, the 23 cases presented include a wide diversity of products, management practices, and trade regimes, thereby reflecting the multidimensionality that characterises forest products in Latin America.

NON-TIMBER FOREST PRODUCTS OVER TIME: DYNAMISM, HISTORY, AND CHANGE

The multidimensionality of NTFPs has a clear temporal dimension, which often translates as a long and complex series of historical trajectories. Aubertin's (1996) observation that the history of the lowland American tropics is inextricably linked to the history of use and exploitation of NTFPs provides an interesting perspective by which to examine this aspect of the multidimensionality of forest products. The long history of commercial forest product extraction in Latin America can conveniently be divided into five more or less distinct eras or phases: pre-Hispanic or pre-Columbian, colonial, industrial, modern, and postmodern.

Pre-Hispanic phase. Pre-Columbian networks of trade and exchange linking different regions in the Americas—notably the coastal plains, the Andes, the Amazon and Orinocco basins, as well as meso and north America—were sustained largely through the flow of commodities such as metal tools, salt, and such animal and plant products as *Spondylus* shells, feathers, pets, medicinal plants, and resins such as copal (Renard-Casevitz *et al*. 1988; Currie 1995; Shatto 1998; Purata *et al*. chapter 21; Hersch *et al*. chapter 22). In contrast to other parts of the world, notably south-east Asia and parts of Africa, where trade routes and commodity flows have been maintained for several thousand years, many of the American regional trade networks were severely weakened or destroyed following European conquest and the concomitant depopulation and the re-organisation of indigenous social and political institutions. Similarly, while some of the plants included in this volume, notably *Pimenta dioica* (L.) Merrill, *Pouteria sapota* (Jacquin) H.E. Moore & Stearn, *Carludovica palmata* R&P, and *Sabal yapa* Wright ex Becc. (chapters 2, 3, 19, 23), have retained a relatively salient position in

Figure 1. Location of study cases



Source: ESRI Data and Maps 2002.

Table 1. Important characteristics of study cases

no.	country	species	Common names	part of the resource used	Dominant form of management	transformation*	scale of trade	geogr. range**	Regional status***	author
1	Mexico	*Pimenta dioica*	Pimienta gorda, Allspice	fruit	managed/ cultivated	medium	international	medium	increasing	Martínez, M.A. *et al.*
2	Mexico	*Pouteria sapota*	Mamey, Zapote mamey	fruit	wild	low	national	high	increasing	Nava-Cruz, Y. and Ricker, M.
3	Peru	*Tayassu tajacu; Tayassu pecari*	Pecarí, Sajino and Huangana	meat	wild	low	national	high	decreasing	Cornejo A., C.
4	Bolivia	*Bertholletia excelsa*	Castaña, Almendra, Nuez del Brazil, Brazil nut	seeds	wild	low-medium	international	high	stable	Stoian, D.
5	Bolivia	*Euterpe precatoria*	Asaí, Palmito, Palm heart	palm heart	wild	medium	international	high	decreasing	Stoian, D.
6	Brazil	*Euterpe edulis*	Palmiteiro, Palmito, Palm heart	palm heart	wild	medium	national	medium	decreasing	Fantini, A.C. *et al.*
7	Brazil	*Orbignya phalerata*	Babaçu	fruit	wild/managed	high	national	high	decreasing	Pinheiro, C.U.B.
8	Brazil	*Bactris gasipaes*	Pupunha, Pejibaye, Peach palm	fruit	cultivated	low	national	high	stable	Clement, C.R. and Van Leeuwen, J.
9	Brazil	*Platonia insignis*	Bacuri	fruit	managed	low	national	high	decreasing	Medina, G. and Ferreira, S.
10	Brazil	*Endopleura uchi*	Uxi	fruit	wild/ managed	low	national	high	decreasing	Shanley, P. and Gaia, G.
11	Cubal	*Pinus caribaea*	Pino macho	exudate	managed/cultivated	high	international	low	stable	Betancourt F., Y. *et al.*
12	Costa Rica	*Psychotria ipecacuanha*	Raicilla, Ipecacuana, Ipecac	root	cultivated	medium	international	high	stable	Ocampo S., R.A.
13	Peru	*Myrciaria dubia*	Camu-camu	fruit	wild	medium	international	medium	decreasing	Pinedo P., M. and de Jong, W.
14	Peru	*Uncaria tomentosa; Uncaria guianensis*	Uña de gato, Cat's claw	bark	wild	high	international	high	decreasing	Nalvarte A., W. y de Jong, W.
15	Brazil	*Baccharis trimera*	Carqueja	stem and leaves	managed	medium	national	high	stable	Steenbock, W.
16	Brazil	*Maytenus ilicifolia*	Espinheira-santa	leaves	wild	medium	national and international	medium	stable	Scheffer, M.A.
17	Brazil	*Pfaffia glomerata*	Batata-do-mato, Fáfia, Brazilian ginseng	root	wild	medium	international	low	decreasing	Corrêa, C.J. and Lin Chan Ming
18	Mexico	*Sabal yapa*	Xa'an, Guano	leaves	wild	low	national	medium	stable	Caballero, J. *et al.*
19	Mexico	*Trema micrantha*	Jonote	bark	managed	medium	international	high	stable	López, C.
20	Mexico	*Bursera glabrifolia*	Copal, Copalillo	wood	wild	medium	international	medium	decreasing	Purata, S.E. *et al.*
21	Mexico	*Bursera aloexylon*	Xochicopal, Copalcojtli, Linaloe	wood	wild	medium	international	medium	decreasing	Hersch M., P. *et al.*
22	Ecuador	*Carludovica palmata*	Paja toquilla, Sombrero de Panamá, Panama hat	leaves	wild/managed	medium	international	high	stable	Alarcón G., R. y Burbano, M.F.
23	Brazil	*Hevea Braziliensis*	Seringueira, Seringa	exudate	wild	medium	international	high	stable	Pantoja, M.C.

