Amazon Assessment Report 2021

Chapter 11

Economic drivers in the Amazon from the 19th century to the 1970s

Gado e visto em área de fazenda próximo a floresta (Foto: Bruno Kelly/Amazônia Real)

THE AMAZON WE WANT

Science Panel for the Amazon

SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK

A GLOBAL INITIATIVE FOR THE UNITED NATIONS

About the Science Panel for the Amazon (SPA)

The Science Panel for the Amazon is an unprecedented initiative convened under the auspices of the United Nations Sustainable Development Solutions Network (SDSN). The SPA is composed of over 200 preeminent scientists and researchers from the eight Amazonian countries, French Guiana, and global partners. These experts came together to debate, analyze, and assemble the accumulated knowledge of the scientific community, Indigenous peoples, and other stakeholders that live and work in the Amazon.

The Panel is inspired by the Leticia Pact for the Amazon. This is a first-of-its-kind Report which provides a comprehensive, objective, open, transparent, systematic, and rigorous scientific assessment of the state of the Amazon's ecosystems, current trends, and their implications for the long-term well-being of the region, as well as opportunities and policy relevant options for conservation and sustainable development.

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Graphical Abstract

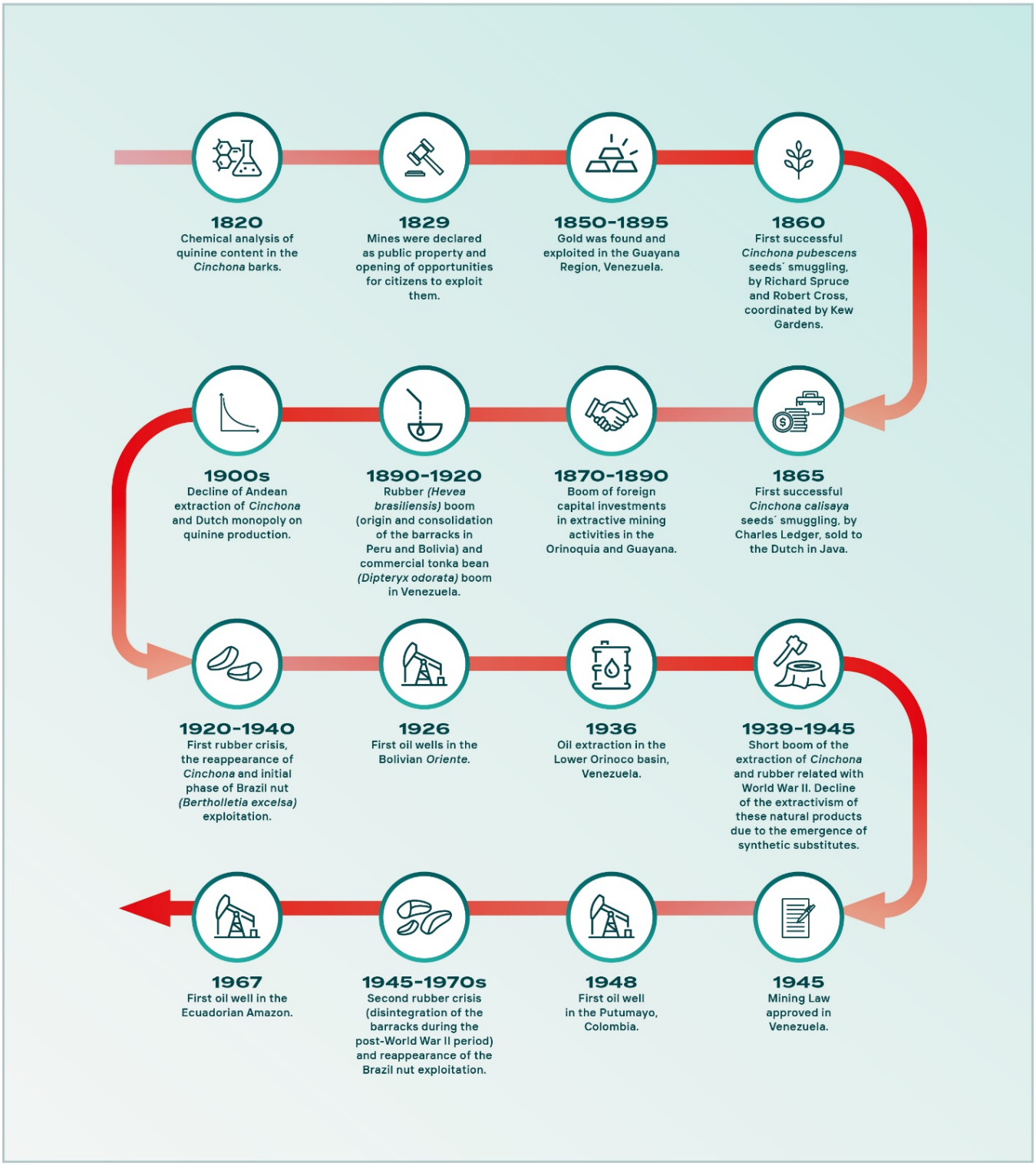

Figure 11.A Graphical Abstract

Economic Drivers in the Amazon after European Colonization from the Nineteenth Century to the Middle of the Twentieth Century (the 1970s)

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Key Messages

- During the nineteenth and twentieth centuries, there were boom and bust cycles for various natural products such as *Cinchona* and rubber. Processes such as the extraction of gold continued, and the exploitation of oil was initiated, both continuing to this day. The extraction of some products created the conditions necessary for the exploitation of others, as in the shift from Chichona to rubber and then from rubber to the Brazil nut.
- Extractive industries were always supported by States, in association with national and foreign investors, and took advantage of Indigenous labor, often in exploitative conditions. Access to the Amazon and the extraction of these products initially took place using rivers, which also continues in the present, with the addition of roads and highways since the twentieth century.

Abstract

The objective of this chapter is to identify the main economic processes that occurred in the Brazilian, Andean, and Guyanese Amazon during the nineteenth and twentieth centuries until the 1970s. Specifically, the chapter describes the history of extractivism and the effects of geopolitical reconfiguration in the Amazon after the processes of emancipation or decolonization. It analyses the history of the extraction of natural resources, starting with quina barks (species of the genus *Chinchona,* Rubiaceae) and rubber (*Hevea brasiliensis*, Euphorbiacae), as well as the characteristics and practices developed by social actors related to the local and regional economy that arose from these exploitations. It also includes a synthesis of the history of exploitation of oil, minerals (mainly gold), wildlife trafficking, the emergence of mechanized agriculture, intensive livestock herding, and mega-infrastructure. Finally, it identifies the main lessons learned and key messages from the use of "historical commodities" in the Amazon and their implications for contemporary patterns of use of resources, such as the Brazil nut (*Bertholletia excelsa*, Lecythidaceae).

Keywords: History of extractivism, Cinchona, rubber, oil, natural gas, gold, NTPF.

11.1. Introduction

Over the last two centuries, the Amazon's oil, minerals, and biodiversity have been used intensively as a result of national and international economic interests. Public policies promoted by Amazonian countries have sought to ensure sovereignty and, gradually, private and state investment, creating a complex configuration of socioecological systems (Homma 2003; Hecht 2011; Bottazzi *et al.* 2014; Pinho *et al.* 2015), even creating "parallel states" (Cuvi 2011; Hecht 2011; Hecht and Cockburn 2011).

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In the nineteenth and twentieth centuries, examples of "parallel states" were those derived from the extraction of non-timber forest products such as *Chinchona* spp. or rubber (*Hevea brasiliensis*) in Brazil, Bolivia, Colombia, Ecuador, and Peru (Hvalkof 2000; Homma 2003; Hecht and Cockburn 2011). These processes affected current patterns of use and occupation (Hecht 2011; Schmink 2011), including violations of the rights of Indigenous peoples and other settlers who were used as low-cost labor in the region. The so-called eco-harvest of the Brazil nut (*Bertholletia excelsa*, Lecythidaceae), currently one of the economic engines of the southwestern Amazon (Peru, Brazil, and Bolivia), is a legacy of the rubber period, which in turn was a legacy of the *Cinchona* period (Stoian 2000, 2005; Duchelle *et al.* 2012).

Since the early 1960s, the predominant perception among the national governments about their Amazon territories was that there were empty, unused spaces, with formidable natural resource reserves (e.g., minerals, oil, hydroelectric energy, wood, agriculture, and plants for pharmaceutical, cosmetic, and agrochemical uses) and with their sovereignty at risk (Fearnside 1987; Hecht 2011; Clement *et al.* 2015). Several countries established policies and programs with the objective of occupying and accelerating the integration of the Amazon into national and regional economies (Fearnside 1987; Valentim and Vosti 2005). This was achieved through the construction of new roads, improvement of existing roads, and investments in large hydroelectric plants, mainly in Brazil. Governments also provided tax incentives and subsidized credit for private investment in oil and mineral extraction, extensive agriculture, and livestock projects (Valentim and Vosti 2005). Policies promoted large-scale initiatives linked to government and private settlements for the relocation of landless families from other parts of their countries (Valentim and Vosti 2005; Hecht and Cockburn 2011; Valentim 2015; Fearnside 2016). In Brazil, these initiatives were complemented by a pilot project for the implementation of an Industrial Free Zone in the city of Manaus, capital of the state of Amazonas (Aloise and Macke 2017).

