

# A Tycoon in the Jungle

## The Micro-, Meso- and Macro-level of an Economical, Social, and Environmental Experiment

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*Working Paper 06/03*

*Draft version of February 28<sup>th</sup>, 2006; no citation without explicit permission*

### Abstract

In the 1920s Henry Ford planned to extend his concept of the “all-in-one”-factory to tires by establishing a rubber plantation in the Amazon jungle. For that purpose, a whole industrial city, within a short time becoming known as “Fordlandia”, was transplanted from Michigan to Brazil. A lot of problems arose (labour problems, organizational failure, shortage of expertise, social unrest, political disturbances, cultural misconceptions, and above all, environmental problems), therefore Ford shifted the commercial plantation to another place, but did not come into production before World War II. After losing access to the usual South-East-Asian sources of rubber, the plantation became important even strategically. In contrast to promising predictions, however, problems continued, the plantation failed to gain revenue and was finally sold to the Brazilian state. In any case, the success of a rubber plantation in the Western hemisphere would have changed at least part of the economic history of the 20th century. Hence, this story of a momentous failure is also a story of economical, social and environmental miscalculations, and of obsession.

**Key Words:** economic history, Ford Motor Company, rubber plantation, Brazil, investment decision, social history, environmental history

**JEL Classifications:** D92, F21, G31, N50, N56, O13, Q13

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## Introduction

In 1942, immediately after the declaration of World War II by the United States, the already well established Journal *Economic Geography* published an article by Joseph A. Russell about an interesting project of one of the most prominent businessmen of the twentieth century, Henry Ford. More than a decade before, the industrial tycoon, recently by *Fortune* declared as “man of the century”, has decided to establish the first rubber plantation in the Western hemisphere in Brazil to challenge the producers in the British and Dutch colonies in South-East Asia and to secure the supply of rubber. Due to the Japanese advances in the Far East in the same year 1942, this venture even gained strategic importance for winning the war.

But this is by far not the only reason for the special interest that this project obviously deserves. It is not even the most important one, nor are the historical circumstances alone promoting its uniqueness, but several lessons that are still to be learnt from it. As it is usually a good idea particularly in economic history, I want to tell a story to draw these lessons out of it. In short, this story is about an outstanding personality trying to win supremacy over nature by constructing trees as well as a whole city in the middle of the jungle, trying to create civilized men out of “savages”, and also trying to produce his own rubber for tires and other parts to equip his cars. Thus it is a story about an entrepreneurial experiment and the unavoidable economic risks connected with it, about the attempt to transplant not only a whole industrial city into an entirely different and unknown environment, but also the Fordist philosophy of factory work and the American way-of-life into another cultural sphere, and about the negligence of environmental considerations in general, which is particularly dangerous in tropical agriculture. Hence, it serves not only as an example to compare other historical as well as recent projects designed in a colonial or neo-colonial style with it, but also to challenge the usual assumption underlying (outspoken or not) most of economics that its rules are the same everywhere.

Besides some preliminary explorations and investigations, Ford started his venture in 1927 by founding the “Companhia Ford Industrial do Brazil” in Belem, the capital of the state of Para in North-eastern Brazil. This company had three main purposes: to plant (and possibly manufacture) rubber, to utilize by-products (like timber or electricity), and also to construct hospitals, schools, and other buildings and infrastructure to improve the local living conditions (FMCR Acc. 301, Box 1, particularly Article 10 of the “Articles of Association”). The plantation was located at the shores of the Tapajoz River, a tributary to the lower Amazon, and 2.5 million acres (i.e. 10,000 square kilometres) of land were granted by the provincial government in connection with excessive tax relieves for material used to “produce and process rubber”. The names of the places affected by the plantation, which soon became known as “Fordlândia”, is a story for itself: the first settlement was established at Boa Vista (“good view”), the second in Belterra (“beautiful land”).

Despite these promising phrases, Ford nevertheless failed tremendously, and in retrospective it is easy to argue that this result was clear from the very beginning. Although this becomes less clear from the contemporary viewpoint, the decisions – the original, but even more the decision to carry on in the 1930s – were very much confused by considerations far from economic “rationality”, not to speak of “sustainable development” (which would be rather anachronistic in the 1930s and 1940s). To describe and discuss this failure is one of the main purposes of the paper, as well as to show that it was not completely unavoidable.

Secondary literature about Fordlândia is relatively scarce, while there is a lot of archival primary material available (at the Benson Ford Research Centre at the Henry Ford in Dearborn), containing company records as well as contemporary magazine articles as an important source of information.<sup>1</sup> At the same time, there is rather scattered information in several books about the Ford Motor Company, about Brazil, about tropical rainforests, or about rubber, although many of those do not mention the project at all. Hence, some information can be found in books about rubber (Davis 1996, Dean 1987, Weinstein 1983) or Henry Ford (Brinkley 2004, Bryan 1997, Nevins and Hill 1957), also Ford himself mentioned the project in his third autobiographical book (Ford 1930). However, the number of scientific articles about Fordlândia is even scarcer (Galey 1979, Russell 1942, but see also Esch 2003, a PhD-thesis covering also two other ventures of Ford, or Sedrez 2000). Hence also some popular sources become interesting, like a novel (Sguiglia 2000), TV documentaries (like Tschirner 2002), recent magazine articles (Dempsey 1996) or even a comic book (originally in French). This paper thus is also dedicated to overcome this negligence, at least a little.

It has four main parts. In the first I will present the macro level of the project, which is the development of the world rubber market in the first half of the twentieth century in particular, and world economic and political history during that period in general. The second part is about the meso level of the project, which is its context within the Ford Motor Company, its relation to other important projects during the two decades of operation, and the effect of changes in the Company management on it. This is also the section for discussing the connections between the project and the political changes in Brazil during the 1920s, 1930s and 1940s. The third part will tell about the micro level, which is essentially what was going on at the plantations themselves and which will also contain a discussion of the investment decision itself. At the end, conclusions will be drawn.

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<sup>1</sup> The author has to express his gratitude for the Benson Ford Research Centre hosting him in February 2005 for extensive archival research as well as the Clark-Travel-to-Collections Grant for additional finance.