* Degree of transformation (degree of processing that is required): low (e.g. fruit, bush meat or other products that can be used directly by the consumer); medium (e.g. fibre from grass used for weaving or handicrafts; wood for carvings); or high (e.g. essential oil extracted from plant and used in incense or as a chemical component in medicine).

** Geographic range: total area (global) over which the target species lives: large (>1,000,000 km^2); medium (<1,000,000>75,000 km^2); small (<75,000 km^2).

*** Status of the population in Latin America.

the resource management profiles of forest dwellers since pre-Columbian times, others, such as *Bactris gasipaes* Kunth (chapter 9), never regained their former importance.

Colonial phase. The period between the sixteenth and nineteenth century involved a series of intense and profoundly important exchanges of plants between continents (Hobhouse 1985). Neotropical crops such as chocolate (*Theobroma cacao* L.), potato (*Solanum tuberosum* L.), manioc (*Manihot esculenta* Crantz), and maize (*Zea mays* L.) became important food crops in other parts of the world, while cultigens like bananas, coffee, and sugarcane were incorporated into Latin American colonial agriculture. A number of neotropical forest products, notably vanilla (*Vanilla planifolia* Andr.), sarsaparilla (*Smilax* spp.), copaiba (*Copaifera reticulata* Ducke), quinine (*Cinchona officinalis* L.), ipecac (*Psychotria ipecacuanha* (Brotero) Stokes, see chapter 13), and copal (*Bursera aloexylon* (Schiede) Engl., chapter 22), became important commodities in the rapidly growing global economy and were subject to the boom and bust cycles that have characterised the history of commercial forest product extraction in Latin America (Bunker 1985; Homma 1992).

Industrial phase. The synergistic conflation of numerous factors in the late nineteenth century led to an explosion in demand for forest products from the tropics. Technological innovations, including mechanisation, allowed entrepreneurs to transform natural products into new kinds of commodities at an unprecedented scale. This ability, combined with rapid urbanisation and the revolution in transportation (notably the steam engine and the locomotive) and communication (notably the telegraph), led to a veritable explosion in the number and size of global commodity chains, many of which involved tropical forest products. The classic example is rubber (*Hevea brasiliensis* Müll. Arg., chapter 24): it was only after Goodyear discovered the process of vulcanisation in the nineteenth century that this forest product, transported from remote areas to industrial centres by steamboats and railways, could be used to produce new commodities, such as tyres. Similar extractivist booms were taking place throughout the world in response to the same interaction between economic forces and technology (e.g., Warn 2000).

The industrial revolution in northern Europe and subsequently in the United States created a huge demand for natural resources, a demand that in Latin America translated into a series of economic booms linked to the extraction of mineral and biological resources including tin, copper, bird guano, and forest products such as rubber, chicle (*M. zapota*), vegetable ivory (*Phytelephas macrocarpa* R&P), barbasco (*Lonchocarpus nicou* (Aubl.) DC.), ipecac (*P. ipecacuanha*, chapter 13), linaloe (*B. aloexylon*, chapter 22), and Panama hat, *C. palmata* (chapter 23). While some of these forest products—ipecac and linaloe are examples—have been exported since colonial times, others, like rubber, entered the global market for the first time during this period. As a result of these extractivist booms, an enormous amount of wealth was generated: rubber, for example, was the third most important export from Brazil from 1887 to 1917 (Padoch and de Jong 1990). A large part of the enormous wealth generated by the extractive economy during this period was captured by an elite whose ties with the industrial powers,

and notably the United Kingdom, contributed to the formation, consolidation, and expansion of modern Latin American nation states and the independence from imperial—and unindustrialised—Spain and Portugal (Skidmore and Smith 2001).

Modern phase. By the middle of the twentieth century, the same process of technological innovation that had helped create forest product commodity chains in the nineteenth century generated their demise. Advances in post-World War II inorganic, and especially petroleum-based, chemistry led to the replacement of forest products such as gums, resins, fibres, and medicines by cheaper synthetic alternatives. Whereas 20% of all buttons produced in the United States during the 1920s were made of vegetable ivory (*P. macrocarpa*) harvested in Ecuador, by the 1960s plastics had replaced vegetable ivory almost completely (Acosta Solís 1944, cited in Barfod *et al*. 1990:293). Similar declines followed for barbasco, replaced by DDT, chicle, replaced by synthetic chewing gum, as well as malva (*Urena lobata* L.), Panama hat (chapter 23), and natural rubber (chapter 24).[4]

Postmodern phase. The contemporary stage of global capitalism has unleashed new social and economic forces, which in turn have revitalised some old commodity chains while creating new ones. On the one hand, the expansion of the global economy, the communications revolution, and the widespread suspension of state subsidies during the late twentieth century have exposed Latin American products to intense competition from other regions. Alarcón and Burbano (chapter 23), for example, note how the cheapest Panama hats cannot compete with synthetic or with natural fibre hats from Asia. Likewise, the remains of the rubber extraction industry in Brasil and Bolivia[5] collapsed following the neoliberal reforms imposed by the International Monetary Fund in the 1980s, which entailed the suspension of government tariffs and subsidies designed to protect the national rubber industry.