These policies and processes accelerated socioeconomic and environmental changes from the early 1960s to the late 1970s. These changes were characterized by rapid population growth in rural and urban areas, accompanied by increased deforestation and urbanization (Valentim and Vosti 2005). As the myth of the Amazon as an empty, unused space was discredited, there was a sharp increase in territorial conflicts between new settlers and Indigenous peoples and local communities (Valentim and Vosti 2005; Hecht and Cockburn 2011). Towards the end of the 1970s, there were a large number of conflicts over land rights and natural resources, which went hand in hand with a growing global perception of the Amazon's key and fundamental role in global sustainability (Hecht 2011; Schmink 2011). This led to the emergence of organized socioeconomic movements that, in association with the growth and effectiveness of national and international political actions, continue to struggle to reshape existing social policies and new ecological systems towards sustainable and inclusive development of the Amazon (Hecht 2011; Schmink 2011).

This chapter synthesizes the main historical processes as economic drivers that shaped the current landscape and diversity of socioecological systems in the Amazon. It carefully analyses what happened after European colonization, from the nineteenth century to the emergence of national sovereignty projects between the 1950s and 1970s. The main natural resources that were used in this period are described, including a synthesis of those resources that today are part of the economic engines of the region.

11.2. History of the Extractive Economy Based on Quina

"Quina" or "cascarilla" are the most frequent names for the plants of the genus *Cinchona*, and some of the genera *Remijia* and *Ladenbergia*. Their barks, in the form of powders, have medicinal properties including the ability to prevent and treat malaria (Achan *et al.* 2011) (Figure 11.1). *Cinchona*

bark contains four main medicinal alkaloids: cinchonine, cinchonidine, quinidine, and quinine, the last being the most important. Each species has different concentrations of alkaloids, which can vary even within the same species depending on the locality, altitude, soil type, age of the tree, and harvest time. There is also a lot of hybridization between species (Garmendia 2005; Maldonado *et al.* 2017). The genus *Cinchona* is widely distributed in the tropical Andes, from the lowlands to above 3,000 m (Figure 11.2 and 11.4). Only the *C. pubescens* species reaches the mountains of Panama and Costa Rica. The sites with the greatest diversity and endemism are southern Ecuador and central Peru (Andersson 1998). The quinas have sometimes been called the "savior plants of mankind". Over time they became important icons for various nations, finding a place in the national emblem of Peru in 1825, and becoming the national plant of Ecuador in 1936 (Acosta 2019).

Like many other historical and contemporary products, the history of the quinas connects the Andes and the Amazon with the world at different times. This history is made up of religious, commercial, and scientific controversies. For example, debates have taken place for centuries as to whether Indigenous peoples knew about its medicinal properties (see for example, Ruiz 1792 or von Humboldt 1821); in this regard, there is increasing evidence that knowledge was transmitted from natives to Jesuits (Estrella 1994; Ortiz Crespo 1994; Crawford 2016). An erroneous history that has circulated widely, up until the present day, refers to the fact that the Countess of Chinchón was cured of malaria with powders of *Cinchona* bark and then she distributed it to the peoples of Lima. Today we know that this story is full of errors, beginning with the supposed participation of the Countess (Haggis 1941). However, it served the purpose of validating the medicine among the nobility and the people. The first European explorer to describe these plants was the French academic Charles Marie de La Condamine, who sent specimens to Linnaeus (de la Condamine [1738] 1986). The Swedish botanist gave that Latin name to the plants, convinced of the legend of the Countess of Chinchón. Shortly after, Joseph de Jussieu carried out a more detailed exploration, but his work was not widely known (Jussieu [1737] 1936). After them, more explorers hunted for quinas in South America (WHMM 1930).

Figure 11.1 Glass pharmacy jar containing powdered quinine. Source: Unknown maker, Wellcome Collection. The jar is believed to be from the pharmacy of the Milosrdnych Bratri Monastery and Hospital Brno, in the Czech Republic. The painted label written in Latin indicates that this glass pharmacy jar contained powdered quinine. In: https://wellcomecollection.org/works/ycqazud9

The connections of the quinas account for the appetite of several international markets, which first led to intensive extractivism and then to the successful smuggling of seeds to Asia, after several attempts by European monarchies and republics since the 18th century (Brockway 1979; Spruce 1996). European colonization of the interior of Africa was fundamental in increasing demand

(Headrick 1981). *Cinchona* was a decisive incentive for the opening of roads to and in the Amazon, later used for other products such as rubber.

The *C. officinalis* species from Loja, in southern Ecuador, also called "fine *Cinchona*", was the first to be extracted in the 17th century. Due to the growing demand, the *Cinchona* areas of that region were rapidly destroyed, generating lucrative businesses and early warnings about the destructive processes associated with the extraction of bark (Espejo and Estrella 1993). The 18th century witnessed boom and bust processes in Cuenca and Loja (Moya Torres 1994). In the eighteenth-century, demand was so high that the Spanish crown monopolized the product for 38 years (Puig-Samper 1991; Estrella 1994; Crawford 2016) and sent two great botanical expeditions to New Granada and Peru, one of whose main objectives was the discovery of anti-malarial plants. One aim of that royal expeditions was to determine if Loja's fine bark trees were present in other sites, or to find equally effective species (Caldas 1966; Nieto Olarte and Flórez Malagón 2001) Those expeditions helped to increase the knowledge of *Cinchona* to a large extent, but also contributed to the intensification of conflicts around the taxonomy, distribution, and quality of the different species (Fernández 2019). Even the Prussian Alexander von Humboldt intervened in the matter, further confusing the issue and, as in other matters, without giving explicit recognition to the sources of his knowledge (Cuvi 2011).

There was much controversy over the quality of the quinas, an issue associated with frequent adulterations (Crawford 2007). That situation changed in 1820 when the alkaloid quinine was first isolated by Pierre-Joseph Pelletier and Joseph B. Caventou, which led to improved analysis. After that, it was possible to measure the quality of different species, and to open new sites for extraction in Ecuador, Peru, and Colombia, where it helped configure an Andean-Amazonian space, generating profound transformations of the landscape (Figure 11.3). In those countries, there were three periods of boom, of which the third, between 1877 and 1882, mainly

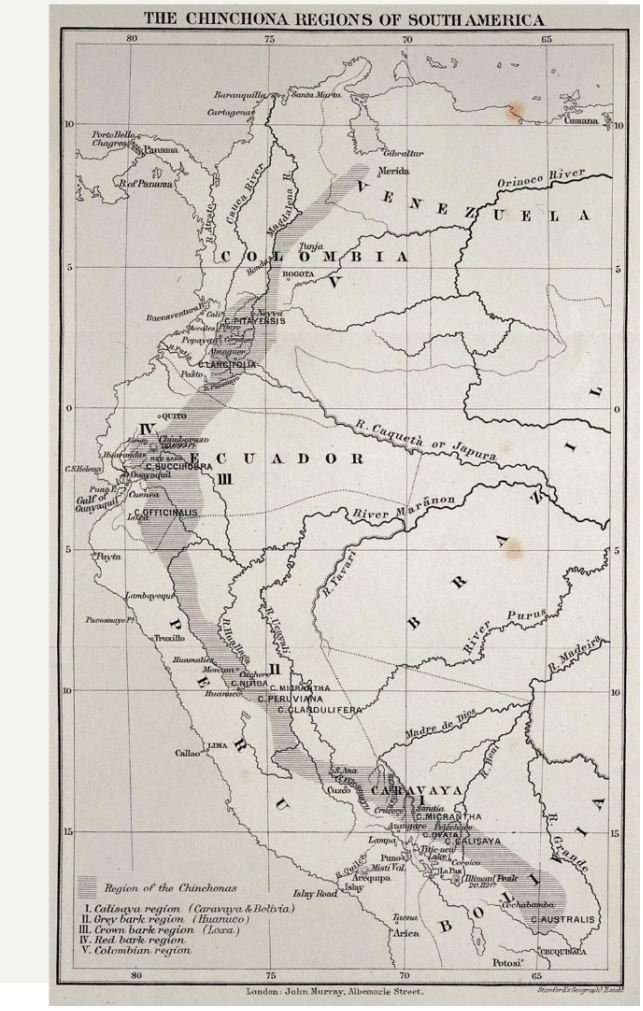

Figure 11.2 The *Cinchona* regions of South America, nineteenth century. Source: Clements R. Markham, Peruvian bark: a popular account of the introduction of chinchona cultivation into British India, 1860-1880. Welcome Collection. In https://wellcomecollection.org/works/hjgh4e7c

in Santander and on the Amazon slope and foothills, allowed for improvement of the fragile links between the Amazon and the country and laid the foundations for subsequent rubber exploitation (Zárate Botía 2001; Palacio Castañeda 2006). Chemical analysis also led to the knowledge that one of the species with the highest quinine content was *C. calisaya*, distributed at altitudes between 200 and 3,300 m, especially in Bolivia towards the Amazon slope, intensively exploited from the beginning of the nineteenth century (Steere 1943; An-

Figure 11.3 Gathering and drying of *Cinchona* bark in a Peruvian forest. Source: Wood engraving, by C. Leplante, c. 1867, after Faguet. Wellcome Collection. https://wellcomecollection.org/works/werf33s3

dersson 1998; Zárate Botía 2001; Maldonado *et al.*2017). As in Colombia, the use of this species laid the foundations for the subsequent exploitation of rubber, by involving the native population in its exploitation, defining an economy strongly based on free access and low-cost labor.