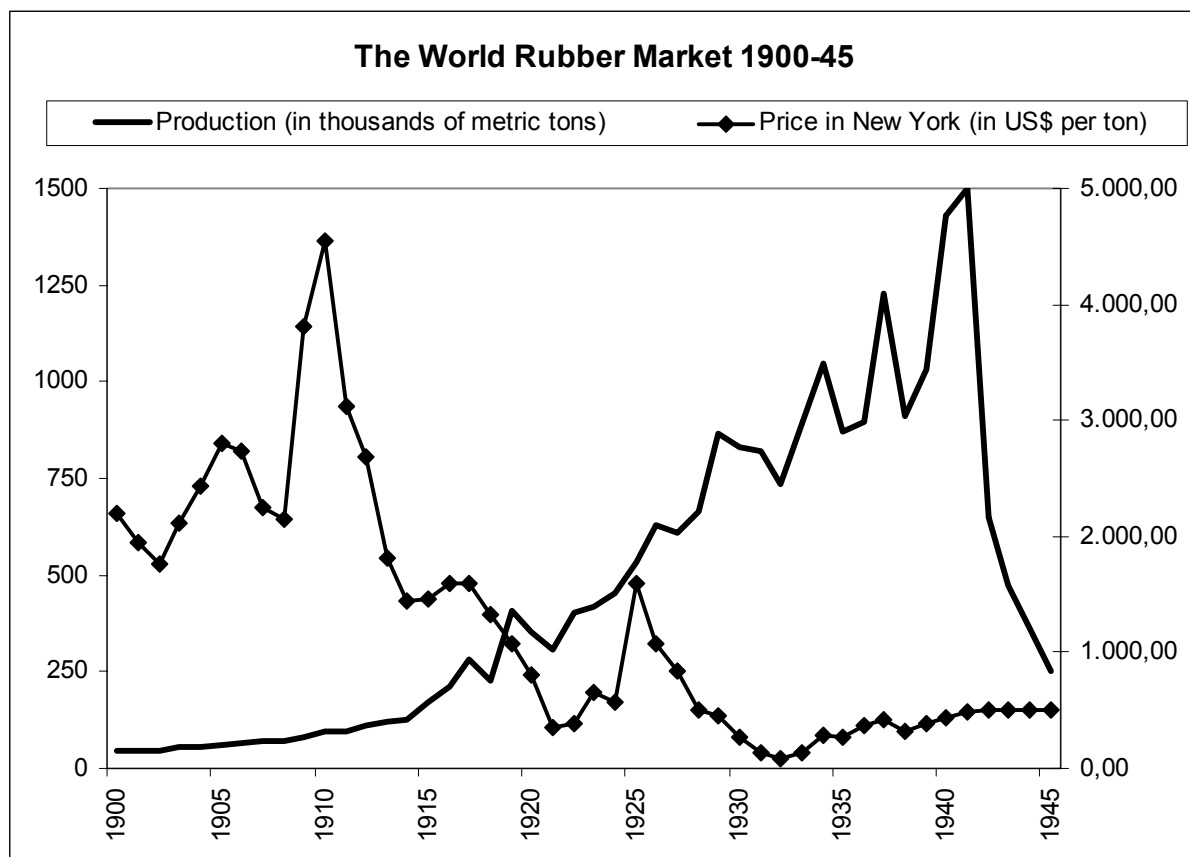
## The Macro Level

Rubber was one of the raw materials igniting a “rush” in the late nineteenth and early twentieth century. All over the world sources of wild rubber were exploited, usually connected with extraordinary violence against the native populations. This is particularly true for two regions: the Congo basin and, most important for the world rubber market until World War I, the Amazon jungle (which is mainly Brazilian, but also Peruvian and Bolivian). Until approximately 1890 hardly more than 17,000 tons of rubber was produced worldwide per year, 44,000 tons in 1900, and 96,000 in 1910, Brazil usually amounting for more than half of the entire production (IRSG 1996, pp. 2-3 and 73). From 1890 to 1910 the price of rubber rose threefold, finally reaching the highest absolute level (before 1995) in 1910, when rubber paid 964 Pound Sterling per ton in London and 4,554 Dollars in New York (IRSG 1996, p. 42). The effect was unexpected wealth for some “rubber barons” in the Amazon valley, resulting in the building of a luxurious Opera House in the jungle city of Manaus (Brazil), an Eiffel House in Iquitos (Peru), from which the rich people mailed their clothes to Lisbon for washing, and a lot of palaces in all locations connected to rubber. Brazil earned the lion’s share of the revenue, amounting for 150 million dollars per year from rubber alone in the heydays, i.e. statistically remarkable 10 per head (in current value), but extremely unequally distributed to only a very limited number of these heads.

A situation like this usually is not sustainable due to various efforts in exploiting the profits. The most significant of these efforts dated back to the 1870s, when Sir Henry Wickham sent (illicitly) 70,000 seeds of “*Hevea Brasiliensis*”, the highest yielding rubber tree specie, from the Amazon to London (Dean 1987, pp. 14-22). Some 2,000 of these seeds were successfully grown and later exported to the British possessions in Asia, where they were utilized on plantations, coming into production around 1900. This changed the situation on the world market dramatically. Plantation rubber (mainly from British, but also from Dutch and French plantations) developed its market share from nothing in 1900 to 13 % in 1910, taking the lead over Brazil in 1913 and exceeding 90 % for the first time in 1922. At the same time the Brazilian share dropped from more than 60 % in 1903 to less than 10 % from 1919 on (IRSG 1996, pp. 2-5). Even worse was the performance of wild rubber from Africa, amounting for less than 1 % of the world market during the 1920s. In 1920 world production was around 350,000 tons and prices had fallen to 200 Pounds (800 Dollars) per ton (IRSG 1996, pp. 2-5 and 42-3).

Prices kept on falling until 1922, when they had reached 85 Pounds per ton. This cut profits and obviously alarmed British authorities, now gaining most from rubber. Thus the so called “Stevenson-Plan” was carried out, regulating sales according to world prices (in fact establishing a cartel with Dutch producers) and in that way increasing profits (in fact exploiting monopoly rents). Until 1925 prices had risen again to 320 Pounds, a remarkable resource boom (IRSG 1996, p. 42).

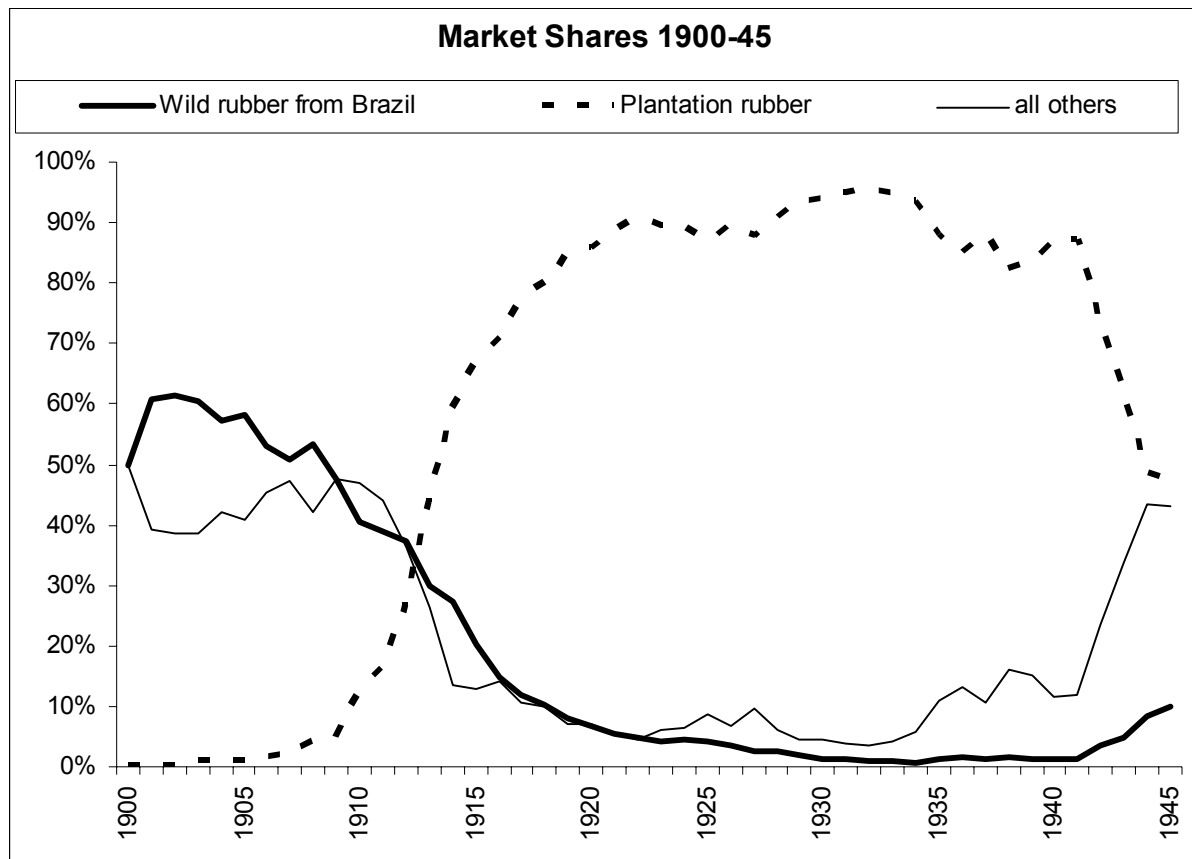
Thus, the Stevenson-Plan was alarming for those demanding rubber, and the world's biggest consumer of rubber became conscious of the situation – the United States with a share of about three fourths. Besides the rubber processing industry, this was particularly true for the producers of tires for the heavily expanding automobile industry. The immediate reaction came from tire tycoon Harvey Firestone, anxious of a tremendous price rally. He initiated a conference of important rubber using industrials and officials early in 1923 (his friend Henry Ford was invited as well as representatives of Goodyear), and – also owing to his lobbying – the government then sponsored expeditions to search for alternative rubber sources in Latin America in 1923 and 1924 (Dean 1987, pp. 67-72). The reports of these explorations carried out by the Agricultural Department were submitted to potential investors (among these Ford) even before the politicians saw them. Firestone himself then started a relatively successful rubber-producing venture in Africa (Liberia), producing from the 1930s on and still existing, Goodyear experimented in Central America (without considerable success), but withdrew in the 1940s, and Ford turned to Brazil. All this fits well into a global trend towards as much national self-sufficiency as possible and monopolizing all valuable resources within still growing colonial empires, a reaction to the disastrous experience of World War I, which has destroyed a world market relatively open and has put an end to the “first wave” of globalization.



