Chapter 9

Conflicting senses of the natural physical environment (land) and technology in the Amazon: reviewing the stimulus to rubber plantations in 1900-1915

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ABSTRACT
In the Amazon, in the *promotion of rubber plantations*, in the years 1900-1915, the territorial sense of land - soil to be deforested for monoculture - collided with the ecological rubber tree property in which land meant the elastic gum forest. This defined the size and contours of the property. The promoters *of the* plantations built the "civility" of these in contrast to the "incivility" of the ecological rubber tree property. The Brazilian policy for rubber promoted plantations, but this policy did not avenge them. And although several entrepreneurs have tuned in to it, the vast majority of *seringalistas* (the owners of rubber companies) opposed monoculture, claiming that it would destroy one of its main capitals: the rubber forest.

Keywords: Amazon, rubber, Land appropriation

1 INTRODUCTION

The territorial sense of land intrinsic to *rubber plantation advocacy by the state* and the British - only a soil to be deforested for monoculture, the property being defined by its extent -, collided with the ecological appropriation of native rubber forest (*seringal)* - in which land meant elastic gum forest and the economically lucrative number of rubber trees defined the size and contours of a property. The two types of land ownership were aimed at obtaining profit. However, they were distinct technological styles. The ecological appropriation was based on the conception of *seringal* ecosystem as capital to be exploited and preserved and in working methods and tools capable of guaranteeing profit and accumulation of capital without destroying the native rubber forest. The territorial appropriation was based on the scientific view of nature: it is not capital to be explored and preserved.

The rubber tree property followed an ecological pattern of land appropriation, which appears in the Amazon gradually from the 17th century. This ecological pattern of land ownership was shaped by attempts to solve problems generated by the inadequacy of imported scientific agricultural and industrial methods, and also of indigenous methods of burning when used in infertile soils and large-scale production to local

ecological specificities: excessive time, physical effort, and high costs in soil cleaning, soil degradation, destruction of forests and other valuable natural resources. It combines indigenous ecological methods with European and/or other peoples' knowledge.

By combining productive use with management-conservation practices of natural resources, this ecological appropriation contradicts the territorial appropriation that, by conceiving land as soil, separates productive use from conservation practices. In the Amazon, ecological themes were open to debate about the production process itself. The preservation of nature was thought to be quite different from European conservationism, which is understood as a distinct and separate activity from productive use, synonymous with cultivated forests or Royal gardens (Grove, 1995; Drayton 2000). In the Amazon, on the contrary, since the 17th century, the need to adopt indigenous ecological planting-management methods, combining productive use with ecological management, was the object of permanent discussion.

2 ECOLOGICAL PROPERTIES

Before the 1840s, the terra-*seringal* itself did not induce private appropriation. The elastic gum forests exploited to produce articles were part of slave, private or state agricultural properties, family agricultural property or of indigenous lands. And most, it was in the legal condition of *terra devoluta* – not privatized land administrated by State, occupied in an unlegalized manner, either by indigenous communities or by small family producers, or it was land for common public use, in particular *by arranchamentos* (temporary private companies). Both family and business production were based on indigenous methods of extraction and manufacture of latex into artifacts for common use modified and adapted to the production of rubber raw material.

In Grão Pará, since the beginning of the 18th century, waterproof articles were produced and exported. Only in 1844 began the export of rubber raw material in response to the increase in prices caused by the growing international industrial demand. The terra-seringal valued itself in the market. The rubber tree property emerges. At that time, the best lands were already largely privately owned, which was promoted by the Portuguese crown. Initially, companies were organized in the vicinity of the forts, following the territorial scientific view of land, competing for the best soils and practicing the rotation of soils in the planting of sugarcane. They deforested for monoculture. As they faced soil degradation problems, they learned about the diversity and location of natural resources, as well as on alternative methods of ecological planting-management of fertile floodplains and dry lands soils. Among the indigenous peoples, some used ecological productive methods and others also utilized certain anti-ecological productive methods, albeit on a small scale. Several of these peoples invented ecological planting management of soils, forests, meadows and animals based on collective use of land, including, as several studies have demonstrated, making forests.

Several settlers began to incorporate these ecological methods into their lands and recreate them to maximize profits. And they come to value fertile floodplains and other economically valuable ecosystems. In 1696, they began cattle breeding in the natural (not planted) grasslands of Marajó Island, abandoning the time-consuming, laborious and environmentally predatory practice of deforestation to plant pasture. Throughout the 18th century, the appropriation of natural grasslands and varied ecosystems throughout the region intensified, such as cocoa and other valuable forests.

Ecological appropriation arose amid the well-known brutality against indigenous peoples and the ideological ambiguity originated in the contradiction of European settlers: increasing denigration and prejudice against native peoples, and dependence not only on their work, but on their knowledge. The natives occupied the land selectively based on ancient knowledge about the diversity and complexity of the natural physical environment – it is known today that 88% of the Amazon soil is of the type low in nutrients, while 12%, moderate or extremely fertile, represents 50 million hectares, an area equivalent to the total land dedicated to agriculture and grazing in the rest of Brazil (Nascimento and Homma, 1984).

In the 18th century, in discussing the anti-ecological practice of slave companies of adapting indigenous methods of burning to the production of manioc on a large scale on infertile soil to supply their domestic consumption, causing soil degradation, Father Daniel manifests the contradictory attitude, common among European scholars educated in Enlightenment scientific, in relation to indigenous peoples and ecological appropriation: it calls them beasts and savages, but shows the need to return to more traditional indigenous methods. The European Enlightenment view of superiority and authority over native peoples hides, in this way, the dependence on the traditional knowledge of these peoples.

Ecological appropriation was also the subject of pressure by the Portuguese crown for considering it primitive. From 1754 to 1777, Pombal policy aimed to overcome indigenous cultural legacy by promoting the import of European technologies, particularly English, to which it attributed superior status. Imports of sugar mills and other manufacturing technologies grew. However, monoculture in Grão Pará lost ground, because the understanding of land as particular ecosystems adequate to certain kind of economic use, as well as the learning and recreation of ecological methods of planting-management of native forests and meadows become a common practice in society since the 17th century. Rethinking European customs and techniques through ecological values and methods was criticized by representatives of the Crown. In 1758, the government said that settlers had adopted indigenous methods and customs. The Law of 1755, which encouraged the marriage of Portuguese with natives, would have failed, because instead of "civilizing" the indigenous, the Portuguese would have absorbed their customs.