The vegetable ivory industry, on the other hand, which had almost disappeared by the 1970s, began to thrive again in the 1990s, with exports to Japan, Germany, and Italy (Barfod *et al*. 1990). The vegetable leather and, to a lesser extent, Panama hat cases described in this volume are other examples of industrial commodity chains that experienced modern decline and postmodern revitalisation. The expansion of the service economy, and tourism in particular, the growth of niche markets, and a postmodern fascination with the local and the indigenous, have all opened new spaces for commercialisation of forest products in Latin America, particularly for crafts (for example, alebrijes, papel amate, Panama hats, and vegetable leather), specialty foods (Brazil nuts, zapote mamay), nutritional supplements (vitamin C from camu-camu, and medicinal plants carqueja, espinheira-santa, and cat's claw). Many of the cases in this volume highlight the way in which forest products, once associated with the rural underclass and with recent urban migrants, have in the past decades become part of the urban 'chic'. The process of coating cotton or other fibres with *Hevea* latex, originally used by rubber tappers to waterproof their bags and garments, is now used in fashion accessories in Rio de Janeiro, Paris, and London (chapter 24). Likewise, well-made and marketed 'Panama hats' fetch up to US$1,000 in London,

and painted wood carvings, alebrijes, from villages in Oaxaca, Mexico, are on display in California art galleries. Medicinal plants such as cat's claw (*Uncaria spp.*), sangre de drago (*Croton lechleri* Müll.Arg.), espinheira-santa (*Maytenus ilicifolia* Mart. ex Reiss), and Brazilian ginseng (*Pfaffia glomerata* [Spreng.] Pedersen), once purchased mostly by the lower middle class from street vendors in Peru and Brazil, have been scientifically legitimised and are now consumed by the urban affluent in these countries as well as abroad (Alexiades 2002a, b; Nalvarte and de Jong, chapter 15; Scheffer, chapter 17; Corrêa and Ming, chapter 18), as have *Maytenus ilicifolia* and *Pfaffia glomerata* in southern Brazil. Indeed, 15 of the 23 cases presented in this volume describe forest products that either have entered the world market or whose international commercialisation has been revitalised in the past decade or so.

KEY ISSUES ALONG THE TRADE CHAIN OF FOREST RESOURCES

The 23 cases in this volume provide a detailed and textured composite of NTFP systems in Latin America today. Besides illustrating the multidimensionality and diversity of conditions under which forest products are extracted, processed, and traded, the accounts illustrate a number of recurrent themes and raise some important issues and questions, particularly with regard to the role of such systems in promoting environmental and social well-being.

Ecological issues

Ecological factors shape and are shaped by both supply and demand of the forest product. On the one hand, abundance, and distribution of the resource directly shape supply by determining the amount of raw material that is available. The ecological characteristics of species also either enhance or curtail their ability to survive landscape-level changes and to recover from extraction. Some of the key biological factors that influence vulnerability or resilience include life form, age to reproductive maturity, productivity, density, resprouting potential, and plant part harvested (Peters 1994; Cunningham 2000). The notion that harvesting of fruits and nuts causes less ecological impact than harvesting of tissues such as roots is broadly supported by the eight fruit and nut cases presented. The choice of harvesting technique is, however, equally important, as even fruit harvest can be dramatically unsustainable if it entails felling of the tree, as is the case in the harvesting of *Mauritia flexuosa* L. from parts of Peru (Gentry and Vásquez 1989).

Over half of the case studies report declines in the availability of the forest species, though in most cases this is not a result of direct overexploitation but of habitat degradation and land use change. This circumstance is particularly the case in Brazil, which after the 1960s embarked on an ambitious programme for developing the lowland interior through road building, colonisation, logging, as well cattle ranching and large-scale commercial agriculture (Hecht 1985). Levels of deforestation are particularly high in the more developed south. For example, according to Fantini *et al.* (chapter 7), only 10% of the original forest cover remained as of 1990 in the Mata Atlantica of Brazil. Likewise,

Corrêa and Ming (chapter 18) report that the high rate of urbanisation in the state of Paraná leads authorities to estimate that 70% of the superior plant vegetation in the state is at risk. In Mexico, agricultural expansion of unshaded coffee plantations and cattle ranching threaten to destroy the trees used for bark cloth, while in Costa Rica and Ecuador increasing urbanisation and agricultural expansion have led to erosion of the wild resource base.