*Source: IRSG (1996), pp. 2-5 (production) and pp. 42-3 (prices).*

But these attempts could not have an immediate effect, because rubber plantations need at least seven to ten years before coming into production, and also the gathering of wild rub-

ber could by no way be increased to the amounts necessary to satisfy U.S. demand. Thus, in the mid-1920s, fears were very real: fears of an ongoing increase in prices as well as of a general shortage of rubber at the world market. The effect especially on Ford, then producing more than two million cars each year, and his policy of continuing price cuts to improve his market share (followed for more than a decade before), would have been very clear: extra charges for tires would by far surpass any cut of the price of the car itself.



*Source: IRSG (1996), pp. 2-5 (own calculation)*

*Remark: "Plantation rubber" refers to production figures from Malaysia, Indonesia, Thailand and Sri Lanka.*

The Stevenson-Plan (as a follow-up cartel in the late 1920s) actually failed in the long run for various reasons, mainly for failing to secure an effective cartel of all producers, a development speeded up by the world economic crisis from 1929 on. The Great Depression hit the automobile industry particularly hard, because the shrinking purchasing power of the consumers was not spent on new cars but goods more essential for everyday life. For the rubber industry this was an extraordinary demand shock, which contributed a lot to the price disaster during the Great Depression. But prices had already declined until 1929 again to 94 Pounds per ton of rubber. Nevertheless, when the Depression further lowered demand, prices reacted catastrophically and dropped to a historical low of 21 pound sterling per ton in 1932 (i.e. 7.7 cents per kilogram of rubber in New York), a price at which plantations could hardly find any profitable market. Furthermore, prices remained low and never topped pre-Depression levels throughout the 1930s. Nevertheless, production

volumes improved slightly but constantly (after a setback of only 20 per cent during the Depression) helping to keep prices low (IRSG 1996, pp. 42-3).

Hence, during the 1930s the situation became less severe, prices and production increased again until the final outbreak of World War II in Asia, which of course changed the situation dramatically. While in 1941 total production amounted for 1.5 million tons of rubber, early in 1942 Japanese troops occupied most of the rubber growing areas in South-East Asia. As a consequence of the shortage, that could be expected from this, prices in New York (and later also in London) were controlled and set to 496 Dollars throughout the war. As expected, production dropped sharply to finally 250,000 tons in 1945. Thus particularly U.S. specialists were screening Latin America for natural rubber, for healthy and high yielding trees, and for possible locations of production (Davis 1996, pp. 296-329, Dean 1987, pp. 87-107). Brazil even employed several thousands of “rubber soldiers”, fighting World War II at the “rubber front” in their domestic jungles, a job that proved to be much more dangerous and much less honoring than has been combat in Europe, which was also carried out by 25,000 Brazilians (Levine 1998, pp. 70-1; see also Revkin 1990).

Due to the vital importance of rubber for war production, this had – besides the search for alternative sources of natural rubber – two important consequences: the development and production of synthetics, although weaker in quality, was strongly enforced; and recycling became an important issue (even the speed limits in the U.S. were set not due to saving oil, but saving tires). This seemed to be a good environment for a rubber plantation far from the danger of conquest by Axis troops.

## The Meso Level

Actually it was not, for various reasons particularly on the micro level. But it was also problematic, because the attitude of the Brazilian government, itself a fascist regime, was not absolutely clear before Brazil joined the Allies as one of the first South American nations in 1942. Until then, the president of the country, Getulio Vargas, and a lot of his followers even openly sympathized with Germany. Also the Allies seriously took an invasion of Northern Brazil by German troops into account, and definitely there was the danger of a cut of supplies from Brazil by German submarine forces in the Atlantic, even patrolling the mouth of the Amazon (Levine 1998, 64-9). Nevertheless the various ties (particularly economical ones) connecting Brazil with the United States proved to be much stronger than any pan-fascist ideas might have ever been, and later Brazilian troops even fought in Italy to win the war.

But what proved to be sustainable throughout World War II (and before) in Brazil were two elements of fascist ideology carried out as strongly as possible by the government, both not very favorable from Ford's viewpoint: a corporatist regime in the sphere of economics (and particularly labor relations), and the nationalist idea of “Brasildade”, of “Brazil for the Brazilians”. Especially the latter one made any attempts of solving Ford's labor

problems (to be discussed in more detail later) by the “import” of Chinese labor or by migration from the Caribbean factual impossible, even before the outbreak of the war. Vargas also tried to centralize the country, having been very federal until the first Vargas’ “revolution” of 1930. After a second one in 1937 the country turned into a “mild-tempered, semi-totalitarian dictatorship” (Levine 1998, 55), and Vargas characterized it in May 1938 as following: “A country is not just a conglomeration of individuals within a stretch of land, but above all a unity of race, a unity of language, a unity of national spirit” (Levine 1998, 57). Despite this rhetoric, the success of all these attempts was limited due to the immense vastness of the country (Brazil is almost as big as the United States) and the difficulties of administration and even communication, but they guided administrative actions to a certain extent all over the country and hence could pose problems.

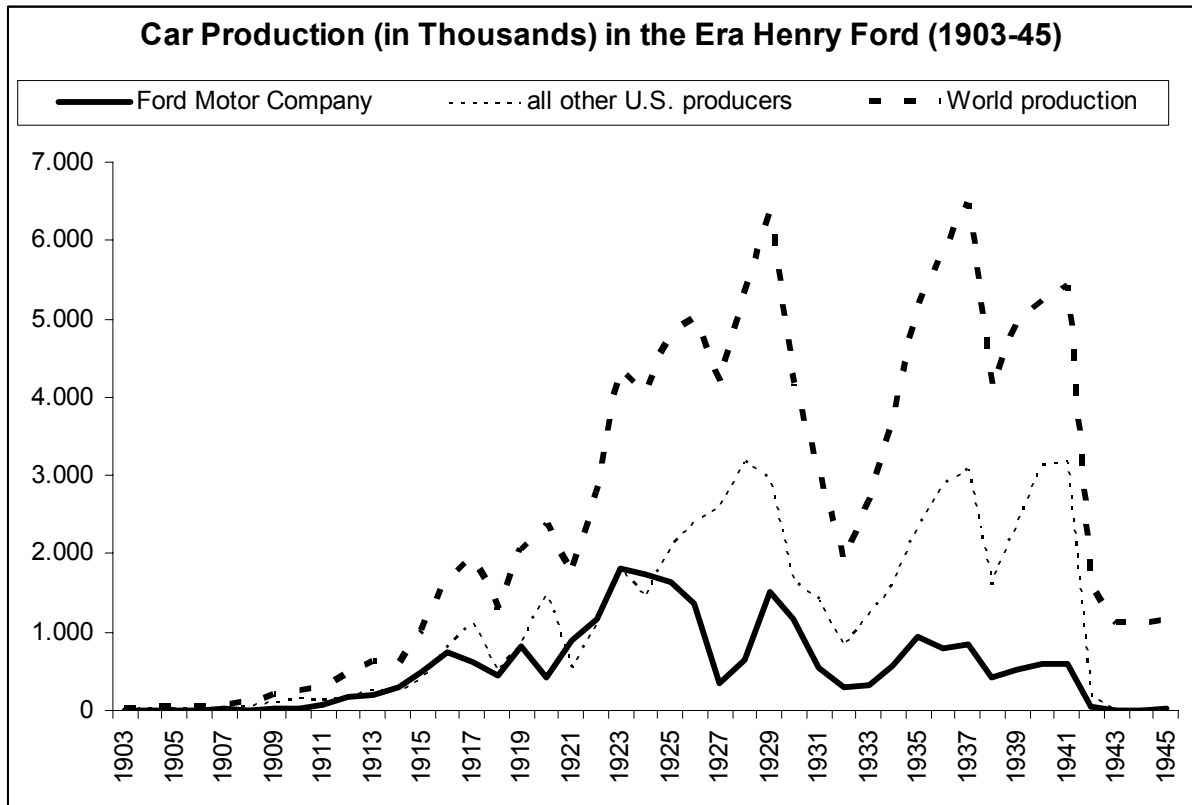
Thus the man to deal with in Brazil from 1930 to 1945 was Getulio Vargas, who overthrew the federal government of the so-called “old republic” in 1930 after having lost more or less regular presidential elections. The “old republic” was a federal and oligarchic regime, in which wealthy businessmen and the governors of the states (often closely associated to the business dynasties) played the most important roles. Vargas replaced this system (though never completely) by a much more centralized and populist regime, even more enforced by another revolution (one from above, preceding re-elections) in 1937 to establish the “Estado Novo”, the “new state”. Nevertheless, local authorities (during the early 1930s personalized by so-called “Interventors” instead of governors) stayed to be very important for carrying out business, particularly in the more remote northern parts of the country. And at least from 1940 on and despite ongoing disputes with local authorities over all these years, Ford had won complete support by the regime. The president visited the plantation and presented it as an “example” of economic, social and particularly sanitary development in the North. Even before that, officials usually referred to the conditions on the plantation (also with respect to labor relations) as far beyond national standards (FMCR Acc. 74, Box 5, folder “Presidential Visit”; see also Galey 1979, pp. 277 and 281-2).