Indeed, it was customary to occupy the land selectively, but different from the indigenous, when choosing them, many considered their suitability to produce a given commodity and the potential for generating profits. The best lands were those that offered fertile soils, valuable forests and natural grasslands and/or rivers, as well as fishy seacoast and easy access to local markets and export ports.

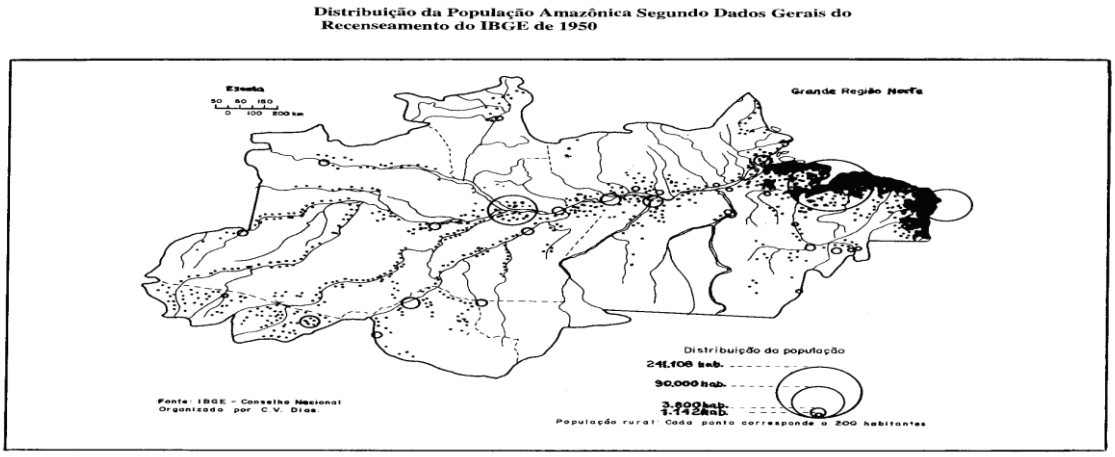
From the 1840s, when the rubber tree estate came along, the best land had already been appropriated in both accessible central areas and fertile floodplains - those irrigated annually by the flood of muddy water rivers. Changes in the prices of export products and means of transport had valued new lands, which were exploited in different ways, resulting in different ecological and economic zones. In 1950, the selective appropriation of land, more expanded, could be visualized in IBGE map (Map 1).

By appropriating natural rubber florets, *seringalistas* reproduce the same ecological perception of land with the particularity that land meant rubber forest. The selective appropriation of seringais occurred simultaneously throughout the region requiring in-depth knowledge of ecology, because ecological particularities affected the productivity of *seringais.*

3 SOCIALLY UNEQUAL LAND APPROPRIATION

The ecological meaning of land was mixed with the modernity of the rubber trees land, productive capital and valuable merchandise, whose socially unequal access followed the standards of the rest of Brazil. Colonial land policy favored the upper and middle classes, to the detriment of indigenous peoples and poor populations. Land could be obtained through official donation, partnership, and possession of *terras devolutas* – the lands belonging to the Crown and not legally privatized. The concept of *terras devolutas* ignores the factual condition of occupation or not of these, thus making the native peoples and the family producer, who possibly inhabited them, politically fragile compared to the relatively privileged condition of entrepreneurs. This concept, along with the requirement of ownership of capital or credit in the market for land donation, had long fueled a tendency for the upper and middle classes to appropriate the best lands, leaving the most distant and less fertile for the poor. The land law of 1850 legitimized its unequal access by establishing the purchase as the only way to obtain *terras devolutas*.

Map 1:



Other conditions have strengthened this trend. First, the foreign stimulus whose impact had been intensified by the national context of economic and political instability caused by the constant fluctuation in prices of export products, in particular sugar, and by the high costs of African slaves in the region.

The harmful effects of the fluctuation in sugar prices were intensified in the region due to the difficult transport to exporting ports located in the Northeast, and the disincentive of the Pombal policy, which prioritized sugar exports in the northeast, strengthening the trend to the increasing decrease in sugar exports, accompanied by the gradual abandonment of production of this product in favor of rum. In the first half of the 19th century, price fluctuations also affected the export of cocoa, cotton, rice and various forest products. The social conflicts surrounding Pará's adhesion to the independence of Brazil aggravated the situation of instability. In particular, the Cabano movement involved the occupation and partial destruction of sugar companies and farms, a fact that, in addition to the bombardment of Belém, resulted in a deep economic crisis.[1]

Moreover, there was no appropriate credit system for either the ecological planting-management of rubber plantations or for the local rubber derivatives industry, which failed as foreign industry consolidated. Second, the post-1840 national situation only aggravated regional difficulties. The coalition of elites allied with D. Pedro II, who took power, promoted political centralization in Rio de Janeiro and the economy in the Southeast, while gaining international recognition through the country's submission to the economic and ideological interests of international capital. Scienticism had shaped an official attitude, and an intellectual environment marked by the *attribution of higher status* to technology, education, customs and European industrialist ideologies considered symbols of the highest level of human evolution, to the detriment of locals. The Amazon valley was secondary in official policies and elites were influenced by foreign scientists and intellectuals who used the derogatory view of peoples capable of establishing relatively harmonious relationships with native forests, considering them primitive and uncivilized, and environmental determinism to invent the supposed primitivism and inferiority of the region. The notion that European scientists held the truth about the laws of nature and human society was so well accepted that the imperial government, through the Brazilian Historical Institute, financed the German naturalist Carl F.P. Von Martius to create a symbol of nationality - a unifying history of Brazil. The naturalist defined indigenous peoples as advanced civilizations that would have degenerated at the primitive technological and cognitive level in the supposedly inferior natural environment of the Amazon valley; they would have no soul, and their personalities would be deformed.

[1] O Marquis of Pombal, whose name was Sebastião José de Carvalho e Melo, Was Prime Minister of Portugal from 1750 to 1759. He advocated absolutist monarchy and various Enlightenment ideals. He had a great admiration for English capitalist modernity. His brother, Mendonça Furtado, ruled the State of the Grain Para and Maranhão from 1750 to 1777, procuring modernize the Grão Pará, including creating policies and severe measures to force all its residents to speak the Portuguese language. **Mendonça Furtado** exchanged significant correspondence with the Marquis of Pombal on the administration of Grão-Pará and Maranhão, which constitutes a valuable source of historical research.

It is in this context that small traders and small and medium-sized rural entrepreneurs saw high rubber prices and foreign stimulus as an investment opportunity. In 1868 this product already led the export agenda, although *seringalistas* were a secondary capitalist fraction – many entrepreneurs resisted this production because they considered the marketing-financing system a return to colonial financial and commercial relations.