In several enclaves, such as the Cuenca and Loja regions in Ecuador, and in Colombia, Peru, and Bolivia, there was a direct relationship between political power and "*cascarilleros*" (bark gathereres) (Moya Torres 1994; Zárate Botía 2001). The quinas were fundamental in opening up mountain passages towards the Amazon, in addition to strengthening existing ones and motivating the migration of locals and foreigners into the Amazon. Extractive areas proliferated throughout the Amazon. Among other things, transportation routes changed, no longer moving through the Andes and ports such as Callao, Guayaquil, or Cartagena; but also through the Amazon, via Iquitos or Manaus, boosting local economies. It triggered large-scale spatial, social, and economic changes, fostering a whole series of production chains, from the packaging of bark to the provision of food, meat, bananas, sugar cane, cocoa, coffee, cotton, cassava, yam, oats, fruit trees, tobacco, and livestock (Zárate Botía 2001). Bolivia even decreed a monopoly on *Cinchona* and created a Bank of *Cinchona* in 1840 (Pardo Valle 1947).

Among the main users of *Cinchona* bark were the expansionist European empires, who needed it for their armies in Africa and Asia. They had been trying to smuggle plants since at least the 17th century, finally succeeding in 1860, when *C. pubescens* seeds were sent from Ecuador to Sri Lanka and India (Spruce 1996), and in 1865 when seeds of *C. calisaya* from Bolivia arrived in the Dutch colonies on the island of Java. The British used the alkaloid-poor *C. pubescens* species to make totaquina, while the Dutch received seeds from the powerful *C. calisaya*, which they genetically improved, increasing its quality and creating a new species, *C. ledgeriana*, named in honor of smuggler Charles Ledger, who illegally obtained the seeds from Manuel Incra Mamani, an Indigenous man from Bolivia (Gramiccia 1988).

Towards the end of the nineteenth century, South American production reached its peak, and gradually began to stagnate, because Dutch production in Java monopolized the market and British purchases declined. By the first half of the twentieth century, Java accounted for 90-95% of the global production and market. Only small shipments departed from South America, representing a marginal percentage of production, sometimes bought out by members of the Kina Bureau to take them off the market (Pardo Valle 1947). When it stopped being profitable, the quineros' investments found different targets. In Bolivia and Colombia they became rubber barons (Stoian 2005). In Colombia, they also directed their financial capital into the coffee and navigation sectors (Zárate Botía 2001).

During World War II there was a brief, although very intensive, renewed boom in the extraction of Andean quinas (Hodge 1948; Cuvi 2011). This led to the reopening or rearrangement of routes from the mountains to the Amazon, also associated with other renewed extractivist actions such as those involving rubber (Bangham 1945; Cuvi 2011). An important case comes from Tingo María, in Peru, where, among other things, a colonization front associated with a scientific station was made. During this period, Colombia was the largest supplier of bark, followed by Ecuador, Bolivia, and Peru. The scale of the *Cinchona* Program was unprecedented. In the 18th century, when the Spanish crown exercised a 38-year monopoly over the production of *Cinchona*, 350,000 pounds of bark were shipped to the Royal Apothecary (de Andrés Turrión 1989). In contrast, through the *Cinchona* Program, between 1941 and 1947, the United States imported approximately 40 million pounds of dried bark. This figure does not include bark processed in Latin American factories (Cuvi 2011).

Quinine and other natural anti-malarial alkaloids obtained from *Cinchona* barks remain an important antimalarial drug almost 400 years after their efficacy was scientifically documented, although in a much lower amount. Since World War II, synthetic compounds such as chloroquine or primaquine, among others, have been widely used (Greenwood 1995). The same can be said for synthetic quinine, used since 1944 (Woodward and Doering 1945). There were a few subsequent booms, for example during the Vietnam War, when synthetic-resistant strains of malaria appeared (Greenwood 1995). However, over time demand for the natural product declined considerably, limiting its use to beverages such as tonic water, cosmetics, or medicines to combat resistant strains.

Cinchona alkaloids were among the first Andean-Amazonian products to be integrated into European therapeutics. These processes contributed to myths about the potential riches of South America (see Chapter 9), whose products were gradually and constantly incorporated into international markets. The boom-and-bust cycles illustrate how demand from these markets impacted not only the products themselves, but also the forests that contain them, and local economic, social, communicational, political, and geopolitical dynamics. Today we can identify similar cases around *guayusa* and *ayahuasca*, among other products. The case also illustrates the long duration of biopiracy, a process that we still witness, for example, with the bioprospecting of useful plants.

The decrease in demand for South American *quinares* since the nineteenth century, first owing to the

development of plantations in southeast Asia, then to the decrease in demand for natural bark, has changed the status of the *Cinchona* plants, which moved from being on the verge of extinction to not currently threatened. Only one of them, *C. mutisii*, is considered Endangered according to the IUCN Red List, and three others are Vulnerable. Today, pressure comes from the continuous destruction of habitat.

11.3. History of the Extractive Economy of Rubber

In the nineteenth century, European capitalism had already established a framework to search for and transfer wild plants that were potentially useful as raw materials for industry and in pharmacy. Although the natives of the Amazon Basin demonstrated the use of rubber products to arriving Europeans since the sixteenth century, it was not until the discovery of vulcanization in 1839 that industrial application of rubber multiplied and a boom in demand took place. Among the many latex producing species worldwide, those belonging to the genus *Hevea*, especially *H. brasiliensis* (Euphorbiaceae) provide the highest yield of the highest quality latex. The fast-growing world rubber demand led to a boom in rubber production in the Amazon.

Although rubber production ("the trees that produce gold", Zeitum Lopez 1991) involves a large number of the countries, its history is linked to the lowlands of Brazil, Peru, and Bolivia) (Figure 11.4). In 1880, the Amazon Basin was the only place in the world producing wild rubber. Brazil supplied 60% and Peru 30% of global rubber consumption (Haring 1986). In Peru, the rubber economy coincides in part with the so-called period of the "Aristocratic Republic (1895 - 1919)", after the Pacific War (1879 - 1883), when the country lost territory and access to its exportable renewable resources, guano and saltpeter, to Chile (Contreras and Cueto 2013). The defeat was a strong blow to Peru's economy and position as the primary exporter of these materials, causing economic collapse (Pennano 1988). Without guano and saltpeter, Peru turned to other economic activities, such as rubber exploitation in the Peruvian Amazon. This period saw the global consolidation of capitalism, which implied the search for regions in the world that could supply natural resources to major economic powers, as well as the establishment of unequal commercial relationships between countries (Chirif 2011). Peru formed part of this unequal economic model as a supply country. In the case of Bolivia, the use of rubber began at the start of 1860. It was characterized by the fact that many families dedicated to quina, already in decline, moved to rubber. They promoted production based on the establishment of barracks that allowed them access and direct control over the forest, as well as to consolidate Indigenous labor, giving rise to unequal employer-client relations (Stoian 2005). The rubber boom in Bolivia occurred between 1898 and 1919 and was characterized by high prices rather than volume, an incentive for the involvement of private capital, mainly foreign, and a state that benefitted from the collection of taxes without exercising any control over the rights of the forest (Stoian 2005). In Brazil, this cycle started in 1850 and crashed towards 1920 (Weinstein 1983; Dean 1987).