Conversely, changes in land use may favour some forest species. In Brazil, for example, the babaçu palm (*Orbygnia phalerata* Mart.) thrives in open pastures and resprouts well after fire. Because of conversion of natural forests to pasture, babaçu now occupies over 18 million hectares in Brazil, over half of these in the state of Maranhão (chapter 8). Allspice (*P. dioica*), mamey (*P. sapota*), and guano (*S. yapa*) in Mexico, ipecac (*P. ipecacuanha*) in Costa Rica, and Panama hat (*C. palmata*) in Ecuador are all managed in response to landscape-level changes, thus guaranteeing supplies in areas of large-scale forest conversion (chapters 2, 3, 19, 13, 23).

In a number of cases, increased demand for a forest product has led to the implementation of management practices that appear to favour sustainability. In areas in close proximity to markets in Pará, Brazil, for example, demand has encouraged farmer-led innovations in the management of the fruit trees *Platonia insignis* Mart. (chapter 10) and *Endopleura uxi* (chapter 11). In most instances, however, increased demand has probably contributed to the abandonment of those collection and management techniques that promoted sustainability. Yet in other cases, such as Bolivian palmito (*E. precatoria*), unsustainable harvesting practices probably have had minor impacts on the ecological viability of the species given that the spike in demand was short-lived (chapter 6).

The impact of harvesting or land use change may compromise the genetic diversity even among cultivated species, mainly by its effect on wild populations. As Scheffer (chapter 17) notes for espinheira-santa (*Maytenus. ilicifolia*), species where most genetic variation occurs within populations are particularly vulnerable to genetic erosion. Genetic erosion is also noted as a risk for species such as pupunha (*Bactris gasipaes*), Brazilian ginseng (*Pfaffia glomerata*), carqueja (*Baccharis trimera*), and Costa Rican ipecac (*Psychotria ipecaucuanha*). As a result, several authors underscore the need to implement in-situ conservation measures for these species.

Responses to scarcity

Increased rates of harvesting of wild populations frequently lead to forest product scarcity, particularly for rare, slow-growing species with narrow ecological requirements, such as uxi (*E. uchi*, chapter 11). While abundant fast-growing species with broad ecological requirements and rapid regeneration rates are less vulnerable, they may still be locally depleted beyond their capacity to survive, as is the case with espinheira-santa and fáfia in parts of Paraná, Brazil (chapters 17, 18). A useful approach to understanding conservation outcomes of increasing species trade is to examine harvester responses to resource scarcity or local extinction (Cunningham 2000).

Increasing the harvesting range

Increasing the distance travelled to locate and exploit new populations is a common first response to resource scarcity (Cunningham 2000), and is reported for espinheira-santa, Brazilian ginseng, and copal (chapters 17, 18, 22). In some cases, such as that of *Euterpe edulis* in the Atlantic forests of Brazil, finding new wild populations has been the principal response to resource scarcity for several generations of harvesters, leading to widespread local extinction.

Substitution

Simultaneous or serial substitution of species is one common response to a declining resource base, often at the expense of quality (Cunningham 2000). Scheffer (chapter 17), for example, estimates that over 30% of plants commercialised as espinheira-santa in Brazil are other species than *M. ilicifolia*. Likewise, almost half of the wooden boxes sold as linaloe (*B. aloexylon*) in Olinalá, Mexico, are actually made of pine wood (*Pinus* spp.) (chapter 22). The papel amate case from Mexico is an excellent example of serial substitution: over the past 20 years, several species of *Ficus*—traditionally used to make the bark paper—have been replaced by 16 other species (chapter 20). Whereas in this case the serial substitution of the raw material was undertaken by the same harvesters, there are other instances of substitution where the forest product is extracted from other regions. Wild populations of the palm heart from *E. edulis* in the Brazilian Atlantic forest were so severely decimated between the 1930s and 1960s that much of the palm heart industry moved to the Amazon, exploiting wild stocks of *E. oleracea* and *E. precatoria*, even if these are of lower quality.

Substitution with cheaper alternatives, whether synthetic or from different species or regions, has led to the collapse of demand for a number of forest products. The fafia or Brazilian ginseng (*P. glomerata*) case illustrates the other side of the coin: though taxonomically unrelated, this plant is now traded in Japan as a substitute for Asian ginseng, whose wild populations have been severely depleted in many parts of Asia (chapter 18). Another form of substitution involves harvesting the natural resource before the plant has reached its optimal stage of development. Hersch *et al.* (chapter 22) describe an instance of 'green apple-picking syndrome' in the state of Guerrero, Mexico, following declining stocks of wild *Bursera*. Harvesters have begun to cut increasingly young trees, which in turn have poor-quality wood. As harvesters become more desperate, they begin to steal wood from private properties, forcing owners to themselves harvest individuals which have not yet reached harvesting age.

Intensification of the production system

Intensification of the production system is another response to forest product scarcity. In the case of Panama hat, cultivation of the species in plantations, or *pajales*, in the nineteenth century continued to provide the raw material after the decline in world demand in the middle of the twentieth century.

Many of the cultivated species, including allspice in Mexico, pine (*Pinus caribea* Morelet) resin in Cuba, and ipecac in Costa Rica, are associated with industrial uses and/or international markets (chapters 2, 12, 13). In recent years, the realised or expected increases in the demand for such plants as camu-camu (*M. dubia*) and cat's claw (*U. guianensis*), have led state agencies and nongovernmental organisations (NGOs) to promote cultivation or intensification of the production system, either in the way of direct intervention, technical assistance, or subsidies (chapters 14, 15).