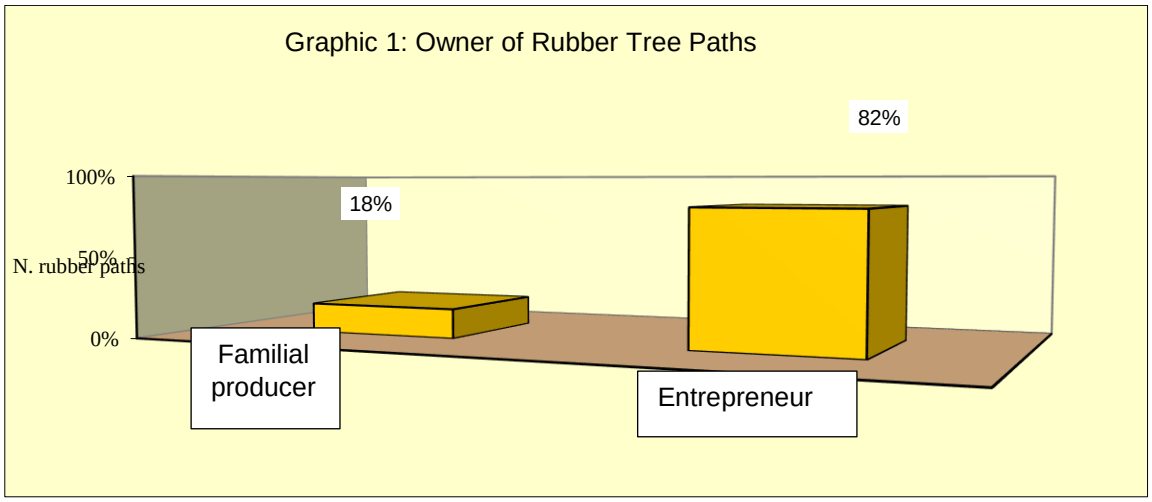
As this economy grew in importance, the role of capital ownership in the appropriation of *seringais i*ncreased and, with this, the action of the financiers: exporting houses controlled by English and Portuguese-German capitals, aviators (commercial-usurious capital), banks or credit associations. Aviator houses had become the main intermediaries in the flow of credit to production by accepting the *seringal* and rubber raw material as a mortgage. By preferring the mortgage of extensive *seringais* and large amounts of rubber raw material, they reinforced the relative privileges of entrepreneurs in the process of land ownership.

Together with the increase in foreign capital investments in the region, increased the predatory exploitation of *seringais*. Foreigners invested in rubber trade and financing, production in partnership with *seringalistas*, and exploration of rented seringais that were convenient for non-residents. Non-residents explored specially forests *of Castiloa Ulie*, whose latex was used to make caucho and the methods of extracting latex required the cutting of the tree. They often killed even the most valuable species by using deep cuts.

From the 1860s, the presidents of Pará and Amazonas stimulated the entrepreneurial privatization of *seringais*, claiming that predatory exploitation resulted from a lack of sense of ownership, because the owners preserved their *seringais*. In Pará, in 1870-1910, this stimulus was associated with the immigration policy of food producers to the expanding domestic market and the encouragement of the intercropping production rubber-cereals. Finally, the government aimed to raise income through the sale of *terras devolutas*. They forwarded these proposals to the central government, while subsidizing the immigration of rubber tappers (the rubber producer employed by rubber companies) and shipping.

Businessmen appropriated the best rubber stakes. In Acre, the densest section of *seringais*, located in the District of Acre, was appropriated by 105 companies belonging to individual entrepreneurs and partnership companies.

Graphic I shows that, in Pará, although familial producers owned 37% of the 2,927 rubber forest properties in the 10 largest producing municipalities, the entrepreneurs held 82% of the total rubber paths. In the companies, the rubber path was composed of 100 to 200 rubber trees, while the paths of the familial producers, from 40 to 80. About 75% of the properties were medium to small size, but 24% of the owners owned 2 to 11 properties and 59% associated rubber with other crops, while 41% produced only rubber.



Source: Property Legalization Records, Instituto de Terras do Pará (ITERPA)

4 THE ANTI-ECOLOGICAL CONNOTATION OF LAND POLICY

The imperial government's policy on agriculture, which includes the land legislation of 1850, was inspired by scientificism, for which industrialization symbolizes the highest level of human development. It stimulated scientific agriculture and pressured Brazilians to abandon other methods, considered primitive and inefficient. The land law also inherited the evolutionary scientificism of Portuguese law through the notion of social function of land ownership tied to a scientific-territorial meaning of land and occupation: colonization or agricultural settlement, towns and cities. These types of activities qualified effective occupation and productive use of land - requirements for the legalization of possessions and for the legitimation of sesmarias.

The Land Law made ecological appropriation difficult. Appropriating *seringais* meant to place them according to territorial extension and use defined by law, measure them and request the legalization of possession: bureaucratic and time-consuming, executed by institutions located in distant cities that provided provisional title to be replaced by definitive after proof that the possession was in accord with the legal terms. The title had to be registered at a notary's office.

Ecological appropriation contrasted with the legal meaning of land and effective productive occupation. The meaning of terra-seringal implied that the density and geographical distribution of rubber trees, and not the soil extension, defined the extent and contours of the property. This could result in territorial extension beyond that permitted by law.

Ecological productive use also contrasted with the legal perspective. For the rubber producer, using a seringal productively meant exploring it through ecological planting-management and not monocultural cultivation. To ensure continuity of production, latex was extracted so as not to damage the rubber tree, whose health also depended on the preservation of the ecology of the seringal, and old plants were replaced. To increase productivity, rubber trees and/or other compatible crops were cultivated in the shade of the forest or through the opening of small clearings, only at the beginning of planting. The modifications of these methods throughout the 19th and 20th centuries, even after the emergence of rubber monoculture, did

not aim at this, because the rubber forest meant valuable productive capital. They preferred to preserve this capital and question the legal requirement for monocultural cultivation.

The government avoided the subject. In 1860, he fixed the maximum extent of the seringal property. In 1874, he recognized the specificity of ecological appropriation, but ended up reproducing the practice of compel people to adopt scientific agriculture through the requirements for the legalization of possessions and revalidation of old titles: monocultural cultivation as proof of productive land use and the demarcation of soil extension, instead of creating measures appropriate to the ecological perspective of planting-management of *seringais*.