So much for Brazil, but what is to be told about the environment of the project at the Company level (Nevins and Hill 1957, 1963, Sward 1948, Brinkley 2004)? After the introduction of the assembly line in 1913, Henry Ford became the by far most important car producer of the world. In 1914 as well as in 1921 more than half of the world production of cars was of the Ford model-T-type, which accounted for 37 per cent of all cars running on the planet in 1925 (IRSG 1996:44-51, Nevins and Hill 1963:478-9). These 11 million cars needed – at least – four tires each that also had to be renewed regularly. In the 1920s, the only source of raw material to manufacture these tires was natural rubber. Furthermore, tires were not the only part of the car that was produced from rubber. Hence, Ford needed tires (which he usually bought from his friend, Harvey Firestone, or another tire producer) as well as dried rubber (which he usually had to buy from the British or Dutch plantations in South East Asia). For both, a secure supply of rubber and thus its world market price were essential.

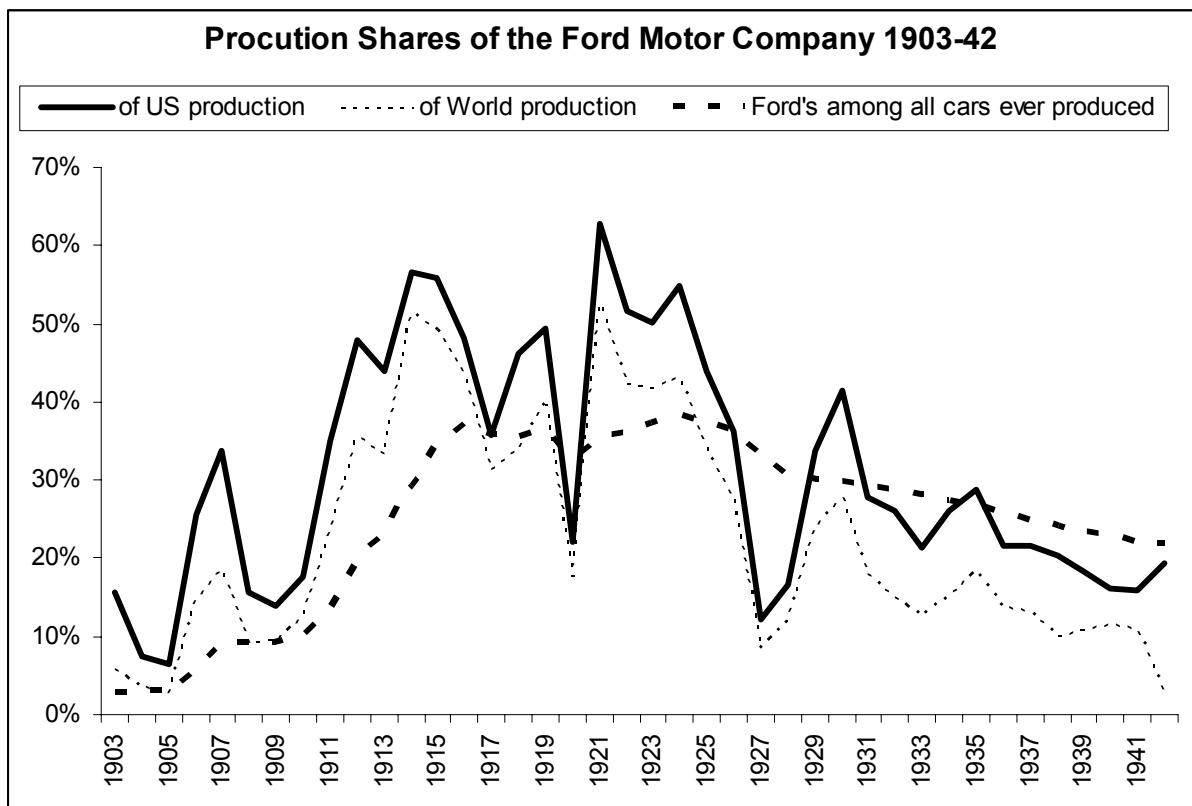


This was not a big problem in the world rubber market of the 1910s. Although Ford's demand for rubber increased steadily as his production figures of cars increased, rubber prices decreased due to the explosion of production owed to the introduction of plantations in Asia. But it became a very serious and real problem in the 1920s because of the price rallies connected with the cartels enforced by British rubbers producers then. That Ford personally very much disliked monopolies and cartels (due to events in the early history of his company) may also have contributed to the reaction that followed. Hence, Ford started his venture in Brazil in 1928, immediately after a serious intra-firm-crisis (changes at the automobile market made a complete restructuring of the Ford Motor Company necessary) and immediately before an even more serious extra-firm-crisis (the Great Depression). While Ford in 1923 reached a production record for 2.2 million vehicles (of which almost 1.9 million were passenger cars), the number dropped due to changes in the preferences of consumers and strong competition to only 550,000 vehicles (380,000 passenger cars) in 1927. Ford decided to adapt to the changing market conditions and – instead of selling the same Model T, all black, every year – built a new model and provided several varieties. The new Model A was very successful and as early as in 1929 Ford produced again more than 1.5 million cars. But during the Great Depression Ford was hit badly, later, but harder than his competitors. Total production in the automobile industry decreased 40 per cent annually from 1930 to 1932, and Ford's share dropped from more than 41 per cent of total US-production in 1930 to less than 22 in 1933 (in 1932, he produced less than 300,000 cars). All this contributed a lot to the extraordinary unemployment figures in the United States during these years: Ford alone cut employment by more than 70 per cent from 1929 to 1932 (see Nevins and Hill 1957 and for the numbers Nevins and Hill 1963:478-9 and Nevins and Hill 1957:685-7).

Henry Ford was in absolute control of his Company from the first plans to possibly grow rubber somewhere in the early 1920s until September 1945, when he finally resigned, making his grandson Henry Ford II president, although – until his early death in 1943 – the president formally was his son Edsel (who was also formally president of the “Companhia Ford Industrial do Brazil”). In the mid-1920s Ford was on the absolute peak of success, hence he obviously felt like being able to carry out anything successfully, if he just wished to do so, an attitude strongly reflected in his autobiographies (Ford 1923, 1926, 1930). He even played with participating in the presidential elections in 1924, in which he would have had good chances. This mood changed for the first time, when in the late-1920s serious problems by strong competition, the public demand of a design change of his cars, and finally the Great Depression arose. Although he overcame the first, more or less internal crisis of 1927, he never completely recovered from this series of setbacks, although running a profitable business again in the 1930s, when he also started to experiment with alternative materials to equip his cars, most prominently soybeans (Bryan 1997). During the war, he completely (and profitably) dedicated his business to war efforts, concentrating on bombers and jeeps. When he finally resigned at the age of 82, a radical restructuring of the Company took place immediately, which led to the termination of several unprofitable ventures, ranking prominently among these the Brazilian rubber plantations.