While the ecological characteristics of some species, notably agrestics and heliophytes such as carqueja (*B. trimera*, chapter 16), make them more likely candidates for cultivation, forest species such as ipecac (*P. ipecacuanha*, chapter 13) have also been cultivated under forest canopy. In those cases where cultivation is encouraged as an alternative to extractivism, it is important to consider, as several authors point out, the implications for harvesters, whose subsistence often depends heavily on harvesting wild forest products and who often lack secure land or resource rights and alternative sources of income. Even in cases where cultivation is technically possible, economically feasible, and socially desirable, its contribution to the conservation of existing forests is not always certain. In any event, the fact that significant amounts of the raw materials harvested in 15 of the 24 case studies continue to be collected from wild populations attests to the ongoing importance of extractivism in the Latin American tropics.

Market issues

The kind and degree of industrial transformation of the forest product and the scale of commercialisation vary considerably according to the species and region. Some, such as palm hearts and Brazil nuts, are well-known and widely commercialised: 1997 exports of these from Bolivia amounted to US$12 million and US$32 million, respectively (chapters 5, 6). In contrast to such well-known and well-travelled species, most individual NTFPs generate rather modest annual financial returns. In spite of their small individual turnover, the cumulative value of hundreds of these small-scale forest commodities is considerable, forming the monetary base for millions of harvesters, processors, and traders. And while the size in such trade in forest products might be expected to decline as forest products are replaced by substitutes or brought into cultivation (Homma 1992, 1993), in Latin America this decline has not occurred for a multitude of forest products that are still wild-sourced and which still enjoy strong demand from urban centres. Amazonian cities include large and growing numbers of rural migrants, who in turn generate demand for certain forest products (Browder and Godfrey 1997) and who continuously forge new supply links between the forest and the city. Finally, there are also those forest products whose markets are characterised by a high degree of volatility: palm heart from the Bolivian Amazon, for example, experienced a boom and bust cycle in less than a decade (chapter 6).

Local economies and subsistence

Only a small percentage of all forest products gathered in the tropics have any kind of market, and an even smaller proportion of these are commercialised internationally. Even though some export NTFPs, such as palm heart and Brazil nut, generate substantial national revenues, most individual NTFPs have small, often seasonal, and at times ephemeral, turnovers. Even so, the importance of NTFPs to local incomes may be substantial, particularly in cases where few other income-earning options exist. The timing of the income is sometimes almost as important as the amount: the fruit harvest of uxi, for example, coincides with the start of the academic year, when many parents face an additional, small but nonetheless significant, financial burden (chapter 11). The Quilombo producers in the Vale do Ribeira de Igape, Brazil, can always turn to harvesting palm hearts when needs for cash arise (chapter 6). Likewise, weavers in the Manabí, Ecuador, often keep a stock of Panama hats, using them to generate cash at short notice and in times of need (chapter 23). For the predominantly Nahua harvesters of *Bursera* wood described by Hersch *et al.* (chapter 22), incomes derived from forest products are likewise small but significant, especially given the dearth of economic options available to this disenfranchised group of people living in an economically and ecologically marginal part of Mexico. Finally, the pine resin case described by Betancourt *et al.* (chapter 21) provides yet another example of a forest product serving as a safety net, only this time in the context of international politics and the U.S.-led economic embargo against Cuba.

Forest product commodity chains usually involve a large number of actors, who in turn are often placed in diverse and widely separated geographic, social, and economic spaces. The longer the chain and the higher the degree of processing, the greater is the difference likely to be between those who harvest the resource in the forest and those who produce or commercialise the final product. These differences are often reflected in the price changes along the chain, but sometimes also in the way how profits accrue to different kinds of social actors, sometimes even at the same stage of the chain. For example, Brazil nut harvesters may capture anywhere between 6% and 47% of the export price, depending on the kind of harvester, the commercialisation route utilised, and the time of year (chapter 5). In any event, there is a widespread tendency for actors involved in the later stages of the chain—namely processors and middlemen—to capture more profits than the raw material harvesters. In the case of linaloe, for example, intermediaries sell the raw material to carvers for prices up to 10 times what they pay the harvesters (chapter 22). The *Bursera* wood carvers in the states of Oaxaca and Guerrero, Mexico, are likewise better organised, have better access and links to markets and to social capital than the collectors of wood (chapter 21).

As new markets for existing forest products are developed, new and different actors enter the chain. Espinheira-santa, which until recently was only available locally and in the form of crushed leaves to be consumed as a tea, is now consumed in more cosmopolitan contexts and available in other, more processed forms, including capsules and tinctures (chapter 17).

Expansion of trade chains and increases in the degree of processing are often realised by a small group of actors. In many cases, such as that of cat's claw in Peru, the market for these more highly processed or widely distributed final products is dominated by larger firms, which have the capital and know-how for product development and marketing, and which can provide some quality guarantees. In many instances consumers have to choose between the product sold by large companies, which has a guaranteed quality but is sold at a high price, and the 'clandestine' product, which is cheaper, but often of uncertain quality and frequently adulterated.