In 1891, when the first Republican constitution transferred the administration of public lands to the Federative States, the government of Pará issued the decree that considered the conservation of extractive forests and natural pastures, with permanent economic exploitation, proof of occupation and productive use of the land. The government of the State of Amazonas did the same in 1903.

These changes did not benefit the most important rubber producing area: the District of Acre, which because it was incorporated into Brazil as federal territory was regulated by federal law. The 1904 Acre merger treaty provides for the recognition of previously acquired properties.

This recognition prevailed during one year of international arbitration, but when the task was transferred to federal institutions, the possibility of annulling legalizations prior to the treaty was considered as a means of collecting fees. The government, without reviewing the requirement of scientific-territorial occupation, had allowed the registration of possessions in notatories and allowed *seringais* to be mortgaged. In 1906, registry offices were installed in Acre. The ambiguity of the law made commercial transactions with *seringais* more complex, as they were economically evaluated by the number of rubber tree paths with cases of land leftovers - an extension of soil that was not covered by the title. However, a property title registered in notary could only be challenged through complex and slow process. The *seringalista* could claim to have incorporated more *terras devolutas* into his property, located in an area of national border, where Brazilian law encouraged the privatization of large tracts of land. The attitude of federal institutions regarding the recognition of *seringais* private property meant an additional difficulty into the claim of *seringalistas*. Because it was a federal territory, Acre had no representatives in the national congress.

5 REPUBLICAN CONTINUISM: THE PROMOTION OF *RUBBER PLANTATIONS*

According to the literature, the First Republic resulted from the seizure of power by military and civilians dissatisfied with the monarchy. They disagreed on various issues and were inspired by various strands of scientific ideologies, in particular French positivism (which preached the superiority and supremacy of science and scientists) and utilitarianism and the English liberal perspective in the Spencer and Victorian strands; but they were united in the belief that a republic should bring progress: modernization through *the expansion of technological know-how* through the promotion of industrialization and expansion of the means of transport and communication.

The republicans in power were also united around the continuity of the imperial policy of political and economic centralization in the Southeast, based on a regionalist view of the Brazilian nation: "national economy" meant coffee and industrialization of the Southeast, and financial administration to pay debts to foreign banks. They also converged around old attitudes towards the Amazon. One of the reasons military elites were to take power in 1889 was discontent with the monarchy for transferring high-ranking officers to the Amazon. These military personnel took the way to the Amazon as an exile in an area on the fringes of "civilized" Brazil. The second Republican president punished oppositionists by transferring them to the Amazon (Calixto, 1993).[2]

After 1894, coffee elites increasingly dominated the state. From 1898 to 1920, the coalition of ruling coffee elites, articulated with key allies throughout the country, including the Amazon, and well connected with exporting houses and English, North American and German banks, exacerbated Brazil-nation's connection to developmental rationality. Despite maintaining *the sloga*n Order and Progress in the Brazilian flag, these elites, now more influenced by Victorian and Spencerian English utilitarianism and liberalism, fought French positivism, the urban middle class and workers' movements. They also perceived planters and businessmen unhappy with their policies through the prospect of Survival of the fittest. They welcomed Pan-Americanism but intensified the economic and financial dependence of English financiers.

The Brazilian State became an administrative organization concerned, first, with the financial administration aimed at meeting the requirements of contracts signed with international banks, adopting ideologies of trusts and cartels that had revised *the liberalism of laissez-faire* to propose state intervention in the economy.

The purpose of transforming Brazil into a "civilized" (industrialized) nation intensified the link to the developmental view of the biosphere and social and regional differences. The idea that the Amazon would be a sick and underdeveloped place to be "civilized" through science culminated in the writings of Euclides da Cunha, a military officer who had headed the study committee on the national border with Bolivia and Peru. In 1904 he used conceptions of geological evolution, environmental determinism and green prejudice (he claimed that the Amazonian nature, inferior and wild, would have shaped people without physical and moral qualities and without art or science) to argue the "inferiority" of the Amazon landscape compared to that of the Southeast. Violence and exploitation in labor relations in *seringais*, he said, were typical of wild nature and society, forgetting that violence intrinsic to the submission of ordinary people to the greed of profit of capitalists was a modern and civilized phenomenon that characterized even rubber plantations.

On the other hand, *the promoters of rubber plantations*, in their campaigns, particularly those of 1906-1908, sought to discard Amazonian rubber, their biggest competitor, because they were concerned

[2] Remembering that "civilization" in this perspective was synonymous with industrialization, considered by scientificism positivist and by social evolutionism the upper stage of the development of human intelligence.

with attracting investors and establishing cultivated rubber in the market. We learn from international literature and from historical sources that

> [...] In 1906, tropical America was the most important producer of rubber (about 60%), tropical Africa the next (30 to 35%), and tropical Asia the least important, contributing just 3%. Moreover, the highest quantity Fina Hard Para, constituted the greatest proportion of the rubber exported by Brazilian Amazonia, and this was the kind usually commanded the best price and was most on demand.
>
> This contradicted the British empire's wish to become the most important supplier of rubber. Rubber plantations emerged under heavy institutional, economic and political support by the British State facing difficulties which were sorted out only after 1909. The attempts to cultivate rubber failed in many areas. For example, the level of productivity in Ceylon was low at the beginning due to uncertain methods of extracting latex and young trees. Moreover, the cultivation of rubber was not viewed favorably, and this started to change only after around 1907. Entrepreneurs, in addition to facing plant pests, exhaustion of soils and other problems, which had frustrated the attempts to implement large-scale cultivation of coffee in Malaysia, were also afraid of over production. Entrepreneurs also thought that cultivation of rubber would be more an affair of the government than for private individuals due to the high cost involved. As a result, before 1909 there was shortage of finance in the Malay States.
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> Under such circumstances, the British government not only had to invest heavily in research, infra-structure of transport and exportation, offers of credit etc, but also to convince entrepreneurs about the efficiency of the technology of large-scale monocultural rubber, trying to drive investments towards rubber plantations. (BENTES 1998, Chapter 5).