In 1896, the Peruvian merchant Julio Cesar Arana began exploring rubber plantations in the Putumayo River valley, now a territory of Colombia. By 1905, he had acquired over three million hectares within Colombian territory, using Indigenous labor to extract rubber. Over the course of twelve years during which native rubber was exploited, the Indigenous population of this region went from 30 thousand to less than eight thousand, while revenues of US $75 million were generated from the export of 4,000 tons of rubber. In Brazil, rubber export houses were mainly concentrated in the cities of Manaus (state of Amazonas) and Belem (state of Pará), which were the main ports of the Amazon River system. At its peak, rubber was one of the leading products in the Brazilian economy, accounting for up to 40% of its exports, second only to coffee (Weinstein 1983; Dean 1987; Becker 1995). In 1876, Henry Alexander Wickham, working for the Royal Botanical Garden of London, collected 70,000 rubber tree seeds in the Tapajós River Valley and took them to England. The result-

ing seedlings were later planted in British colonies in Malaysia, generating extensive, high-yielding plantations. Over a period of 50 years, the British became the largest rubber producers in the world, with disastrous effects on the Amazon's economy.

In Peru, the rubber economy was based in the city of Iquitos, which collected rubber from the surrounding areas. Transport between Iquitos and Lima, over the Andes, was difficult. For this reason, Iquitos was naturally more connected to markets by the Amazon River. This connection increased after 1853 when an agreement was reached with Brazil for the navigation, circulation, and trade of Peruvian ships on the Amazon River (Pennano 1988), and commercial relationships were also established with England and the United States. By this time, Charles Goodyear had discovered the vulcanization of rubber (1839), and international demand rose, making Brazil the first and most important producer of this product. The city of Iquitos, Peru, achieved its rubber economic boom after Manaus (Chirif 2011). Export records show that the export of rubber grew exponentially from 1862 to 1870, and again from 1884 to 1910, although the following year, 1911, there was a sudden export decline due to falling international prices (García 1982; de la Rosa 2004).

In Peru, rubber was exploited in the Putumayo Basin (now Colombian territory), and in the Madre de Dios region, where an intensive search for new rubber-producing areas took place. In Putumayo and Madre de Dios, this activity disrupted the lives of local Amazonian populations, who were captured, subjected to slavery, and massacred ("Putumayo massacres") in order to extract rubber and meet growing international demands (García 1982; Casement 2014). Towards 1870, as demand grew, the harvesting of rubber spread to new areas and led to the rise of Iquitos and Manaus as large rubber centers. At the same time, in Madre de Dios new routes were sought for the extraction and trade of rubber (de la Rosa 2004). Ancestral knowledge about the management of rubber forests was used (Pennano 1988), and those who had that knowledge were enslaved.

The Amazon was integrated into the global economic order, supplying rubber to distant economic centers and establishing trade relations between countries (Chirif 2011). In the case of Bolivia, the rubber economy was concentrated in the north of the Amazon (along the Yata, Mamore, Itenez, Orthon, Tahumanu, and Madre de Dios Rivers). Its decisive and key participant was the so-called "Casa Suarez" (Nicolas Suarez and his brothers) that based its success on control of the vertical supply chain (of meat and other foodstuffs) for the barracks and laborers, along with a system of debt-peonage (in Spanish "*habilito*", in Portuguese "*aviamento*"), which became widespread throughout the region and persists today in the case of the Brazil nut (*B. excelsa*). On the other hand, Casa Suarez bet on the control of the transport route (eg. Cachuela Esperanza, Beni) and then on the control and administration of the territory, specifically, the barracks (Weinstein 1983; Stoian 2000, 2005).

In both Peru and Bolivia, before intensive rubber exploitation was established, local populations went deep into the Amazon to extract latex using native techniques. It was then transformed and transported to small shipping ports for sale (Pennano 1988; Stoian 2000, 2005). In the case of Peru, specifically Putumayo, native manual labor was used for this extraction, while in Madre de Dios both Andean migrants and local Indigenous populations participated (García 1982; Pennano 1988). Around 1890, with the increase in this activity, the *Regatón* figure appeared, which later became the *aviador*, thus monopolizing the local rubber trade (Pennano 1988). As the *aviador* knew the needs of the rubber collectors, he granted them credit on account of future collection, but added interest to the loan. The *aviador* easily found the backing of a banker to trade the rubber while, over time, the local producers could not repay the loans and were left in debt-peonage, at the expense of the *aviador*. In both countries, the first rubber colonies were made up of a boss, rubber tappers, and peons (García 1982; Stoian 2005). The boss was the owner, who paid a fixed salary to the rubber tappers, while the peons, mostly Indigenous, received a piecerate payment, condemning them to permanent

debt-peonage with no power to leave. The rubber economy was based on a local chain economic system, in which the rubber tapper depended on commercial companies for credit, employed workers to take care of the land, and, in some cases, semi-enslaved Indigenous people for the direct extractive work (Stoian 2005 and others).

Rubber seeds were also taken from the Americas, creating large plantations in other colonies, which were equipped with roads, railways, cheaper labor, and better possibilities to reach international markets. The opposite happened in South America, except for isolated trials by Harvey Firestone and Henry Ford in Brazil or Roberto Crawford (Pichis River) in Peru (San Román 1994). On the Amazon and Napo Rivers, rubber estates were created from relatively small legal grants of land, which became joint ventures that commercialized rubber and agricultural products (Weinstein 1983; Becker 1995). On the border of Brazil, Peru, and Colombia, powerful rubber exploitation lineages were established and came into constant conflict with one another, while a border dispute between Peru and Bolivia in Madre de Dios was permanently fueled by the expansion of rubber production. Returning to the commercial *boom* developed in Iquitos (Peru), Cachuela Esperanza (Bolivia), and Acre (Brazil), its success was based on a regional commercial monopoly, led by companies or powerful families with investment capacity, access to credit, and channels and incentives to export (Weinstein 1983).

During the twentieth century, World War II interrupted the supply of cultivated rubber from Southeast Asia to the Allied Forces and increased demand for rubber from collectors who extracted latex from native rubber trees scattered throughout the Amazon. In response to this demand, the Brazilian government organized the "Battle for Rubber" to increase rubber production in the Amazon. More than 30,000 "rubber soldiers" were recruited, mainly from the northeast region of Brazil, and sent to work in the Amazon's rubber plantations. With the end of World War II, most of the financial support from international governments for these projects was stopped, and the region's economy faced a decline that lasted almost two decades, affecting not only Brazil but also Peru and Bolivia (Weinstein 1983; Dean 1987; Pennano 1988; Stoian 2000, 2005). The extractivist economy based on the exploitation of rubber completed the integration of the Amazon into the world economy; however, it depended heavily on the decline in *Cinchona*, participation of foreign capital, and a system of barracks that was gradually consolidated and remained "intact" for decades. It was also later deeply affected by the reorganization of access to forest resources and the redistribution of land by agrarian reform processes, especially in Peru, Bolivia, and Brazil.

11.4. Other "Commodities" from the Amazon: Wildlife and Non-Timber Products

In pre-Hispanic times, the flora and fauna of the Amazon were objects of consumption and trade across the American continent, under the control of different Amerindian peoples and while conserving biodiversity (Chernela 1985; Lopez-Zent 1998). However, since the nineteenth century, global industrialization and the imposition of extractive economic models shifted the balance to have a negative impact on ecosystems and local populations. An enormous amount of wildlife from the Amazon has been exported to the United States, Europe, and Asia to meet demand for leather, skins, and feathers, among other products. This has caused the extinction of several species and threatens others. The eight Amazonian countries have made lists of threatened species of flora and fauna, which include more than 12,000 native species (Sinovas *et al.* 2017), such as timber and non-timber plants, including cedars, mahogany, palm trees, lianas, vines, and orchids; as well as small and large animals such as reptiles, mammals, fish, and frogs. These species are sought after for industrial (pharmaceutical, food, cosmetic, textile, fashion, furniture), medicinal, and ornamental purposes, as well as for the pet market.

National governments have enacted laws and legal measures have been taken to reduce this pressure on native biodiversity, such as the creation of for-

est reserves or protected areas, regulation of the hunting of certain species, and the breeding of plants and animals in nurseries and captivity for commercialization. However, the lucrative, uncontrolled, and illegal extraction of wildlife continues to exist (Mayor *et al.* 2007; Rodríguez and García 2008). During the 16th and 17th centuries, some animal species were traded, such as the manatee (*Trichechus inunguis*) for its meat, skin and oil, and the macaw (*Ara macao*) for its feathers and exotic flavor. Between the eighteenth and nineteenth centuries, the Amazon and Orinoco turtles were almost exterminated by the enormous collection of their eggs to make oils, just as the Orinoco caiman hunt began. From the middle of the nineteenth century to the beginning of the twentieth century, animals such as otters, hawksbills, eagles, and boas were caught for the export of their skins, antlers, and shells. Live birds were also caught for their plumage and as pets; birds, shrimp, snails, shell, and nacre lime were dissected; alligator, puma, and jaguar hides were stored; insects, oysters, ducks, pearls, and water and land turtles (morrocoy) were caught and their shells collected (Rodríguez and García 2008; Sinovas *et al.* 2017). During the 1920s in Bolivia, when rubber prices declined, trade in forest animal hides and skins rose and the "Casa Suárez" in Cachuela Esperanza became an important shipping point (Letellier 1964). In the 1970s, demand for wild fauna skins from the fashion catwalks increased. The same happened with butterflies, tarantulas, colorful frogs, lizards, snakes, ornamental birds, and fish such as paiche or pirarucú, among others, to be used as pets, for biomedical and ethological research, and for advertising aimed at tourists (Sinovas *et al.* 2017).