Source: IRSG (1996), pp. 44-51; Nevins and Hill (1963), pp. 478-9.



Source: IRSG (1996), pp. 44-51; Nevins and Hill (1963), pp. 478-9 (own calculation).

To fully understand what was going on in Fordlândia, one has to add some more elements of the Ford philosophy. Most important among these are his concept of the “all-in-one”-factory fed at the one side with raw materials (all coming from sources in possession of the company) leading to finished cars at the other end, his concept of “not producing cars but men” in his factories by also claiming social responsibility for the workers, and his concept of building up markets for his products by paying relatively high wages.

The rubber plantations were designed to make a resource necessary to produce tires as well as a lot of other rubber parts of cars available for Ford at a price not affected by monopolists and cartels or any other reason for shortages. Strangely enough, in the 1920s this particular resource was absent in Ford’s chain of vertical integration. This shows a close connection between the situation at the world rubber market in the middle of the 1920s and Ford’s decision to invest in rubber. Ford had already invested in securing at least a minimum supply of most inputs into the production process. He definitely very much liked the idea to be completely self-sufficient in car-production. Hence, for some years Ford followed this overall strategy of complete vertical integration and for that end acquired sources of raw materials (timber, iron, coal), bought and built infrastructure (a railway, a small fleet, waterpower-plants), and constructed factories to produce various intermediates for his cars (like glass, wooden parts, metal parts). Now he also invested in his own tire factory at the Rouge (his main plant in Detroit) to utilize the material from Brazil.

Another very influential idea was his concept of “producing men”. This concept originated in the 1910s in Detroit and was enforced by the so-called “Sociological Department” (Nevins and Hill 1953, 554-63). It was essentially about incentives for living what Henry Ford refers to as a “proper life”. To be eligible for the “profit shares” by which wages were raised up to a daily rate of five Dollars (a wage accompanied by a serious speedup of work and thus in real terms no big increase), one had to meet certain requirements about marital status, housing, diet, habits, financial situation, and even ones status of “Americanization”. This company policy was enforced from 1914 to 1920 and – connected with the excellent pay – helped a lot to reduce the high rates of turnover at Ford following the introduction of assembly-line-production. After abandonment at home, Ford applied it obviously to his overseas venture in the Amazon jungle. He clearly wanted to “produce” men from the “savages” he found there by social care, education and capitalist work (Esch 2003). He transplanted a North American village and a Ford-style factory to South America. By this, he introduced not only high standards of sanitation, housing and diet to the Amazon (although especially Michigan-style housing and diet were not really appropriate there), but also North American means of entertainment (up to square-dance) and religion (at first, Ford did not provide a single Catholic church in his Brazilian village). Ford did not receive the reaction expected, the “natives” strongly resisted the American way-of-life in general and the capitalist work ethos Ford wanted to proliferate by his venture in particular. It was a problem for a long period of time that a lot of people simply left the plantation after having earned a little money (the company in a policy shift from payroll- to contract-labor recognized this in 1931, but the problem was not solved as such by this

measure). Later, Ford focused more on supporting families and especially on educating children, the “best prospects” of the company.

Due to his philosophy, Ford also paid wages in Brazil far beyond local standards, at first doubling or even tripling ordinary amounts. Strangely enough, during the Depression his employees in Brazil even seem to have got a payment comparable to the wages some of his suppliers in Detroit received – according to the reports about Briggs in 1932, that paid \$1.40 for a 14-hour-day (Sward 1948, 220-2). Nevertheless these wages failed to attract a sufficient number of workers (at least of workers willing to stay) and they did not change their attitudes towards consumption in particular and life in general. This pattern also survived a policy change of the company, when the plantation was opened for a larger number of families (at first, the company was anxious that the plantation would be flawed by a huge number of women and children going there to live and enjoy the social “security” of relatively affordable food, housing and medical care without paying back through work).

Other things, like Ford’s concept of the utilization of all resources (and possibly also wastes) available, the philosophy of not employing “experts” but men learning on the job, and his extreme dislike of trade unions (which is not very compatible with a corporatist environment like the one faced in Brazil), add to the picture. Nevertheless, the operational importance of the Brazilian venture (not its importance for an overall business strategy) should not be exaggerated. According to the closing balance, it accounted for less than one per cent of the overall value of the Ford Motor Company (almost \$1 billion at the end of 1945). Even if the largest estimates of overall investment throughout two decades are taken into account, they amounted for much less (in current value!) than the Ford Motor Company usually earned as net income annually even in the 1910s. In fact, the importance of the rubber plantations even decreased after the outbreak of World War II, which definitively shifted interests completely. The tiny Brazilian part of the big cooperation was in this context almost forgotten and more and more alienated.

The death of Edsel Ford in 1943 left Henry in charge alone. The relationship between the two always was difficult, especially during Edsel’s final years. But this loss left Henry Ford, then almost 80 and previously hit by two strokes as an old and lonesome man. Even before, he only had a few contact-persons within the company who he trusted, and he became more and more isolated afterwards. Also his physical ability did not allow concentrating on too many issues and the rubber plantation seemed to be one of the minor ones, at least from 1941 on. Thus the management of the Brazilian venture could act relatively autonomous.

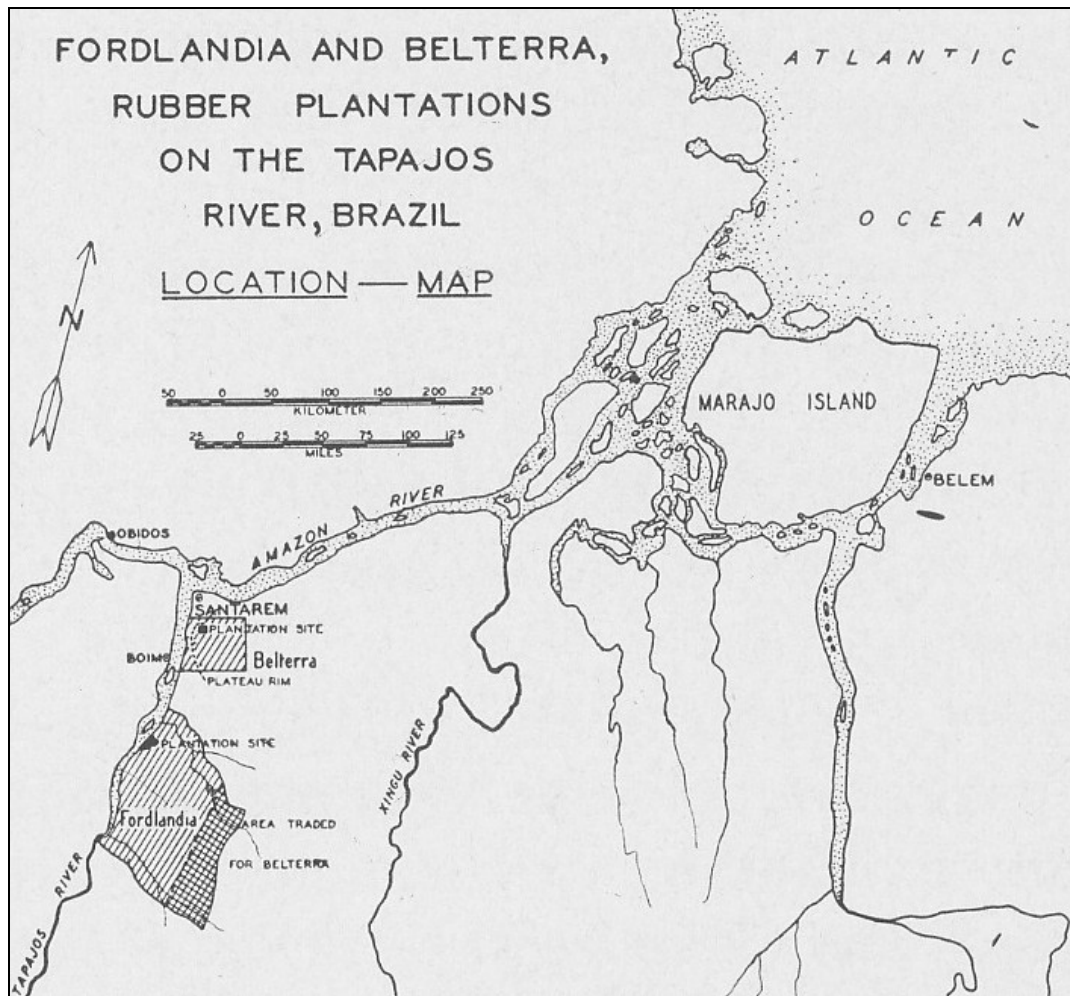
Hence, also the personality of Henry Ford, easily to be derived from his autobiographies, definitively contributed a lot to his virtue in standing all tides against rubber as another success story in his personal records. His self-perception as a man almost “doomed” to success, unstoppable and powerful, armed with the certainty of a just mission to create a better world, and the engineer’s believe in human supremacy over nature strengthened his stamina. If Ford always has success, than the plantation will turn out to be successful, as