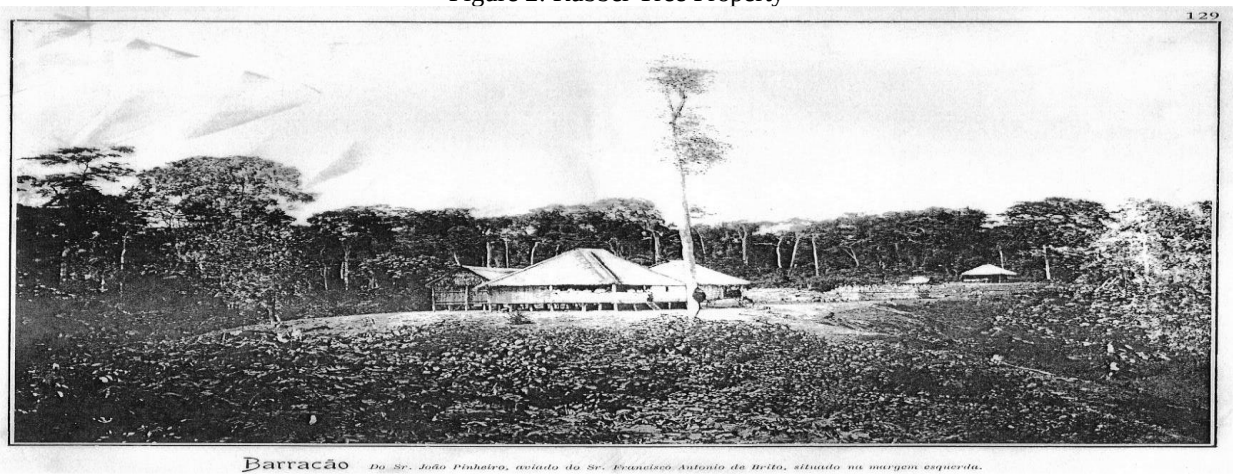
British did it through the scientistic ideology. First, British scientists constructed the notion that Amazonian rubber production would be nomadic and predatory, and therefore doomed to disappear, ignoring that 80% of regional production was neither nomadic nor predatory, since the privatization of *seringais* meant the expansion of production based on private property and the growing disappearance of *arranchamentos*.

Second, at the First International Rubber Exhibition in London in 1908, the British Consul in Pará argued that rubber enterprise could not be defined as private property because the term would not apply to immense areas of desolate forests and swamps, nor to what he assumed to be the condition of rubber companies: the absence of both well-defined geographical boundaries and legal titles. The classification of *seringal* property as "desolate forests and swamps" illustrates what men educated in scientificism thought about the appearance of the planting management of native rubber forest (Figure 2): symbol of primitivism and “underdevelopment”. The perception of European territorial private property as the model to be followed induced such statements about the legal situation of rubber forest property, while at the same time claiming not to be familiar with Brazilian land legislation. The purpose was to alert investors to the supposed "primitivism" of local rubber production in contrast to the " *civilization" of plantations*, aiming to convince them to invest in rubber plantation in British colonies.

The symbolism of monoculture as a promoter of progress and civilization, as opposed to the supposed primitivism of local ecological methods has long materialized the convergence of local political and scientific elites with scientificism. Since the mid-19th century, local professionals have proposed the development of rubber monoculture in suitable areas. The aforementioned support and appreciation of the

appropriation and ecological use of natural resources by the provincial government and, later, a state republican, occur from the 1860s amid a growing affinity with scientificism. In 1866, the president of the Province of Pará founded a scientific institution, the Museu Paraense de História Natural e Ethnografia, forerunner of the Museu Paraense Emílio Goeldi, focused on archaeology, ethnology and natural history.

Figure 2: Rubber Tree Property



Source: BENTES 1998 APUD Falcão (s/d)

From 1897 to 1917, the governors of the State of Pará, republicans who were members of the wealthy classes educated at European universities, promoted scientific agriculture and the study of the exporting economic potential of the forest. The scientific presupposition of superiority of European scientists and educated men was manifested, in particular, in the priority given to European scientists in the direction of the Museum of Natural History and Ethnography. In 1907, swiss zoologist Emilio Goeldi was hired to direct and revive that institution, whose next directors were the Swiss botanist Jacques Huber (1907-1914) and the German zoologist Emilia Snethlage (1914-1921).

In tune with scientificism, this institution remained unrelated to the ecological production of rubber until 1898. This occurred despite rubber having multiplied tax collection five times in the period from 1889 to 1894, and twelve times in 1889-1899; only in 1898, when the success of Asian plantations was evident, the director of the Emílio Goeldi Museum, Jacques Huber, devoted himself to the botanical study of rubber trees, publishing on the subject until 1913 (May; Sanjad (Drumond, 2005).

In 1898, Huber reaffirmed the adequacy of the old state policy to encourage the privatization of rubber forest still in the condition of *terras devolutas*, stating that official efforts should be directed towards the protection of *Castiloa Ulie* forests because rubber forests did not need protection, because these forests had already been privatized and their owners already take care that the most valuable asset of their land, was preserved and enriched through new plantings. However, from 1906, during and after the British campaigns to promote rubber monoculture, while many *seringalistas* reacted to the pressures to adopt this technique, Huber remained in tune with the scientific perception of knowledge, also assuming aspects of the nationalist bias of the official debate: the primary concern not to lose the collection of taxes by the State

and to ensure high productivity and economic profitability, and the wish to maintaining the leadership of Amazon rubber in the market.

True to the hierarchical way in which scientificism perceived the various kind of knowledge, this nationalism assumed that the leadership of Amazonian rubber could be maintained through the import of *plantations techniques* or the modernization of rubber companies in the Amazon. And, therefore, it attributed greater credibility to the views of scientists and capitalists from industrialized countries and regions.

Illustrative is the life story of Jacob Cohen, a local agronomist with extensive experience in research and monitoring of ecological and scientific methods of planting-management of seringais, latex collection and rubber preparation. Despite all his knowledge and experience he was always relegated by the state government that hired foreign scientists very little or nothing familiar with that knowledge, to whom Cohen had to work and pass on his qualified knowledge.

The promotion of scientific agriculture and the study of the forest by the governors of Pará, through two decrees of November 1909, provided for awards and subsidies for those interested in *cultivating Hevea* and improving local methods of making rubber, the creation of the Paraense Congress for the Defense of Rubber and the creation of scientific stations, schools of scientific agriculture and refining factory of rubber raw material. With Huber's help, the government founded an experimental agricultural rubber campus in 1910, which ran until 1916. The first director, an American agronomist, hired an American agronomist from the Washington Department of Agriculture. He arrived in Pará in 1909, without speaking Portuguese or Spanish and bringing chemical fertilizers, agricultural machinery and up to 50,000 clay pots to plant nurseries. He assumed the total administration of the "Campo de Cultura Paraense", having as assistants Dr. Leopoldo Pena Teixeira, secretary, maestro Clemente Ferreira, interpreter, and Cohen, head of cultures. It settled up infrastructure for Californian-style monoculture, cultivating 450 *Hevea brasiliensis* and permanently maintaining more than 20,000 seedlings to be continuously distributed to entrepreneurs and small familial producers. Rubber tree seedlings were provided by the Goeldi Museum.