There was also a high demand for export of timber species, such as red cedar (*Cedrela odorata*) and mahogany (*Swietenia macrophylla*), primarily to the USA and Mexico. In Venezuela, due to the overexploitation of these species, the national government mandated the creation of forest reserves during the 1950s-1960s, but legal logging removed valuable timber species above the legal size and left the remnants damaged. Also, due to pressure from private companies, protections were weakened in many forest reserves. Domestic demand for these species increased sharply from 1946 to the 1960s. To meet demand, lower-quality species such as *Anacardium excelsum* ("mijao") and *Tabebuia rosea* ("apamate") were felled. In 1970, a system was started which temporarily granted time lots for the exploitation of timber in forest reserves, but these were used unscrupulously and illegally by logging companies, without any control or nurseries to promote the regeneration of timber trees (Kammesheidt *et al.* 2003). One example is the Imataca Forest Reserve, which extends through the states of Delta Amacuro and Bolívar, where the ancestral territories of several Indigenous peoples are located, and which was declared a World Heritage Site by the United Nations Educational, Scientific and Cultural Organization (UNESCO). Today, the Mining Arc has destroyed an important part of Imataca Reserve, where legal and illegal exploitation of various minerals and intense deforestation occur.

Furthermore, many non-timber plants of great importance for the biodiversity of tropical forests have great commercial appeal, including palm trees such as moriche palm (COL), aguaje palm (PER), palma real (BOL) (*Mauritia flexuosa*) (Figure. 11.4), mamure (*Heteropsis spruceana*), and chiquichique (*Leopoldinia piasava*) (Clement *et al.* 2015; Levis *et al.* 2017). Additionally, tonka bean trees (*Dipteryx odorata* and. *D. punctata*, Fabaceae), have been removed from forests in large numbers since the nineteenth century, thanks to their aromatic fruit used mainly in the perfume industry (Torrealba 2011). There are different species of tonka bean trees found in Brazil, Peru, Bolivia, Ecuador, Colombia, Trinidad, Venezuela, and the Guyanas (Torrealba 2011, Figure 11.4). In Venezuela, wild tonka bean trees ("sarrapia") are located in the Amazon, Bolívar, and Delta Amacuro States, but the highest concentration of trees ("sarrapiales") is found in Bolívar State, specifically in the Sucre and Cedeño municipalities, in the territory that expands from the northern Amazonas state, on the Suapure and Parguaza Rivers to the Bajo Caura. During the rubber era (1875-1920), in this region of Venezuela, a commercial tonka bean boom occ-

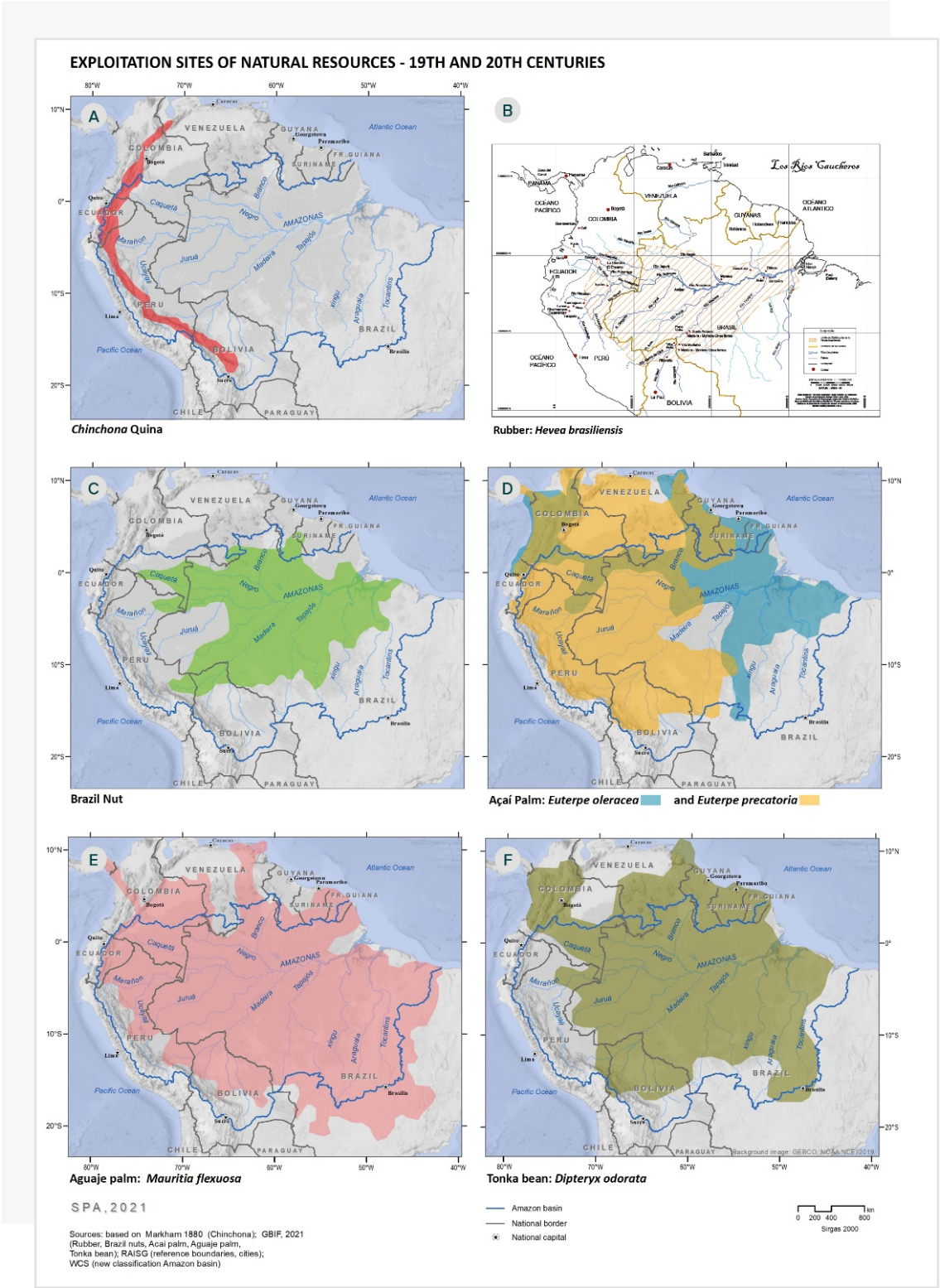

Figure 11.4 Areas of historical distribution of use of A) *Cinchona* (species of the genus *Chinchona*, Rubiaceae), B) rubber (*Hevea brasiliensis*, Euphorbiaceae)[1], C) Brazil nut (*Bertholletia excelsa*, Lecythidaceae), D) açai palm (*Euterpe precatoria*, Arecaceae), E) moriche/aguaje/palma real (*Mauritia flexuosa*, Arecaceae) and F) tonka bean (*Dipteryx odorata*, Fabaceae).

urred (Scaramelli and de Scaramelli 2005). Its commercialization process played an important role in the economic and cultural dynamics of various Indigenous peoples (Mapoyo, Panare, Piaroa and Jiwi) and some Middle Orinoco peasants. Its use was followed by migratory waves of workers from different parts of Venezuela in the period 1890-1965, with significant demand during the consolidation of the extractive economy in Guyana and the institutionalization of debt-peonage (Torrealba 2011). Its production is still in force on a smaller scale. Its seeds have always been highly valued by Europe and the United States and have been widely used in the manufacture of perfumes, the tobacco industry, the pharmaceutical industry, and in food production. The upper Amazon was the center of domestication and origin of cocoa (Zarrillo *et al.* 2018), which was also grown and used in the southeast of present-day Ecuador. In both colonial and early post-colonial times, the coast had the largest number of cocoa plantations, which reached their peak production in the late nineteenth and early twentieth centuries and then collapsed due to pests (McCook 2002). To this day, the Amazonian territories represent only a marginal proportion of national cocoa production.

Following intense extraction of *Cinchona* during the nineteenth century, and rubber at the beginning of the last century, is the harvest of the Brazil nut (Figures 11.4). The rubber period left behind an Amazonian territory characterized by the appearance and dilution of the "barracks" and the formation of new rural settlements (Stoian 2000, 2005). The Pará region in Brazil is largely covered by the Tocantins basin where Brazil nut harvesting began in the middle of the nineteenth century (Clement *et al.* 2015; Levis *et al.* 2017). There are records that mention the export of Brazil nut to Europe as early as the seventeenth century, and although the harvest was relatively intense in Brazil after the collapse of the rubber industry, lower operating and labor costs ended up favoring production in the Madre de Dios region (Peru), and Pando and Riberalta (Bolivia), the main Brazil nut exporting regions today (Clay 1994, 1997). In both regions, the emergence and consolidation of an extractivist economy based on Brazil nuts benefited from the socioeconomic context (agro-extractivism based on the collection of raw materials from the forest) and knowledge and use of the forest generated from the legacy of rubber production (Stoian 2000, 2005).