long as it is carried out seriously, and if men reins nature, than environmental problems always can be solved technically. Thus, success of the venture is not perceived by Ford as a question of uncontrollable external factors, but of sufficient investment and sufficient efforts, controllable internal factors. Ford's disposition to lonesome decision-making (as well reflected in the intra-firm conflicts in the 1910s) became even stronger, the older he became, and the more he also insisted in decisions once made (one of these to invest in rubber). This became more and more virulent, when at the end of the "era" Henry Ford the structure of the Company was rather confuse and responsibilities unclear. Thus the fact that Archibald Johnston, "overhead" of the plantation from the early 1930s on, and also celebrated as a "grey eminence" of rubber in the 1940s (as such advising the U.S. government), was a strong personality and interested in the fate of "his" venture, spent most of his time during the war not in Brazil, but in the United States and thus relatively close to Ford, definitely protected the plantations against criticism. When Johnston finally resigned in summer 1945, the plantation was closed within some months.

## The Micro Level

Although Ford participated in 1923 in the Firestone conference and thus was aware of the problem, and although he was contacted by Brazilian officials already in the same year, he did not carry out any plans before 1926, when a small expedition was sent to Brazil to investigate possible sites there. The decision for Brazil was rather easy to argue: first, it is the motherland of rubber, the home of *Hevea Brasiliensis*, the best yielding variety of the rubber tree with respect to latex, the basis of rubber (also used on the Asian plantations); secondly, Brazil is part of the Western hemisphere and the distance to the United States is much less than from East Asia, while at the same time, the natural conditions are much better than in Central America or the Caribbean, which would have been even closer to the United States; thirdly, the cultural difference between the United States and Brazil was regarded to be much less problematic than in the case of an investment in Western Africa, which would have been equally interesting with regard to natural conditions and geographical distance. The decision for the particular site was not as easy to argue. Based on the reports about the explorations of 1926 (LaRue 1927, 1953), the main reason for choosing the Tapajoz seems to be a combination of two arguments: first, the upper Amazon was ruled out by the Company (as well as all small rivers) because of bad transportation, although the best rubber land was located there; secondly, of the riversides at the lower Amazon, located mainly in the province of Para, the Tapajoz was considered as superior compared to any alternatives for reasons of accessibility, climate (particularly sufficient rainfall) and soil quality. Generally, compared to the average rubber plantation areas in the East, the conditions and the costs (in combination with a proposed higher degree of mechanisation) were estimated to be much more favourable. But in the at least suboptimal choice of Boa Vista, which later became Fordlândia, insufficient preliminary work and corruption seem to have played a role. The fact that it is the same region where Henry Wickham a half-century before has secured the seeds later producing the plantation rub-

ber of East Asia definitely was important as well, but also the fact that a Brazilian contact-person of the company held an option on part of the grant area, which led to the considerable payment of 125,000 Dollars to him (Dean 1987, p. 72).



*Source: Russell (1942), p. 126.*

Nevertheless, besides unexpected cost for bribes, the installation of a plantation in Brazil was a bargain and the chosen site looked perfect (easily accessible by ocean-going ships, sufficient rainfall, and good trees). It also seemed to be rather easy to get seeds and planting material close to the site or from another part of the Amazon basin. Also the history of the world rubber industry proved that the decision to go to Brazil in general and to the Tapajoz in particular could not be wrong. As one problem the scarcity of population and thus of labour was seen. Therefore it seemed to be necessary to construct not only all production sites but also proper housing and city facilities for the workers. But all other difficulties were considered as minor ones.

But the problems turned out to be everything but “minor”. At the beginning of the 1930s, even the macroeconomic conditions were all but favourable for a newly established rubber plantation. But also the microeconomics “on site” had negative influences on the costs

and the volume of latex production in Fordlândia. The most important of the problems were (Russel 1942, Galey 1979, pp. 270-77, Dean 1987, pp. 71-86):

- *Site conditions:* the terrain around Boa Vista turned out to be relatively hilly and thus no machinery could be used but terracing was necessary; the river proved to be not navigable for ocean ships during the dry season and thus a considerable part of the year; and also the natural conditions of the jungle environment, although known in advance, made life and work difficult.
- *Mismanagement:* following the Ford philosophy of training on the job (and Ford's dislike of "experts"), Einar Oxholm, captain of the ship carrying the original equipment and a man without any experience in rubber (or plantations), consequently became the first manager of Fordlândia (Esch 2003:108); results were disastrous with the effect, that management changed several times, before Archibald Johnston took over in 1931. In 1933 for the first time an expert in rubber planting was hired, but personal conflicts between the leading executives continued to disturb the smooth operation of the venture (Dean 1987:78-80).
- *Problems with local authorities:* the cooperation with the Brazilian authorities was all but easy; customs officers often refused to actually enforce the tax concessions granted (not only because Ford resisted to pay bribes), and there was in general a lot of confusion about federal versus regional competences; a lack of cooperation with the neighboring state of Amazonas also turned out to be problematic and costly (see Dean 1987:73-4).
- *Labour problems:* labor turnover was very high at first, amounting to almost 400 per cent annually; in December 1930, even a riot took place among the workers, causing some damages but fortunately no casualties (FMCR Acc. 74, Box 2, folder "Riot of Dec, 1930"); in general, the labor situation was considered to be difficult from the very beginning, because labor has to be acquired far from the plantation (from as far as the states of Ceara or Pernambuco); thus the "import" of workers from various regions (within Brazil as well as outside) was often discussed as an option, but never carried out consequently.
- *New costs and no revenues:* while the costs of construction, clearing, logging, labour recruiting, and especially planting grew and grew, hardly any revenues could be generated; initially it was calculated that tropical lumber will bear at least a part of the burden of the venture, but in fact no market at all for the harvests from Fordlândia could be found, neither in North America, nor in Brazil, due to high costs (nevertheless resulting from conditions typical for a tropical environment); thus commercial lumbering was abandoned as early as 1933; also the exploitation of oil, metal, or waterpower in the region proved to be impossible or too costly.
- *Pest and diseases:* the most important problems throughout the two decades of operation, however, were environmental ones, particularly pests and diseases, which

all contributed a lot to the fact, that only a relatively small number of trees ever came into production; these problems, endemic to the region and seasonally well distributed, hit the plantation continuously and hard; control and treatment, although never fully efficient, added to the already high costs.

Hence, even after the first year it became very clear that things were not as easy as expected: while the construction of the village made some progress, almost all of the freshly planted rubber seeds were dead or dying. Oxholm was replaced, but management did not become more professional and labor turnover stayed very high (in some weeks during 1930 up to 10 % of total labor force quit). After another year, in December 1930, even a riot took place among the workers, ignited by a new way by which the workers were provided with food (FMCR Acc. 74, Box 2, folder “Riot of Dec, 1930”, see also Galey 1979, p. 277, Esch 2003, pp. 116-9). Initially, in 1928 Ford had sent two ships (the MS Lake Ormoc and the barge Lake LaFarge) all the way from Detroit to the Tapajoz, carrying not only the initial American staff (of only eight people), but also the nucleus of his village and factory (among other things, a complete sawmill and a powerhouse were transported) to be transplanted from Michigan to the Amazon.