Only when the American agronomist fell ill and returned to the United States, the government delivered the Experimental Field in the hands of a paraense. The new director adopted the local ecological method of rubber tree cultivation, in consortium with several species of trees native to the Amazon. The result, according to Cohen, was magnificent, remaining until the end of the experimental field.

The affinity of the Brazilian debate on rubber policies with scientificism is interesting in Huber's later publications. It deals with Amazon rubber from the concern with competitiveness with Asian rubber, as well as establishing a *hierarchy between plantations* and local ecological methods. In 1909, he agrees with statements by foreign scientists that Brazil could not compete with the East, because there the labor force is incomparably cheaper, and it is doubted that the "primitive" exploitation of the natural rubber tree forests of the Amazon could evolve into a "rational" and methodical culture in order to reach the same level of competitiveness of plantations in the East. He also recognizes what was widely accepted internationally

– that rubber from the Amazon was of superior quality to that of plantations. However, he advocates the adoption of monoculture in the region because he believes it would lower costs, increasing the chances of regional rubber returning to high price indices in the international market.

Table 1 : Experimental Field of Pará: Types of intercropping.

Californian-type scientific rubber intercropping with cereals (Fisher and Huber)	**Ecological scientific intercropping rubber with native trees (Leopoldo Teixeira)**
Principle: import methods *of* Californian plantations in consortium with temporary food crops.	**Principle:** learn the practical and scientific teachings of the cultures of the main regional plants.
Method: system of avenues, following instructions of Jacques Huber.	**Method**: to cultivate rubber tree in a similar way as it is born and develops in the forest, in harmony with several native essences.
Consortium: rubber trees + temporary food crops. **Rubber tree seedlings**: stump seedlings, more than two years old, cultivated and treated at the Goeldi Museum.	**Consortium**: 6 frames, regulatory distance of 5m in "quinconcio", planting a rubber tree and a tree of native forest species of economic value. **Native species used**: olive oil comadre, Andiroba, Red Ucuuba, Paracacachi, Acapu, Piquiá, Caucho, Maçaranduba real and others. **Rubber tree seedlings from selected** seeds from the Gurupá Islands, used when they reached two years of age.

Source: BENTES 2021b.

In 1911, while visiting rubber plantations in Malaysia, financed by foreign companies, he was ecstatic at the "stunning" success of plantations. Despite recording in detail, the deeply antiecological nature *of rubber plantations*, he does not attribute this to the way scientificism conceives and interacts with the natural physical environment, preferring to define as a major problem of this business the very nature of the industry and its organization, which would depend too much on the goal of maximum profit in the shortest possible time.

His view *of plantations* as supposedly true and higher-level knowledge symbols of human development reappears in a 1913 publication, in which he evaluates amazonian popular knowledge considering his goals of creating "true science", distinct and superior to local knowledge, which he classifies as vulgar. For him, his main difficulty in obtaining information from rubber tappers was the economic criteria and ease or difficulty of work used by them to classify the trees (the methods of collection, the quantity and quality of latex, the prices of rubber, etc.), which reflected interests quite different from his own as a botanist. Such a difference would have imposed the need for careful analysis of the classification of trees by rubber tappers in order to distinguish the "true science" of "popular science". The Commendable recognition that the rubber tappers' conclusions were different from his own because they evaluated the issue from a different point of view, however, was anchored in the hierarchical-developmental perspective of knowledge so that he calls them uneducated and, when referring to information collected from rubber tappers on which he disagreed, he simply classifies them as popular ignorance, confusion and misinterpretations of reality. Cohen demonstrated inaccuracies in important points of the work of this botanist.

The hierarchical perspective of scientificism marked the commission created by the Brazilian National Congress in 1906 to propose a policy for rubber. Only those attuned to the concern with high levels of productivity and the collection of public rents were able to be heard. Inspired by the writings of Euclides da Cunha, the chairman of the commission condemned the exploitative character of what he called the system of bosses to recommend its *replacement by plantations*, which he considered "rational cultivation" as opposed to the supposed "irrationalism" of amazonian ecological methods. An investor from Rio de Janeiro used the British descriptions of supposedly expensive, nomadic, and predatory rubber production to argue that the government should direct its incentives toward rubber plantations in Rio de Janeiro. According to the report of this commission, the preference of foreign investors for Asian lands was not due to the Brazilian conditions of more expensive labor or the difficulties in organizing an agricultural property, but to the supposed ignorance of our natural conditions and also to the unreasonable taxes charged by the various federative states, where the distinction between native and cultivated rubber made by many landowners should have already been adopted. It proposes measures to promote rubber monoculture.

The scientific perspective of the official debate was intensified during the deepest drop in rubber prices of 1912-1915. After two international rubber exhibitions, from 1912 (New York) and 1913 (Rio de Janeiro), new problems arose: the supply of the first ton of rubber from Asian plantations in the world market, the preference of English investors for Asian lands, several local investors began to replace rubber production with the production of leather and resins, the tendency to fall rubber prices caused economic losses and a reduction in the collection of taxes by the State.

The Rubber Defense Plan (PDB) of 1912 and 1913, together with a law created in 1908, met some local demands, but to a greater extent frustrated advocates of local methods.

6 REACTIONS TO SCIENTIFIC CIVILIZATION

In addition to defending the local ecological methods of planting-managing forests, the projects of economic and political changes of the *seringalistas* focused on problems such as control of the rubber market, financing and taxes on production, lack of workers, precarious transportation system and high prices of freight, demanding state protection. They were frustrated by the indifference or partial response of the central government, which becomes a standard especially in the period 1898-1920, because their strategy was to leave regional issues in the care of local politicians who could meet regional demands as long as they did not challenge or disturb the priority: the "national" economy.

The *seringalistas* proposed the integration of Acre as a State and not federal territory as did the Federal Government (Calixto 1993, p. 57). In 1889-1902, when seringalistas opposed the manipulation of rubber prices by foreign traders, financiers and exporters, they were hit by the increase in the conversion rate of the Brazilian currency, which had as a consequence 240 bankruptcies, firms, two banks and insurance companies (Calixto 1993, p. 57). Financial losses in Belém were between 70 and 140,000 contos. Between 1890 and 1910, the governments of Pará and Amazonas had an income of 84,965 contos to cover

an expense of 104,413 contos. Yet the relationship between tax collection and federal government spending in the region resulted in gains. The central government raised 124,107 contos and spent only 21,955, making a profit of 102,292 contos (Santos, 1980, p.210-211; Calixto 1993). The devaluation of the currency meant an increase in the cost of imports and a decrease in the cost of exports. Rubber prices fell sharply in 1901, coinciding with the lack of money caused by the central government's burning of money. Investment in the rubber crop of 1902 was reduced and, therefore, production fell, resulting in a drop in tax collection (Calixto 1993, p.159-160).