It is important to highlight the Pará region, to which the name of the Brazil nut alludes, since other species of contemporary economic importance historically come from this region. This includes the açai palm (*Euterpe oleracea,* Arecaceae*,* Figure 11.4), a name that comes from the Indigenous word Iaçá, which written backwards is açai, whose fruits were important elements in the diet of the Indigenous peoples of the central Amazon. The palm hearts of several species of açai palm were exploited intensively during the 1940s in Brazil's south and southeast regions (*E. edulis* and *E. oleraceae*), even affecting other species during the 1960s and 1970s (*E. precatoria*). In the case of Bolivia, this continued until the 1990s (Stoian 2004, Figure 11.4). Its use was also a consequence of the collapse of the rubber industry (Stoian 2004, 2005). Market contraction, differences in cutting cycles and intensities, increasing distances between supply areas and processing plants, and the detection of botulism caused production to slowly diminish, giving way to species in managed systems, such as *Bactris gasipaes*. The intense use of palm hearts, and associated felling of palm trees, probably affected the populations of these species, especially *E. precatoria* (Johnson 1996; Stoian 2004). However, evaluations on this topic are scarce. On the other hand, in recent decades, supply, production, distribution, and export chains have been consolidated for the pulp or derivatives of açai fruits (*E. oleracea* and *E. precatoria*), especially in Brazil. Such processes are still being strengthened in other countries, such as Colombia and Bolivia.

Extractivism is part of the history, occupation, and re-occupation of the Amazon, as evidenced by an economy based on *Cinchona* and rubber in the recent past, and later on the tonka bean, açaí palm, and Brazil nut. During the nineteenth and twentieth centuries, such activities resulted from national security policies that promoted colonization

of and migration to the Amazon, promoted by republics in the process of stabilization, especially Brazil, Ecuador, Venezuela, and Colombia. These occupation processes were decisive in initiating and consolidating the geography and geopolitics of large-scale exploitation, as is the case of rubber. Added to this were agrarian reform processes that took place from the middle of the last century, which defined new structures and configurations of land ownership. One example is the concept of *latifundios* (large estates) in the Bolivia lowlands that favored mechanized agriculture and intensive cattle raising, leaving extractive activities to peasant and Indigenous communities. On the other hand, dozens of promising NTFP species have been identified, many of them multi-purpose palm species part of the pre-Columbian history of the Amazon (Homma 1992; Clement *et al.* 2015; Levis *et al.* 2017). These products face the considerable challenge of becoming a viable alternative to deforestation and, in the case of Amazonian fruit species, domestication and commercialization through agroforestry systems.

11.5. Historical Gold Mining

Rumors about the immense natural riches of the Amazon began with European conquest (Simón 1882; Rivero 1883; Whitehead 1988). Various explorations confirmed the existence of metallic and non-metallic mineral deposits, including iron, gold, nickel, silver, coltan, thorium, clay, sand, limestone, bauxite, diamond, quartz, jade, titanium, dolomite, phosphate, granite, plaster, zinc, and copper (Tinoco 2000; Martiz 2019). The most influential and impactful mining has been, without a doubt, gold. Many current populations owe their existence to the fact that they were enclaves of exploitation of this resource. Legal and illegal gold mining coexist in the Amazon and relevant legislation has undergone significant modifications over the years. Europeans reported that Amerindians mined gold and traded it regionally and interregionally, in various communities of the Orinoco and Amazon (Whitehead 1990, 1991). In the 16th century, the colonial system established that mines were the property of the crown, and in 1783 the Mining Ordinances of New Spain expanded this to include precious stones, non-metallic minerals, and coal (Cartay 1988; Fernández 2001).

In the case of Venezuela, in 1829 Simón Bolívar decreed that mines were the property of the Republic and gave citizens the opportunity to exploit them under certain conditions set by the Federal Executive. In 1854, José Gregorio Monagas, then Governor of the Guayana region, enacted the first Mining Code of Venezuela, while his brother, José Tadeo Monagas, was president of the Republic (Martiz 2019). The most significant exploitation of minerals area occurred from 1850 to 1890. The first discoveries of gold, in the area of El Callao, led to applications for the first licenses, the registration of mines, and the installation of factories for the production of gold bullion (Baptista 1997; Paülo and Ángel 2006). This period was also characterized by a boom in foreign capital investments for mining (gold, iron, and oil), forest resources (balata, rubber), and transportation (railways and trams). In the case of Guyana, leading companies and factories for the processing of gold were created, such as Compañía Minera El Callao (1870), Compañía Austin (Orinoco Exploring and Mining), South America Mining. Co, Compañía Minera de Nacupay, Chile, Alianza de Cicapra, El Porvenir, Nueva Hansa, Potosí, Buen Retiro, San Salvador, and La Concordia (Torres 2001).

During the period 1866-1895, the deposits with the highest-grade ores in Venezuela were extracted (Torres 2001), and crushing mills with pylons were installed in the mines belonging to Nacupay, El Callao, Panamá, Mocupia, and Potosí. Gold Field of Venezuela LTD (1898-1946), an English company, bought part of the companies operating in the area and worked with the old mills of the Potosí company. Most of its gold was exported because Venezuela did not have enough processing plants to produce industrial parts. In 1945, the Mining Law was approved in Venezuela, in which mineral deposits were declared to be of public utility. However, institutional criteria in its application promoted corruption and other acts outside the law. In 1977, Decree 2039 was approved, eliminating the

right to acquire a legal grant of land through a simple mining request (area delimited by UTM coordinates) to the authorities, along with free exploration and exploitation (Chacín 1998; Martiz 2019), increasing the accountability of the process.

In 1970, the Compañía General de Minería de Venezuela C.A. (CVG MINERVEN) was put in charge of investments and the modernization of mines, whose primary gold deposits in Bolívar state are located in Tumeremo, El Callao, El Dorado and El Manteco, in the Cuyuní River Basin and the regions drained by the Yuruarí, Botanamo, Caroni, Venamo, and Caura Rivers (Egaña 1979; Noguerol *et al.* 2000; Martiz 2019). Since the 1970s, these mining developments have had a significant impact on rivers, jungles, and savannas, as well as on Indigenous populations of the region, such as the Pemón, Yekuana, Sanemá, Lokono, and Warao. Also impacted were Afro-descendant towns located in the Caura basin, which originate from ancient "*cumbes*" (escaped slave hideout towns), due to the mass migration of miners from other areas of the country and abroad. Additionally, in the period 1970-1980, other gold deposits were found in Venezuela in the Ventuarí, Alto Orinoco, Atabapo, Guainía, Casiquiare, and Negro Rivers, in Amazonas state, and in Colombia in the mountains of Nakén (Guainía), Panapaná (Cuiarí), the hills of Taraira, and Vaupés (González Bermúdez 1996).

As happened in several areas of the Amazon, many young Indigenous people from different ethnic groups moved to work in both legal and illegal gold mines, abandoning jobs as teachers and nurses. This was only moderately profitable for them, or not profitable at all, due to the high cost of living and excessive work (González Bermúdez 1996). Some Indigenous families began to work mining alluvial gold, isolated and separate from the mines controlled by Creoles, but the proliferation of violence, arrival of merchants, prostitution, and alcohol generated conflict and confrontation. The significant immigration of non-Indigenous miners and their operations destroyed the environment, communities, and Indigenous territories and their economies, leading to murders, drug trafficking, and theft, as well as forms of modern slavery.

The destructive effects of legal and illegal or informal activity, of small- and large-scale mining, especially the chemical agents used in the processing of gold (mercury, cyanide) is well-known. In Venezuela, the instruments used in traditional, non-Indigenous mining were the shovel, pick, machete, and wooden tray. Extractivist companies and national governments have taken little interest in studying the system and methodology of exploitation of gold by Indigenous peoples, who knew how to conserve natural systems. In ancient times, they exploited gold, considered to be rays of sunlight (Whitehead 1990, 1991). They knew about goldsmithing and gold alloys (with silver and copper), making idols; geometric, anthropomorphic, and zoomorphic figures; personal adornments; and thin sheets of gold which functioned like currency in local and regional trade. For many Indigenous Carib and Arawak peoples today, the extraction of alluvial gold has no ritual restrictions. The exploitation of gold in open-pit mines or excavation requires rituals to obtain authorization from supernatural beings and ancestors, as tokens of respect and love for Mother Earth. These limitations on certain forms of mining are political actions to respect and protect the Amazon, which have been ignored by those who are only interested in the extraction of raw materials, dehumanizing local populations and destroying the Amazon.

