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AREAS OF ESCAPE AND THE PLANTING OF RUBBER TREE

The rubber tree (*Hevea* spp), tree native to the Amazon region, known for the production of latex, since the days of Christopher Columbus, acquired economic importance, in the 19th century, when it was used in the production of rubber, the raw material for the manufacture of tires and other industrial artifacts, from 1939, when the American inventor Charles Goodyear discovered the process of vulcanization, rubber in reaction with sulfur under high temperature does not deform or lose elasticity.

This condition spurred the production of latex extraction causing the rubber came, in 1910, the second product in the export tariff of Brazil, with 40% behind the coffee with 41% (Santos,1980). The rubber economy made the Brazilian Amazon live its *Belle Époque*, between 1880 and 1910 according to the wealth of the rubber and the euphoria that resulted in social Pará and Amazonas. In 1890, the capitals of distant provinces of Pará and Amazonas anticipated and encouraged what would happen at the beginning of the 20th century, in the capital of the Republic (Dadu, 2000). This economy also contributed to the definitive incorporation of the territory of Acre to Brazil, and the deployment of the Madeira-Mamoré railroad, in the territory of Rondônia.

The rubber tree, in the forest, live with the fungus *Microcyclus ulei,* that the attacks of endemic form, so the damage is insignificant because the trees are vegetating among other native species, that is, the rubber tree, under these conditions is benefited by the ecological balance of biodiversity.

The growing demand for this raw material, in the international market, stimulated the deployment of large monoculture production systems. Ironically, it was a Brazilian who sparked interest by English planting of rubber trees in their Asian colonies. Between 1861 and 1863, João Martins da Silva Coutinho, involved in the exploitation of rubber in the

Amazon, recommended the cultivation of the rubber tree to the provincial Government of Pará. Your suggestions were not followed, he took seeds to Rio de Janeiro, where they were planted in the National Museum. Seen by botanical interest, the Brazilian Government sent him to Paris to disclosure in the Universal Exhibition of 1867 where he repeated suggestions he had made to the Government of Pará (Passarinho, 2010). His account attracted the attention of London which would change the rubber economy and geography.

The plantations were developed from 1876, first in England (Kew Garden), then in South-East Asia, deployed by the British with seeds from the Brazilian Amazon, brought by the English subject Henry Wickham with the consent of the Brazilian Government. This attempt was successful, as well as the increasing demand for natural rubber, the fungus *Microcyclus ulei*, does not find, in plantations in this region, conditions for their development.

In Brazil, the first attempt to establish commercial plantations of rubber trees was done by Ford Motor Company who settled on the banks of the Tapajós River, 41 km from the city of Santarém. The climatic conditions prevailing in the areas of natural occurrence of *Hevea brasiliensis*, with abundant rainfall, air temperature and high humidity, set to hot, humid weather. In 1928 had already been deployed 4,000 hectares with material from Asia. Around the plantation town of Fordlandia, which housed the technicians, factory workers and their families, with all infrastructure including schools, warehouses, pharmacies and a hospital.

The high concentration of rubber trees, devoid of natural defense of biodiversity brought about a favorable environment for the development of the fungus *Microcyclus ulei* (p. Henn.) v. Arx, now epidemic. The severe attacks were decimating threateningly most plantations. Although there were started work with the crown budding, grafting or double, where the plant has three types of material: the root, origin obscure, a trunk of material of high productivity and a cup of the causative fungus resistant material of the South American Leaf Bligth; the damage became so severe that, in 1934, the rubber from Fordlandia abandoned and chosen another planting area.

A new project, this time in Belterra, was deployed. Its location was a little more privileged; the place was higher, with better soil aeration and a little better. In 1941 were already planted 6,478 hectares, but the insistence on cultivating high productivity eastern clones, but susceptible to pathogen, resulted in new failure and, in 1945, due to a severe epidemic of severe attack of South American Leaf Blight, the company Ford ended its activities in Brazil, transferring to the Brazilian Government (Ministry of Agriculture, in the figure of the Instituto Agronômico do Norte-IAN), for only 500 thousand dollars, Fordlandia plantations and Belterra, an investment that cost the Henry Ford, nine million dollars

(Coutinho, & Pires, 1996). Henry Ford died in 1947, but attempts to plant rubber trees continued.

The production of rubber trees grown had been one of the motivations for the creation of the Instituto Agronômico do Norte (IAN), in the city of Belém, in 1939, the agronomist Enéas Calandrini Pinheiro. Responsible for its implementation, the agronomist Felisberto Camargo, formed in ESALQ, believed that only with the planting of rubber trees Amazon could return to the good times of the rubber or at least dream of getting the country to self-sufficiency (Ferreira *et al*., 2011). IAN continued to research program started in Fordlandia in order to control the South American Leaf Blight through the hybridization of resistant species *Microcyclus ulei* with eastern clones of high production. Of this work emerged the clones IAN-717, IAN-873, Fx-3925, Fx-3810, Fx-2261, and Fx-386 (Duarte & Albuquerque, 1999).