The PDB results from negotiations of the governments of Pará and Amazonas, the Territory of Acre and the federal government. Although expressing, to some extent, local demands forwarded by these governments, reducing taxes on rubber and food imports, and encouraging the use of Brazilian rubber in the national market, the Plan reflected the scientific bias of the national and regional debate: seeking industrializing development through the import of so-called "superior" technology and the concern to keep Brazilian rubber competitive in the market, not the valorization and promotion of the particularities of ecological rubber production.

The policy expresses the communion of Brazilian officials with this scientificism and the little political commitment to discuss the issue of productivity from the vision of the forest as productive capital to be explored and preserved, which pointed to the need to conceive competitiveness in a long-term perspective and to improve knowledge and local methods. The policy promotes rubber plantations throughout Brazil and exempts from paying import fees for technology destined for this activity.

Local complaints for incentives to locally created ecological methods received consideration, but through awards to methods of modernization of them, capable of maintaining the competitiveness of Brazilian rubber. Several proposals were submitted in 1913. And the Ministry of Agriculture funded a study on rubber production throughout Brazil and the potential for monoculture. The study showed the very high incidence of plagues in Asian rubber plantations, alerting investors in Brazil to develop their own seedlings to prevent the importation of plagues, and revealed the great potential for the cultivation of other elastic gum species in northeastern Brazil.

By encouraging production based on imported technology, the PDB impacted amazon industries. Like the can industry for latex extraction, which protested the unequal competition to which it was exposed.

The plan primarily met the interests of those in tune with official rationality: foreigners and Brazilians interested *in plantations*, Marajó farmers and urban traders. Since the previous decade, several foreigners were experiencing the failure of their rubber enterprise. The main reason for these bankruptcies, according to Pará congressman Jose F. Teixeira, Jacob Cohen and A. Russan, a foreign investor, was the unpreparedness of foreign managers hired to manage the uniqueness of seringais. The state government entered into an agreement with the British company Port of Pará for the arrival of a British rubber plantation specialist to teach the techniques of cutting trees used in plantations to local producers. In 1912-14, only 50 landowners were listed by him as interested in *investing in rubber plantations*. They were mostly

foreigners. English companies mediated this specialist's efforts to set up rubber *plantation schools* and in 1911 financed his visit, along with Huber and two other scientists, to Asian plantations. Concerned about the supply of cheap raw materials to Industries in the United States, U.S. authors have proposed adapting *to rubber plantations* or modernizing rubber plantations. The official stimulus to monoculture benefited, in the following decade, the Ford Project. He implemented massive monoculture, devastating the environment (Schmink, 1988). When official incentives ceased, Ford sold the project to a Brazilian consortium that produced lucrative rubber until at least the 1980s (Neves, 1985).

The promotion of monoculture collided with the ecological conception of *seringalistas* for whom preserving the rubber forest had a deep economic-ecological significance, being a decisive circumstance for the non-proliferation of monoculture in the Amazon. There were no plagues in local production. In 1943, Cohen demonstrated that during his 33 years of experience in rubber-intercropping research and cultivation, he and other renewed foreign scientists never faced plague problems. The complete non-control of pests by agronomists is a problem of large-scale monoculture, appearing in debates about the Ford project and, specially, the "rubber battle" during World War II.

The plagues and the long and deep cutting of the *tree used in the plantations* become problems also when looked at from an ecological perspective, because *seringalistas* and their technical collaborators attributed enormous importance to the issue of the preservation of native trees. The representative of the Amazonas Commercial Association (ACA), at the 1908 event, insisted on maintaining ecological management and informed that *seringalistas* were unanimous in criticizing the scientific method of cutting rubber trees. In Pará, *seringalistas* sued English for having rented their *seringais* and killed rubber trees due to the use of the scientific method of cutting.

The Representative of the ACA disputed the speech of the British consul at that event, claiming that in the Amazon valley, for a long time the swamps (floodplains) provided the highest agricultural productivity, and the best species of elastic gum trees were located precisely in the floodplains. In the dry lands, where the largest rubber producing areas in Acre are located, soil moisture is guaranteed by the high incidence of heavy rains. The methods used *in plantations*, he said, should be carefully evaluated to improve Amazonian methods. However, this evaluation should enhance the extensive local experience in ecological methods of planting-management of native forests and the better quality of rubber produced with such methods. He emphatically criticized the negligence of science regarding differences in soil quality and deforestation as "soil cleansing". It demonstrates that the different qualities of the soils affected the quality of rubber and the development of trees and that it would not be necessary to deforest to practice agriculture. It recommends the continuity of local ecological methods of planting-management of *seringais*.

In 1910, at the Congress of Commerce, Industry and Agriculture, held in Manaus, considering deforestation completely unnecessary, seringalistas were unanimous in the revalidation of local ecological methods (Miranda, 1990). In 1909, Leopoldo Penna Teixeira, who later took over the direction of the

experimental field in Pará, disputes the Cerqueira Pinto method in defense of local methods of rubber preparation and conservation.

As for the PDB, the seringalistas agreed with this in the reduction of taxes and in the treatment of the land issue, because it removed the barriers to official recognition of property in Acre and the distinction between domain, sovereignty, and jurisdiction, supported the recognition of old land ownership titles by the Union.

However, they claimed that the solution to rubber problems was not in the adoption of monoculture, but in reducing the cost of living of rubber tappers and production by reducing taxes, offering credit compatible with ecological planting-management, improving infrastructure and transport costs, as well as offering public health and education services. They also react to the official promotion of *plantations techniques* in the Amazon, emphasizing the predatory nature of these techniques and defending local methods.

The agreement that allowed training in these techniques was criticized through the argument that these methods demonstrably killed rubber trees.

Also in 1913, Chaves, a seringalista in Acre and a merchant from Pará, published a book, thoroughly evaluating the various methods of forest management and latex collection in terms of productivity and non-damage to trees to conclude that he preferred the simple local method of rubber cutting, because it was more productive and less harmful to trees. The less damaging quality of this method to rubber trees, he said, meant an advantage over the highly lucrative cutting method of *plantations*. It reports that the native *seringais* had no or very few diseases, fungi or parasites, except saúva and ferret. Conscious rubber tappers apply annatto or clay on the surface of excess cuts to scare away such insects. In 1912, Costa, an engineer who had proposed the adoption of rubber scientific agriculture along the Belém-Bragança railway, argued in a lecture to the Rio de Janeiro Engineering Club that the modern rubber cutting method was not suitable for native plants.