Legal mining, with legislation that has undergone modifications over the years, has coexisted with illegal gold mining in the Amazon. Both have had substantial impacts on the geographies and situations of Indigenous, Afro-descendant, and peasant populations, among others (Whitehead 1990; Tinoco 2000; Arvelo-Jiménez 2014). Europeans reported seeing gold garments and jewelry that adorned members of the local elite and other Indigenous individuals. The original peoples of the Amazon practiced artisanal forms of mining, without causing destructive changes in the environment.

11.6. Historical Oil and gas Exploitation

Oil influenced the Amazon's economies during the twentieth century. It was essential for the consolidation of previous processes, such as those associated with the extraction of quina, rubber, and other products. In Latin America, few commodities have led to the same strong feelings of economic nationalism that arose in response to oil. The political debate has been dominated by critics and promoters of foreign multinationals' investment and participation, with oil policies fluctuating from open-door arrangements to nationalization and even expropriation of foreign-owned assets (Bucheli 2010).

Oil exploration in the Amazon dates back to the nineteenth century. However, in the Bolivian Lowlands (*Oriente)*, it only started in the 1920s (Klein 1964). In the Venezuelan *Orinoquía* exploitation has taken place since 1936, in the Colombian Amazon since the 1940s, in the Ecuadorian *Oriente* since the 1960s, and in Peru since the 1980s. Brazil has been a major consumer but a minor producer. These processes were marked by the intervention of international companies, sometimes with the participation of domestic ones, always in association with national elites. The degree of openness or national control has varied.

In the Bolivian *Oriente*, various explorations and attempts were made, first with national companies, then international ones (Klein 1964). After several unsuccessful attempts, in 1926 Standard Oil operated eleven production fields in the *Oriente* and others in various parts of the country. However, it had permanent conflicts with the State, related to noncompliance, clandestine installations, and other issues. In the 1930s, the outcome of the Chaco War, as in the subsequent Ecuador-Peru conflict, was related to conflicting interests between Standard Oil and Shell. In 1936, Bolivia created the company Yacimientos Petroliferos Fiscales Bolivianos (YPFB), which increased conflict by confiscating everything from Standard Oil, who requested intervention from the US government without much success (Klein 1964; Klein and Peres-Cajíias 2014).

Natural gas occurs in the same fields as oil but only became economically important when foreign markets opened up. "Indeed, while the first records of natural gas production date back to 1952, it was not until 1972, with the start of exports to Argentina, that production reached significant levels" (Klein and Peres-Cajíias 2014). Since the 1970s, oil and gas have become fundamental engines for the Bolivian economy.

In Venezuela, oil was used by Indigenous peoples as medicine, for lighting houses, and for caulking canoes (Fundación Polar 2010). In 1800, Humboldt recorded the location of several fields in the region known as the Orinoco Belt Oil Fields (von Humboldt 1826; Fundación Polar 2010). The modern oil period began in 1875, with the founding of the national company Compañía Nacional Minera Petrólia del Táchira (González Rincones 1956). However, oil extraction in the Lower Orinoco Basin began in 1936, with Standard Oil and the drilling of the La Canoa-1 Well, in the southern areas of Guárico, Anzoátegui, Monagas, and Delta Amacuro (Fundación Polar 2010). In 1943, a Hydrocarbon Law was enacted, specifying the duration of licenses, taxes, and controls on foreign companies, which forced them to refine part of their production inside the country (Malavé Mata 1962). During the expansion of the Venezuelan oil industry since World War II, i.e., la Plaza 1980 (Quintero 1972), new types of licenses for export were created, as were "national reserves", the royalties from which resulted in an increase in the percentage of GDP from 15% in 1914, to 50% in the 1960s. Nationalization of oil production followed in 1976. Petróleos de Venezuela S.A. (PDVSA) was created, and that country became a founding member of the Organization of the Petroleum Exporting Countries (OPEC), generating high national profits.

As in other Amazonian countries, the oil boom had negative impacts on Indigenous peoples, such as the Kariñas. Although they possess colonial titles for land and received royalties from oil companies, they have had to migrate to other areas in the south of their territory owing to environmental deterio-

ration, which has impoverished the economy and impaired health (Jiménez and Perozo 1994; Whitehead 1994; Arvelo-Jiménez 2014). In the 1960s, the closure of the Caño Mánamo, the main tributary of the Orinoco Delta, by the oil industry, caused flooding and an ecological disaster in wetlands, forests, and savannas, which destroyed the environmental, cultural, social, and economic balance of the Warao Indigenous people and caused impacts which persist until the present day (Heinen 1992).

In Colombia, the first exploitation of oil occurred on the coast, then in the Orinoquia, and finally in the Amazon. Putumayo's oil history dates back to 1937, with the Saxon Petroleum company. Texaco was in charge of the revitalization of this activity and in 1948 drilled the first well, José María 1, in the jurisdiction of Mocoa (today Puerto Guzmán). In 1955 the percentage of royalties that oil companies had to pay was reduced as a stimulus to explore the southern Amazon region, which led to Texaco obtaining a license for the exploration of 16,000 km² for 30 years in 1959, the most extensive given in Colombia until then. Texaco moved its work from the area near the Caquetá River to the border with Ecuador, where the Orito 1 well was drilled in 1963, becoming the epicenter of oil activity (completed in 1971) (Avellaneda Cusaría 2005).

Oil activity in Putumayo signaled the possibility of consolidating the country as an oil producer and articulating those territories to the nation. Oil activity made it possible to stimulate a new form of colonization, and transform the landscape in a more significant way than is generally attributed to peasant colonization, because the opening of roads led to a "sowing of people". New municipalities, such as Orito, San Miguel, Valle del Guamuez, and Puerto Caicedo were created for the purpose of managing some royalties. There were investments in road infrastructure to connect extraction sites. Problems with land titling and ownership continue to cause conflict between residents and companies (Avellaneda Cusaría 2005).

Initial oil exploration in Ecuador took place in 1921. Geologists from the Leonard Exploration Co., a company that obtained a license for 50 years covering 25,000 km² (Wasson and Sinclair 1927), were ultimately unsuccessful, owing to a lack of funding (Gordillo 2003; Rivadeneira 2004). After that, Shell carried out explorations from 1938 (Tschopp 1953); after they obtained a ten-million-hectare license in 1937, they opened roads from the central Andes, built an airport, and caused significant impact on local Indigenous peoples. They did not find sufficiently lucrative deposits in terms of crude oil quality, and the exploitation had logistical difficulties due to its remote nature. After the 1941 war between Ecuador and Peru, which various people associated with the interests of competing oil companies, the former lost a large part of its territory, including the licensed area, so Shell retired in 1948 (Rivadeneira 2004).

After Shell left Ecuador, President Galo Plaza stated that "the *Oriente* is a myth", adding that Ecuador was not designed to be an oil country but an agricultural one (Rivadeneira 2004). However, in 1968, the Texaco-Gulf Consortium, which in 1964 had obtained a license for 1.400 million hectares for 58 years (Ramón *et al.* 2019), began drilling high-quality fields in the northeastern zone, starting with the Lago Agrio 1 well in 1967. These explorations were successful, and the country began exporting crude oil in 1972. In part, this was made possible by the explorations carried out on the Colombian side of the Putumayo in 1963. The corporation built roads and an oil pipeline that crossed the Andes to the coast. It operated for almost 20 years with very little oversight, causing enormous pollution. The company acted as a parallel state in the territory. Other companies also explored diverse areas in the 1960s and 1970s. The *Oriente* ceased to be a myth and the oil rush and its related economic opportunities attracted thousands of migrants, some as part of the agrarian reform and colonization of 1973. These processes were widely criticized by some sectors of the population, including Jaime Galarza Zavala (1974), imprisoned by the ruling Military Junta for protesting. He alluded to the Seven Dinosaurs (Standard Oil of New Jersey, Shell, Mobil, Gulf, Texaco, BP, and Standard

Oil of California) that behaved as they pleased in the countries.

11.7. The Start of Intensive Cattle Ranching in the Amazon

Livestock, along with road construction and government-induced settlement programs, have been the main drivers of deforestation since the 1960s (Fearnside 1987; Valentim and Vosti 2005). Cattle were introduced to São Paulo, Brazil, from Cabo Verde (Africa) in 1534 (Homma 2003). In the mid-17th century, Portuguese settlers introduced cattle to the Brazilian Amazon. Initially, cattle were raised on grasslands established after the deforestation of areas around the city of Belem (Pará). For the next three centuries, until the 1960s, the island of Marajó, in Pará, was the main cattle ranching center in the Brazilian Amazon. Livestock farming was also carried out along the middle and lower sections of the Amazon River, mainly in extensive grazing systems on native pastures in higher portions of temporarily flooded areas (Dias-Filho and Lopes 2020). During this period, most of the major urban cities in the Amazon had to rely on imported meat, sometimes from other parts of the country or from abroad to meet demand. Because of the lack of roads, in many circumstances, meat was transported by air, leading to scarcity and high-cost products that were only accessible to the wealthiest segments of the population (Dias-Filho 2014; Dias-Filho and Lopes 2020).