International markets and globalisation

Not surprisingly, the biggest revenue earners reported in this volume involve products traded in the international market, including Brazil nuts, palm heart, Panama hats, Mexican alebrijes, and pine resin. International markets for Latin American forest and agricultural commodities have shown a historical disposition towards boom and bust cycles, often at a high social cost (Bunker 1985; Homma 1992, 1993; Stoian 2000). Bolivian rubber tappers, for example, turned to Brazil nuts and palm heart following the suspension of state subsidies on rubber in the 1980s and the consequent collapse of its market value (chapters 5, 6). NTFPs have often substituted for cash crops during market lows. Low coffee prices, for example, mean that coffee farmers in the state of Puebla, Mexico, derive more income from allspice, which grows in association with coffee, than from coffee itself (chapter 2).

Many of the cases illustrate the difficulties faced by NTFP producers in a deregulated world market. The danger of substitution by cheaper imports is particularly noticeable among crafts and forest products used in industry, such as babaçu oil (chapter 9) and pine resin (chapter 12). New heightened forms of competition have a mixed effect on product quality. Whereas López (chapter 20), Hersch *et al.* (chapter 22), and Alarcón and Burbano (chapter 23) lament the loss of quality and concomitant loss of skill, knowledge, and expertise following mass production and substitution with cheaper products, high-quality items are at a premium in some niche markets, though these, as in the case of vegetable leather, often need to be developed from scratch.

Economic globalisation has opened spaces for some Latin American products, in particular those linked to specialised or high-end markets, particularly for crafts and medicinal plants. In some instances, neoliberal policies, in the form of liberalised exports or fiscal incentives, as well as investments by the World Bank and other international organisations, have helped promote the international trade and processing of forest products such as Brazil nuts (chapter 5).

Clearly, exploiting such market opportunities requires a certain level of political and entrepreneurial long-term commitment, as well as a degree of organisation among producers or processors, which, as Pinheiro (chapter 8), Clement and van Leeuwen (chapter 9), Ocampo (chapter 13), and Hersch *et al.* (chapter 22) lament, are frequently absent in Latin America. Capital, information, and innovation are also all necessary in order to identify and respond in time to the rapidly and continuously changing characteristics of

the global marketplace. The experiences related in this volume suggest that interventions in these cases should be directed at creating more favourable institutional and legislative environments, strengthening the technical and organisational abilities of producers, ultimately helping them identify new markets, improve product quality, and increase profits. Problems related to quality consistently re-emerge throughout the volume. Variations in quantity and quality of both the raw material and processed goods is one limiting factor in developing international markets for many forest products. In this sense, many authors concur on the urgent need for incentives to improve quality, not only through quality control and training, but by putting in place a pricing system that adds monetary value to quality.

Another important lesson to draw from the case studies is that international markets are often inherently fragile and short-termed, particularly when linked to luxury goods or fads, which in turn are especially vulnerable to economic recessions and to fickle tastes. Quality once again emerges as an important factor, in terms of both developing and holding on to international markets. Problems of inconsistent or poor quality and of product contamination have, for example, limited the access of Bolivian palm heart to the huge Brazilian market (chapter 6), led to the fall in the international price of Brazil nuts (Newing and Harrop 2000; Stoian, chapter 5), and probably contributed to the sudden fall in international demand for cat's claw (chapter 15).

Socio-political and institutional issues

NTFP production systems form part of a matrix of social, political, and institutional relations—as well as economic and ecological ones. The actions of harvesters, traders, and processors respond not only to changes in the abundance, distribution, and accessibility of the species, but also to power relations and institutional dynamics. In many cases, as Fantini *et al.* (chapter 7), Hersch *et al.* (chapter 22), and others note, the main challenges facing the development of sustainable NTFP production systems are social and political, rather than technical (see also Pierce 2002). The various case studies both highlight and qualify some of the socio-political and institutional aspect of NTFP production-to-consumption systems, particularly in the context of state and nonstate interventions.

Resources and property rights

Immersed in the 'subordinate modernity' (Hersch 2003:33) of contemporary Latin American social and political life, NTFPs continue to form a safety net for peasants and indigenous people, helping them weather the ups and downs of the global market and its agents. Some harvesters, such as those described in the cases of sabal, Panama hat, allspice, and vegetable leather, have formally recognised rights over the resources that form the basis for their subsistence. Others, such as the landless, displaced peasants and migrant labourers that harvest fafia, espinheira-santa, palm hearts and linaloe, work and live under conditions of greater social and legal marginality.

The prediction that producers with clearly defined proprietary rights over their resources are more invested in minimising the destructive effects of harvesting is generally supported by the case studies in this volume. The Mexican woodcarving case in chapter 21 elegantly illustrates this notion, suggesting that most populations of *Bursera* have been depleted by extractors without property rights, whereas one community with well-defined property rights and a good level of organisation has set in place an innovative study of resource availability and implemented a management plan for the species. In other instances, such as that of rubber tappers in extractive reserves described by Pantoja (chapter 24), harvesters are economically disenfranchised, but have clear proprietary rights and stronger social institutions, which in turn have helped them regulate resource extraction. In contrast, however, palm hearts in Bolivia were extracted unsustainably during an economic boom, irrespective of the tenure or property regimes (chapter 6).