The difficulties did not vanish but became less important, when – something not coming as a complete surprise according to several reports of experts about possible difficulties – an army of insects (mainly caterpillars and ants) and diseases endemic to the region (mainly the South American Leaf Blight, but also Black Crust) attacked the plantation. These two pests killed almost all of the now more than a million trees before any of them had come into production (which was expected to happen in the mid-1930s). In retrospect the situation seems to be clear: five years of planting was (almost) for nothing, the costs – for construction as well as for production – were much higher than expected in advance, some problems (labour) proved to be as serious as expected, but the majority (environmental, administrative, technical) proved to be much more serious, and any attempt to utilize by-products failed. The world market price of rubber was extremely low and a strong increase would have been necessary only to cover the costs (not to talk about profits). Also Ford, only slowly recovering from the disaster of the Great Depression, faced much more serious difficulties at home during these days

Two points could possibly be held against this evidence: Ford’s idea of an all-in-one-factory was – without a secure rubber supply – simply impossible, thus the context of the venture was broader; and the investment amounted already for 7 million US\$. Although Ford himself always had the credo of “never throw good money after bad”, this nevertheless was exactly, what he did for another decade. He did that possibly due to a growing “obsession” to his rubber experiment, but he did that also because he obviously believed to have good reasons. The most important of these reasons can be seen in the overall strategy of the Company, reflected in the construction of a tire plant in Detroit, and his experiments with soybeans in Michigan, already in the mid-1930s providing the basis for a lot of parts for his cars. Viewed in this broader context, although the short-term profitability of



this “enlarged” venture did not improve much, perspectives for the whole became brighter and in this context the rubber plantation also became less important.<sup>2</sup>

Hence, Ford did not surrender. Instead, an expert for leaf diseases was hired immediately, and the original plantation at Fordlândia was given up in 1934 (although not completely abandoned, but continued as “experimental” station mainly for tree-breeding) to construct a new one. This site was located much closer to the Amazon (at Belterra at the mouth of the Tapajoz near Santarém) and it provided a much flatter hinterland much more appropriate for a plantation of whatever kind. For that purpose the most remote part of the old concession (a part never even investigated and definitely not seriously considered as plantation land) was exchanged for the equal-sized surroundings of this new site.

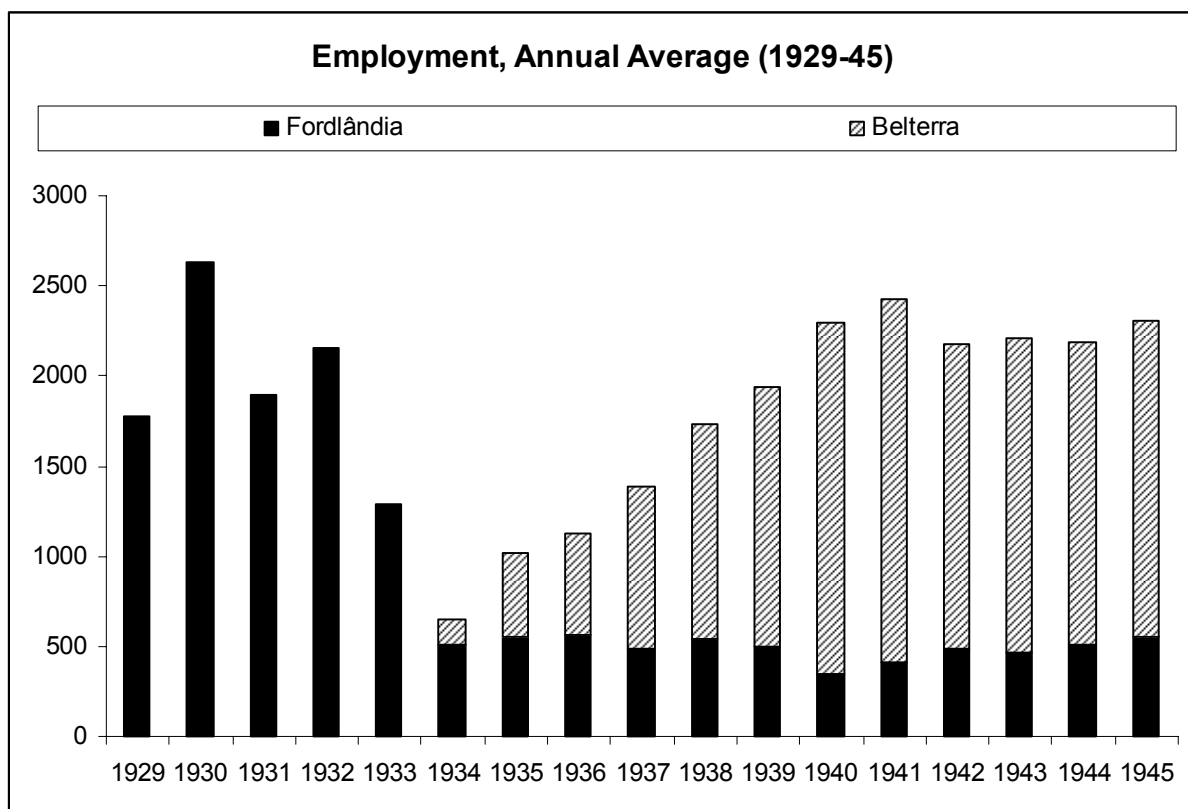
Thus, at the plantations two overall production strategies were carried out: reducing costs and improving methods. The emigration to Belterra, where much less extra effort was needed to grow rubber trees, was the most important part of the cost-cut-strategy. The second strategy also should contribute to cost-reduction at least in the medium term. By using better methods the rate of success should be improved and thus relative costs reduced. But it was also a strategy for its own ends. James Weir, the already mentioned “expert”, immediately initiated the transfer of seeds from East Asia to Brazil, replacing the domestic ones that (to some degree surprisingly) had proved to be insufficient in quality. The main purpose of this measure at first was not so much to strengthen the resistance of the trees, but to increase potential yields. Weir also put much more emphasize on research which was not considered as an issue at all before. Now emphasize was put on the selection of trees with respect to their performance. By a combination bud-grafting and top-grafting, three sources of an “artificial” tree were put together and the tree actually “constructed”: a root resistant to root diseases, a high yielding stem, and a foliage resistant to leaf disease. This technique was not cheap (trained labor, experimental gardens, and time were needed), but the results were rather encouraging. Another attempt to improve the performance of the plantations was experimentation with new by-products, which by by-planting also improved the performance of the rubber trees. Several products were tried: cotton, cocoa, coffee, tropical spices, and others. Thus additional revenues could be expected. Also the workers were encouraged to plant their own food in small gardens close to their homes. This reduced the costs for food and also improved the health of the workers and their families.

Another very important issue was the investment in the living conditions in general. One can summarize all these efforts by referring to a missionary spirit of “civilising savages” that from the very beginning on obviously guided the venture (see Esch 2003, also Dempsey 1996), although it would be an exaggeration to call it “colonial” (Galey 1979, pp.

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<sup>2</sup> However, in his quest for tires and rubber parts Ford did not reduce his efforts to improve the rubber plantation in Brazil. The soybean laboratories in Dearborn were at least equally important in that respect. One of Ford’s dreams (connected to his concept of “one foot in industry, one foot on the land”) was the idea of a car completely produced out of agrarian resources. He came close to that in the early 1940s, when – experimentally – some cars with plastic bodies made out of soybeans were produced.