Preserving rubber trees had a profound economic significance because many years would be needed to replace them. While for investors in *plantations to* tear down the forest was a simple method of clearing the soil, with rare exceptions, the *seringalistas* did not share this view. For them this "cleansing" would mean destroying a capital. Native rubber trees could be exploited for up to 70 years and many could be productive for up to 100 years, while crops could be exploited by modern methods for up to about 25 years. The latex of the Amazon trees, when coagulated by the smoking method, resulted in better quality rubber, but these trees developed and remained sound and productive only if maintained in the middle of the dense and heterogeneous native forest. Plagues and other ecological issues that arose with large-scale monoculture were not seen by *seringalistas* as mere technical issues.

Preservation, as one of the elements of the productive process, seems to constitute a particularity of the ecological-economic use of natural resources in the Amazon in relation to the debate on nature by the Enlightenment scientificism of the 18th century, developmental view of 19th century and beginning of 20th

century. Enlightenment scientism was marked by a dilemma between preserving or not preserving the natural physical environment (Bowler, 1992). However, destroying the biosphere was a practice considered necessary for technological development, a symbol of superiority over other peoples. The dilemma, then, originated in the desire to preserve that, however, became secondary in view of the acceptance of the assumption that progress is positive or at least necessary. The practical consequence was the transformation of preservation into an action external to the productive process, synonymous with parks, gardens where "nature" is not spontaneously developed.

In the Amazon, on the contrary, preservation was an integral part of the production process of numerous products at least until the 1960s. Since the 1890s, the land legislation of Pará and Amazonas provided for the preservation of valuable natural resources as one of the requirements for the legalization of land possessions. In Acre this becomes a reality from 1912. There were numerous measures to prevent the destruction or damage of valuable forests (Regulation No. 737 of 25/22/1850). There were many arguments in defense of local ecological methods. And for a long time, seringalistas have hired a worker solely to inspect the rubber tappers' work to prevent them from damaging rubber trees.

Guided by this economic-ecological perspective, seringalistas and various local professionals diverged from scientificism and the promotion of *plantations*. In 1912, J. Virgolino de Alencar, a rubber producer in Acre, in a report to the National Society of Agriculture, said that he had a number of more productive trees only for reproduction, because he had observed that the seeds of unexplored trees germinated more easily and were stronger. A practice quite different from that recommended by the botanist Huber: that seeds should be extracted from exploited trees. In 1912, during the preparatory meetings for the International Rubber Exhibition in New York, Cohen realized that Huber only referred to the smoking process with urucury pit and offered to prepare samples of smoked rubber with each separate forest essence of use in *seringais*. He presented seven samples, each produced with a different method or smoking substance. Huber pledged to take the samples to the exhibit and inform Cohen about the results but did not keep his promise. Several have adopted the improvements to the latex smoking process proposed by Mendes, but the chemical method, proposed in 1913 by Cerqueira Pinto and awarded by several North American and English factories, although adopted by some, was questioned and not adopted by the vast majority. In 1918, the Commercial Association of Pará (ACP) disputed the promotion of this method by the federal government.

The promotion of the Cerqueira Pinto method met the government's strategy of taking control over it, preventing foreigners from doing so. However, the ACP argued that local producers had long decided not to adopt this method because of its high cost, requiring the importation of chemicals and because it had not proven to be more efficient and acceptable by importers than local methods of latex coagulation through smoking.

In the 1950s, Carlos Neves, son of a *seringalista* and agronomist defending rubber monoculture in specific areas, faced strong criticism from *seringalistas*. He disputed the world-renowned idea that plagues

would have prevented *seringalistas* from adopting monoculture on a large scale. In the 1980s, he used as one of the examples the successful Ford project, in Fordlândia and Belterra (which already used the graft method to prevent diseases), defended the modernizing policies of the military regime for the Amazon. And he argued that, despite the lack of sufficient research to develop regional seedlings, insufficient capital and lack of adequate credit system, *seringalistas* did not adopt monoculture by conscious decision to continue with local ecological methods of planting-forest management, criticizing them for it.

The prevalence in the academic debate of the stigma of the ecological method of planting-management of primitive and inefficient is due, to a greater extent to scientificism, which induces academics not to recognize the inhabitants of the Amazon as historical actors, and to the relatively little documentary research on the subject. The disagreements with official policy were not considered in the national and international debate on rubber. However, the official policy for rubber was not fully implemented. The PDB was not included by Congress in the Union Budget for the following year, interrupting the infrastructure services that had been started, making it impossible (Martinelo *1988, p.* 57).

The official policy did not reflect the view of most local rubber producers. Therefore, its collapse did not mean the collapse of production. The rubber price crisis of 1912-15 bankrupted aviator houses and many *seringais*, as well as scaring away foreign capital. However, many *seringalistas* had long been creating strategies to deal with the constant fluctuations in rubber prices followed by economic crises. The best *seringais* continued to export rubber, including to the UK, throughout the *peak of plantations in British colonies* and were profitable until at least the early 1980s (Bentes 1998).

7 CONCLUSIONS

The scientific-territorial sense of land that led *the advocacy of plantations by the state* and the British - soil to be deforested for monoculture, in the years 1900-1915, collided with ecological appropriation. In this, the modernity of the social status of the *seringal* land as productive capital and valuable commodity, whose socially unequal access followed the legal standards of the rest of Brazil, was mixed with ecological connotations of land, property and productive use, in which land meant the native rubber tree forest. It was the rubber forest that defined the size and contours of the property, being its preservation a prerequisite for the continuity of the production of rubber raw material.

Guided by specific economic and political interests and the common belief in scientificism, British and Brazilian officials and scientists built the civility *of plantations* in contrast to the supposed incivility of ecological rubber forest property. The official policy for rubber promoted plantations, dedicating secondary importance to local knowledge and critics of this policy. Despite this policy, which did not actually take place, it was dismantled in the 1910s, and the fall in rubber prices in 1912-1915, caused by the growing supply of cultivated rubber, monoculture did not proliferate in the Amazon because local producers did not adopt this technique, claiming that it would destroy one of its main capitals: the elastic gum forest.

Although anti-ecological scientificism was adopted by several entrepreneurs, others thought about the natural physical environment and technology in a relatively ecological way and reacted to it.

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