Interventions

Despite years of research and extension efforts on the part of scientists, governments, and NGOs, the potential and value of many NTFP production systems remains thwarted: the peach palm, Brazilian palm heart and babaçu cases in this volume are examples. Moreover, while 'intervention' is often deemed to contribute to community development, conservation, and economic equity, the cases of bacurí and uxi point out that, in these cases, 'zero intervention' has allowed producers to formulate their own effective, locally adapted, ecological and economic production systems.

Government interventions. Many of the authors in this volume reflect on the potential, albeit often unrealised, role of the state in improving social and ecological well-being in the context of NTFP development. Many authors criticise governments for a lack of awareness, interest, and commitment to this sector. In some instances, the greatest—often negative—impact of the state on NTFPs has been indirect, and the consequence of broader interventions, typically through development and colonisation programmes. Tax subsidies in Brazil during the military government of the 1970s, for example, led to large-scale conversion of rubber and Brazil nut-rich forests to pastures, the social and ecological consequences of which in turn led to the formation of a well-organised and subsequently highly influential resistance movement of rubber tappers, whose actions contributed to the formation of large extractive reserves in Acre (Allegretti 1990; Elder 1991).

Direct government subsidies have in the past been directed at some of the major NTFP production systems—notably rubber and Panama hat—but most of these were suspended as part of the structural adjustments promoted by the International Monetary Fund during the 1980s. The ipecac case in Costa Rica (chapter 13) provides an example of the challenges faced by governments trying to implement an effective subsidy programme, which in this case led to widespread corruption and abuse, and to the eventual collapse of the co-operative of producers.

Case studies from Peru, Bolivia, and Brazil report on some of the impacts of the current forestry legislation. Fantini *et al.* and Scheffer (chapters 7, 17)

suggest that many requirements, such as obtaining permits and presenting management plans for the targeted species, penalises small producers, who often work with small profit margins and who cannot afford to shoulder the added financial burden, particularly when complicated technical and bureaucratic steps are involved. Macro-economic government measures have also been damaging to small producers of babaçu, as these have curtailed their access to the natural resource. Most of the Brazilian analyses of government interventions are likewise highly critical of efforts at criminalising the extraction of some NTFPs, even when these are under threat, as this has reportedly favoured corruption, led to a lowering of product quality and price, and contributed to the vicious cycle of ecological degradation and social marginality. Several authors likewise emphasise that many government interventions lack a coherent long-term vision, placing too much emphasis on the regulatory aspect, while providing inadequate incentives and support. Likewise, a number of case studies suggest a need for better integration and coordination among the various agencies and forms of government intervention, especially among research, extension, and enforcement.

Martínez (chapter 2) and Hersch *et al*. (chapter 22) suggest that the failure of government efforts to promote reforestation and promote NTFP production in Mexico is due to technical and logistical factors, as well as a lack of follow-up and long-term commitment, and to the lack of local participation. Despite these shortcomings, there are some success stories. For example, the Mexican government agency Fondo Nacional para el Fomento de las Artesanías has successfully promoted the crafts sector. In parts of Bolivia and Brazil, on the other hand, NTFP harvesters have benefitted from forestry laws that award them proprietary rights over logging companies.

Nongovernment interventions. The economic reforms of the 1980s and 1990s in Latin America had profound social and political ramifications. The dismantling of the welfare state and the contraction of the public sector, coupled with a continent-wide transition towards liberal democracy and political decentralisation, all catalysed the growth and consolidation of civil society in the region (Edelman 2001). On the one hand, the emergence of new social movements related to human rights, social justice, and environmental issues opened up new political and institutional spaces, and these opportunities were effectively utilised by such forest producers as the rubber tappers in Acre. The dramatic growth in the number and influence of NGOs has meant that these institutions have become the principal agents of intervention in many areas, often targeting forest communities and forest products (e.g., Forte 1999). The kinds and contexts of these interventions by NGOs on NTFP production systems varies considerably among cases. In some instances, such as carqueja in Paraná, Brazil (chapter 16), interventions have sought to create an almost entirely new production-to-consumption system: here, a consortium of NGOs has implemented new cultivation and processing techniques, trained processors, established quality controls, developed new products, and identified new markets for this plant. Other interventions, such as the one described for vegetable leather (chapter 24), on the other hand, involve forest products with a long history of use, but which are now being inserted in a new trade chain designed for a completely

new end-product and a different market. Yet another group of interventions, exemplified by the Panama hat case (chapter 23), are directed towards an old and well-established production system and trade chain, often with the goal of revitalising the system or reconfiguring the distribution of profits within the chain. It is quite conceivable that the challenges and outcomes of these interventions vary considerably according to these differences. In any case, the authors of the above-mentioned cases observe that tensions do emerge among NGOs, local organisations, and producers, particularly around issues of representation and control.

Several of the case studies in this volume consider certification as a tool to promote the social equity and environmental sustainability of NTFP production systems. Guidelines for sustainable management have been developed in the cases of Brazil nut, palm heart, and carqueja, both to inform producers and, in some cases, to work towards Forest Stewardship Council certification. As the Brazil nut and palm heart cases suggest (chapters 5, 6), the organic and fair trade certification system may be among the most profitable of the various certification systems. Certification is an accessible and useful option, particularly when there is a market prepared to pay an additional premium and for producers that have substantial financial, administrative, and technical support. In practice, this constraint limits certification to a few production systems—notably crafts, some foods, as well as medicinal and ornamental plants—aimed at supplying an international luxury market. Limited organisational and administration skills coupled with the higher direct and indirect costs generated by certification effectively places certification out of the reach of most NTFP producers. Even so, the process of working towards certification, which includes implementing guidelines for sustainable management and increasing the level of understanding and organisation in relation to markets, has been very useful for many producers (Shanley *et al*. 2002).