With these clones began new plantings. Although suffering frequent leaves fall, managed to produce latex in economic bases. To this end, systemic fungicides sprays contributed to minimize losses, but due to the high cost of chemical control, these plantations were also abandoned in the 1990 (Duarte & Albuquerque, 1999). Research with the rubber tree continued and, today, allows you to cultivate rubber tree without the epidemic occurrence of South American Leaf Blight in regions known as escape areas.

The fungus *Microcyclus ulei* requires, for an efficient process of infection and development of high temperature (above 23ºc) and above continuous six hours of higher humidity to 80% (Gasparotto *et al*., 1989). Regions without these characteristics are known as "escape areas". Are considered escape those areas with water deficit of 200 to 300 mm for four to six months, or with precipitation less than 70 mm in four consecutive months and the rubber tree leaves change water deficit in this period, which is defined as dry period (Trindade & Silva, 1999). In addition to that under these conditions the plant develops and produces economically.

In the Amazon, the first recorded planting of rubber trees in the exhaust area occurred in the municipality of Açailândia, located in the West of the Maranhão State. Was done by the Protestant Confederation of Brazil, in 1963, with 25 clones of IAN and Fx series, which developed and produced free from epidemic attack of the South American Leaf Blight. The climatic records collected in this area showed the average total 1,337 mm of precipitation, with four months of drought and water deficit of 335 mm. The rubber tree promoting aging and, especially, the new leaves in the dry season, low air humidity, making the proliferation of fungus *Microcyclus ulei*. Was thus characterized that Amazon has exhaust area for planting of rubber trees (Pinheiro *et al*., 2003.)

Currently rubber is used in the transport, industry and war material. Exist in the global market more than 40 thousand articles made of natural rubber. Are consumed about 600 kg of rubber for the construction of an airplane and 68 tons for a warship. In addition, the natural rubber is strategic raw material for approximately 400 medical devices.

Unique among the natural products, natural rubber due to its high molecular weight and molecular structure (> 1 million daltons) is with resilience, elasticity, plasticity, resistance to wear and impact, electrical insulating properties, and impervious to liquids and gases that cannot be obtained in artificial polymers. Natural rubber is obtained from particles contained in the latex, cytoplasmic fluid extracted continuously conductive vessels of latex located in the bark of the trees by means of successive cuts thin slices peel, process called bleed. (IAC, 2013).

The synthetic rubber obtained from oil has almost the same chemical composition of natural rubber, but their physical properties are viable for some manufactured, but are inferior to surgical gloves, condoms, car tires, trucks, aircraft and various coatings.

World production of natural rubber in 2011 was 10,974 thousand tons, for a consumption of 10,924 thousand tons of which more than thousand 8,577 is sourced from Southeast Asia, involving countries such as Thailand (30.93%), Indonesia (22.66%), Malaysia (9.08%), India (8.10%) and Viet Nam (7.40%).

The biggest consumers of natural rubber in 2011 were China (32.98%), followed by the countries of the European Community (11.13%), United States (9.42%) and Japan (7.00%). The tire industry consumes almost three quarters of rubber produced in the world.

The Brazil, cradle of the genus *Hevea* is still, unfortunately, being a natural rubber importer country. For a country that has, in relation to other producer countries, incomparably greater area, suitable for the planting of rubber trees, the production deficit means, at the very least, indifference to a strategic product as high economic and social value. According to estimates of the International Rubber Study Group (IRSG), in 2012, for a consumption of 350 thousand tons were imported 215 thousand tons of natural rubber, equivalent to 757.4 million dollars. That same year, Brazil reached record production of 135 thousand tons (IAC, 2013; MAP, 2013).

Using their scape areas São Paulo State, with latitude of 23° S became the largest national producer of natural rubber, in 2012, produced 74,993 t, 54.55% of the national production. Follow him: Mato Grosso with 33,750 t, 25.00%; Bahia with 15,592 t, 11.55%;

Espírito Santo with 2,043 t, 1.80%; Amazonian States – Rondônia, Acre, Amazonas, Pará, Amapá and Roraima with 9,585 t, 7.10%-(IAC, 2013).

The current volume of production of natural rubber in the Brazilian Amazon is disappointing to say the least. This is not for lack of technology that makes it impossible to plant rubber trees, but by an evident lack of agricultural policy of the States that compose it. This condition leads, among other things, not to use the escape areas, existing in the region, making its contribution to Brazilian self-sufficiency in natural rubber and, who knows, help the country pass the exporter importer of this strategic raw material. It is not understandable that the Amazon, who lived the economic rubber boom, in the late 19th and early 20th century, continue to waste this economic and ecological option so peculiar and important to their development in the 21st century.

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