Across Latin America, livestock expansion since the mid-19th century has largely been a story of the transformation of forests into cultivated pastures (Van Ausdal 2009). This environmental transformation became more relevant in the early 1960s, when national governments implemented policies to integrate the Amazon with the rest of their territories. In Brazil, these policies included the construction and improvement of roads, subsidies for agriculture, and impressive resettlement programs for landless rural families (Valentim and Vosti 2005; Hecht 2011; Dias-Filho 2014; Dias-Filho and Lopes 2020). Extensive ranching systems also became an important strategy for land grabbers and speculators to convert forests into cultivated pastures and claim unregulated public lands (Fearnside 1987), a process that continues to be an important driver of deforestation in the Amazon today (Stabile *et al.* 2020). By 1975, the cattle herd in the Brazilian Amazon had already reached seven million heads on 20 million hectares of pasture. The resulting livestock load of 0.35 animals per hectare was an indicator of a very extensive production system with low productivity (Valentim and de Andrade 2005).

This land development strategy was based almost entirely on the limited use of technology, in particular forage germplasm and pasture management options developed for and imported from regions with different environmental conditions (Dias-Filho 2014). Conversion of diversified forest ecosystems into extensive areas of homogeneous grasslands with exotic African grasses in tropical conditions with high temperatures and humidity resulted in cultivated grassland ecosystems with low resilience, which favored the proliferation of pests and diseases (Valentim and Moreira 2001). In addition, farmers adopted poor management practices, such as repeated burning in an attempt to control the regeneration of native herbaceous and wood species, as well as the invasion of exotic plant species (Serrão *et al.* 1979). Fire was also misused to try to control high numbers of pests, such as spittlebug (*Deois* sp. and *Zulia* sp.), causing rapid and severe degradation of pastures. Repeated burning favored nitrogen volatilization, nutrient leaching, and erosion of exposed soil, degrading grasslands three to five years after their establishment (Valentim 1989).

Even under these conditions, Margulis (2003) reported that beef cattle farming in the Brazilian Amazon, even with prices 15% to 20% lower than in São Paulo, had a 113% higher profitability. This was the result of substantially lower land and labor costs. Despite being profitable, livestock farming in the Amazon during the 1960s faced several problems, such as rapid and extensive degradation of

pastures, lack of technical and management expertise among farmers, and insufficient and inadequate technical assistance (Valentim 1989; Valentim and de Andrade 2005).

Repairing degraded pastures was difficult and extremely expensive due to shortages of tractors, plows, and harrows, and the high cost of limescale and fertilizers. As a result, farmers accelerated deforestation to expand the area of pastures (Serrão *et al.* 1979). This was facilitated by a legal framework requiring Brazilian farmers to deforest and burn their pastures as proof that it was "productive land" to receive an ownership title from the government (Fearnside 1987; Valentim and de Andrade 2005). Additional economic incentives for deforestation (Fearnside 1987) included lower taxes for owners of deforested lands. National and international concerns about rising rates of deforestation in the late 1970s led to increasing pressure on governments to change policies that incentivized deforestation for ranching and agriculture in the Amazon (Valentim and Vosti 2005; Hecht 2011).

11.8. Origins of Large Roads and Hydroelectric Plants

The end of World War II resulted in a gradual reduction in policies aimed at ensuring an adequate and constant supply of strategic natural resources from the Amazon (McCann 1995). With some exceptions, since then, economic development policies have been dominated by the provision of financial aid and the implementation of deliberate trade-protectionist policies to support national and multinational industrial groups in import substitution and state-led industrialization frameworks (Bran-do 2012). Key to this shift were improvements in transport infrastructure and the reliable supply of low-cost energy.

Approximately 100 hydroelectric dams were built in the 1950s, 103 in the 1960s, and 151 in the 1970s and 1980s (Von Sperling 2012). However, the construction of dams on Amazonian rivers has provoked clashes between developers, government officials, Indigenous populations, and environmentalists (Von Sperling 2012). The Amazon Basin, approximately 60% of which is in Brazil, is the focus of a massive program of hydroelectric dam construction. If successful, these plans could eventually turn almost all of the Amazon's tributaries into a chain of reservoirs for hydroelectric production (Fearnside 2015). Rich in rivers, Brazil has always considered hydroelectric energy as a way of fulfilling its ambition of being a great world power (Moran 2016). Brazil has used hydroelectric power since the late nineteenth century, but the 1960s and 1970s set the stage for increased investment in the construction of large plants. Some of the largest Brazilian dams in operation are located in the Amazon and were planned or initiated during this period. This is the case of Belo Monte (11,181 MW), located on the Xingu River, and Tucuruí (8,370 MW), located on the Tocantins River, both important tributaries of the Amazon River (Fearnside 1999, 2006).

Road construction has also been a key method for national governments to ensure sovereignty and integrate Amazonian territories into national economies. Brazil began implementing an impressive policy of highway construction in the early 1950s, which accelerated after the 1964 military coup. Several of these highways, such as the Trans-Amazonica (BR-230), BR-163, and BR-319, are still in the process of improvement and paving, raising many concerns about their environmental and socioeconomic trade-offs (Valentim and Vosti 2005; Laurance *et al.* 2009; Moran 2016). This is particularly relevant as the density of roads in one county is associated with increased human migration and deforestation in that county and similar side effects in neighboring counties (Pfaff *et al.* 2007).

The construction of new roads in the Amazon also has important implications for previously isolated rural communities or Indigenous extractive communities affected by their construction (Riley-Powell *et al.* 2018). By the late 1970s, evaluations and concerns about past, present, and future socioeconomic and environmental impacts of policies that promoted the construction of roads and hydroelectric dams in the Amazon Basin were alre-

ady on the rise, both in the Amazon and internationally. At the time, there was a growing debate among researchers and policy makers about the challenges and possible strategies for mitigating negative impacts to promote sustainable and inclusive development. Various economic processes were intensified throughout the Amazon starting in the 1970s; for example, oil extraction, deforestation, and hydroelectricity. This was accompanied, sometimes motivated by, the strengthening of land access routes and the consolidation or creation of cities. These processes continue to this day. The opening of land routes is accompanied by issues such as deforestation for timber and the opening of the agricultural frontier.

11.9. Conclusions

Most of the economic cycles of the Amazon between the nineteenth and twentieth centuries were motivated by the demand for raw materials from external markets, located in industrialized nations of the Global North. They were part of geopolitical and geographical processes in the emergence and consolidation of the republics. They had different degrees of participation by States, supported the emergence of powerful elites, and promoted the perception of Indigenous peoples and local communities as low-cost or even free labor ("dehumanization" of the Amazon). These extractive processes continue in part to this day, when products such as beef, oil, or soy, are produced especially for export from Amazonian countries.

The Amazon has witnessed cycles of rise (*boom*) and fall (*bust*) in the exploitation of raw materials, which have shaped diverse social, economic, and spatial structures, sometimes to the detriment of previous territorial arrangements. Products such as *Cinchona* and rubber led to the opening of waterways, roads, cities, settlements, and collection and distribution centers, as well as population movements. Economic booms associated with commodities attracted migrants who gradually took over territories, almost always to the detriment of ancestral populations.

There are two great continuities within the extractivist economy from the nineteenth century to 1970; 1) a neocolonial or postcolonial system derived from the extraction of raw materials, with enslaved or recruited cheap labor, for export, and 2) the management of lowland forests and ancient tropical savannas maintained by Indigenous, Afro and some peasant peoples. Without identifying, revaluing, and adopting the important contributions of Indigenous knowledge and practices to the management of the Amazon, the region will continue to be an heir of the colonial system, which today entails the irreversible destruction of forests and other ecosystems.

The Amazon has been seen as a reservoir of raw materials of strategic global value, particularly in times of crisis. In the 1950s, national governments started to promote occupation and integration of the Amazon, percieved as an empty region with its sovereignty at risk, through policies focusing on road construction; exploitation of minerals such as gold, oil and iron; hydroelectricity projects; resettlement of poor landless populations; and the promotion of deforestation and subsidized agriculture and cattle ranching projects.

11.10. Recommendations

- Looking to the future, we must learn from Indigenous groups and their thousands of years of successful, sustainable management and shaping of natural resources. How to develop economic models that avoid asymmetric exploitation practices, such as debt-peonage, is a key challenge.
- Various Andean-Amazonian products have generated enclave economies over the centuries, with boom-and-bust processes. Economic activities must be carried out within sustainability frameworks, guaranteeing the long-term well-being of Amazonian communities.

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