CONCLUSIONS

Homma's (1992) influential model of the historical dynamics of forest extraction suggests that commercial extraction of NTFPs in the Amazon follows a cyclic pattern that is characterised by an initial stage of expansion, sometimes followed by a stabilisation phase, but which ultimately gives way to the replacement of extractivism through either product substitution or intensification of the production system, namely cultivation. The main factor leading to the collapse is the interplay of ecological and economic factors: the boom in extractivism creates the ecological demise and a price increase for the forest species, prompting the creation of more easily accessible, and cheaper, alternative production systems. These production systems are typically developed in other regions, leading to the collapse of the boom in the original region. Many of the cases in this volume fit quite well in Homma's model. Wild sourcing of rubber, peach palm, pine, Panama hat, linaloe, allspice, ipecac and, more recently, carqueja has given way to cultivation, often in other parts of the world or in production systems controlled by a different set of actors. In the case of Mexican jonote and palm heart from

Brazil's Atlantic forest, there has been substitution of the species utilised. The babaçu, Brazil nut and the Bolivian palm heart cases likewise fit under Homma's 'stabilisation' phase. In the case of Brazil nut, for example, efforts to cultivate it or to substitute it with other nuts have failed.

On the other hand, however, the social, political, and market conditions of the late twentieth century have led to a resurgence of extractivism for a number of products, which in turn is hard to reconcile with Homma's model. For these cases, one might propose a revised model, which considers the possibility that the expansion-stabilisation-decline cycle occurs repeatedly for the same product. While some of the case studies in this volume, such as cat's claw and Brazilian ginseng, describe plants entering their first phase of expansion, others, such as vegetable leather and to a lesser extent linaloe, are entering a second expansion phase. It is foreseeable, too, that during one of these subsequent expansion phases, some of these plants may enter cultivation.

A historical model for NTFP extraction must also consider the possibility that production systems undergo de-intensification. The research of Caballero *et al*. (chapter 19), for example, shows how the Maya have modified the degree and intensity of management of species such as sabal according to diverse and changing circumstances. A revised Homma model would also consider the option that some forest products undergo intensification within forested and diversified environments, as is the case with zapote mamey, uxi, bacurí, and, possibly in the future, cat's claw and camu-camu.

As a whole, forest products in Latin America are managed, utilised, and commercialised in flexible ways and in highly diversified contexts, as part of subsistence strategies that respond to a biologically diverse and dynamic ecological and economic environment. In this sense, it is important to note that the different forest products illustrated in the following case studies form part of production systems that include multiple species, all of which are simultaneously, dynamically, and strategically managed. Even species such as cat's claw, jonote, or allspice, which show a fairly high degree of economic specialisation, are part of complex multi-use systems. The diversity, flexibility, and complexity of NTFP production systems are one important aspect of their multidimensionality.

It is at times difficult to reconcile the complexity and multidimensionality of forest products and production systems with the reductionism and instrumentalism of many analyses and interventions, particularly given the multiple, and at times contradictory, expectations that have been generated around NTFPs and their potential to generate income, improve social well-being, or contribute to forest conservation. On the other hand, many initiatives have focussed largely on economic aspects of NTFPs, ignoring other basic aspects of the resource and its ecological sustainability, including density and productivity (Peters 1994; Cunningham 2000). Even though large amounts of forest products are traded regionally and internationally, there are often no official statistics and it is difficult to obtain data on the number of actors involved, amounts harvested and exported, and even the currency value of such exports (Campbell and Luckert 2002). Assessing the potential role and value of NTFPs is further complicated by the fact that their value cannot be

measured in merely economic terms; cultural as well as social values are fundamentally important aspects of NTFP use (Posey 1999). Such 'invisible value' is often unaccounted for and therefore ignored by governments, the private sector, and many researchers.

In any case, it is clear that the development of NTFP production systems must consider not only the ecological and technical aspects, but social, institutional, political, and market ones as well. This in turn requires new conceptual and methodological tools, as well as new ways of linking research, external interventions, and endogenous processes and organisations. The following chapters—organised according to product type, such as medicinal plants and spices, crafts, and foods—describe a mosaic of plants, products, realities, processes, actors, and institutions. We hope that the reading will provoke thought, analysis, and discussion, and, above all, a greater appreciation of the complexity of these systems and of the possibilities and challenges that issue from them.

NOTES

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3. For detailed accounts of the project's history, premises, and the methodology employed, see Ruiz-Pérez and Byron (1999) and Belcher and Ruiz-Pérez (2001).

4. Pantoja and Saldanha (chapter 19), for example, note that two thirds of the world's production of rubber is synthetic. Even within Brazil, where rubber is indigenous and once was a mainstay of the national economy, 91% the national production is synthetic.

5. Bolivia indirectly benefitted from Brazilian subsidies on wild rubber production until these were terminated in 1986: the Bolivian national rubber industry finally collapsed in 1992 (Stoian 2000).

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