278-9).<sup>3</sup> The material content of this mission was the construction and (partly) staffing of schools, hospitals, warehouses, recreation facilities and churches, the supply of affordable (though price and quality controlled) food and fresh water for his workers and their families, and generally the transplantation of a North American industrial village with all its comforts (like water supply and electricity) to the Amazon Valley. Nevertheless almost all of the employees always were Brazilian nationals. But also the Company clearly expected advantages from these measures: although the first (and very Ford-like) idea of “creating consumers” failed, a change in the attitudes of the workers was expected towards a much more “capitalist” perception of life and thus to a much more disciplined work “ethic” than before. The idea was to initiate the desire for even better living conditions among the workers – which could be satisfied through more and better work and thus benefiting Ford. The success of these attempts was rather limited. “Ford was still failing to sustain the workforce it needed. Having succeeded in creating neither a ‘loyal’ nor a ‘disciplined’ workforce, Ford set its eyes on the workforce of the future: children” (Esch 2003:119). However, this strategy was undermined by the sale of the plantations in 1945, long before a significant number of children had finished Ford-like education.

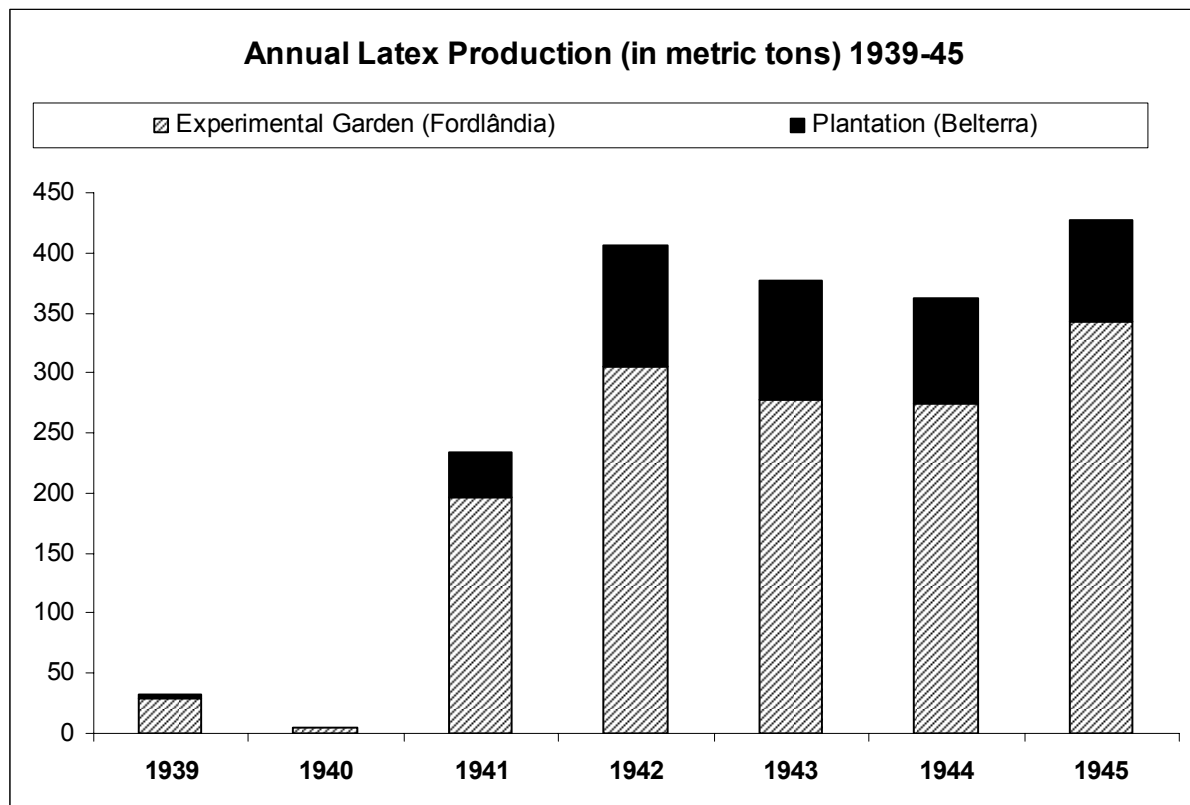


*Source: FMCR, Acc .74, Boxes 2 and 5, “Monthly Reports” (own calculations)*

*Remark: With the exceptions of 1929 (derived from data September to December) and of 1931 (only from December), numbers are the arithmetic average over twelve monthly reports*

<sup>3</sup> At least as much as the overall U.S. policy strategy of “good neighbourhood” towards Latin America in the 1920s and 1930s

Thus, at both places Ford not only planted rubber trees. Employment figures amounted for more than 3,000 people as early as 1930 (mainly for construction), reaching approximately the same number again in 1942 (the lowest level of employment was around 850 people during the summer of 1936). After the establishment of Belterra, constantly about 500 workers were employed at the original site in Fordlândia, while up to 2,500 (according to the season) were employed at the new site. And as stated before, Brazilian officials considered the plantation a fabulous example of development of the North (especially because of its medical standards), most prominently President Vargas himself, who visited it in October 1940 and officially announced that the Ford Motor Company has gone far beyond any labor standards he wanted to enforce in the country.



*Source: FMCR, Acc .74, Box 5, "Monthly Reports" (own calculations)*

In this respect Ford's venture was clearly outstanding. But according to production, it was a complete failure, paying almost nothing back on the investment. Even in the 1930s, the plantations charged the Mother Company much higher prices for the results of first experimental tappings in Fordlândia than the world market would have done (FMRC Acc. 74, Box 1, folder "Latex shipments"). Hence, under the world rubber market conditions of the 1930s a commercial success of the plantation was completely out of question. And in the 1940s the situation did not change, although rubber was vital for successful warfare, because it was needed for almost all military equipment, airplanes, battleships, tanks, and jeeps as well as smaller parts. The bad part of the story for the plantations was that prices were controlled to avoid excessive speculation. At the settled price of US\$ 496 per ton, only small profits could possibly be earned, and therefore remained as invisible as (almost)

did production numbers. All together the output amounted for less than 2,000 tons of latex (not even rubber!) until 1945, most of which came from the “experimental station” at Fordlândia, and not from the actual plantation site at Belterra (FMCR Acc. 74, Box 5, several folders “plantation progress reports” and “monthly reports”). This was negligible even within Brazil, increasing its rubber production from 17,000 tons in 1941 to 30,000 tons in 1944. Hence, the plantation accounted for less than 1 per cent of Brazilian production during the war years, while Brazil in general, in spite of all favorable circumstances, contributed only 5 per cent to world production from 1942 to 1945. Even more, most of this latex was not even shipped to the United States, but sold locally – or not sold at all.

Hence, besides the fact, that the production of synthetic rubber, almost inexistent and inferior in quality before the war, experienced a boom in the United States and elsewhere during World War II to secure at least a minimum of supply of a resource of vital importance, the production of the plantation itself was absolutely insufficient. Instead of approximately eight million trees estimated as necessary to run a commercially successful plantation, not more than three million trees were ever planted simultaneously, of which at the maximum ten per cent really came into badly yielding production. The reason for that was mainly, that Fordlândia never got rid of its original insects and disease problems, and that these also severely attacked Belterra in the 1940s, although in many reports the insufficient labor situation, the lack of capital, or even a “labor shortage problem” was stressed as most important (Russell 1942, pp. 136-41). Although particularly at the beginning, when turnover was high, labor supply was low, it is all but clear that more labor really would have increased production in the end, because the amount of labor available had not affected actual production during the 1940s. While the employment numbers were considered as insufficient to achieve the ambitious production targets on a more or less mathematical (and thus inappropriate) basis, the problem was not so much that available trees could not have been tapped but that the trees available for tapping were not high yielding ones and that their number could not be increased significantly, not matter how much work was or how many workers were put into it.

This does by no means mean that there were no efforts to improve performance. Particularly two strategies were followed: besides the “construction” of artificial trees as mentioned before, the development of pests and diseases was carefully observed (there are excessive monthly reports in the records) and whenever possible treatment was given. If more research in both directions would have improved the situation, is left to speculation. Particularly disease treatment was expensive and practically impossible for the whole plantation, although promising experiments with pesticides and insecticides produced from local sources were carried out (Russell 1942, pp. 133-4).

Another attempt to produce revenue (actually to reduce fix costs) was a large-scale sale in 1941 of most of the initial equipment of Fordlândia, among a lot of small parts also a crane and a locomotive, the complete powerhouse, and the sawmill equipment was put for sale (FMRC Acc. 74, Box 1, “Misc folder”). But hardly any buyer could be found and the powerhouse, although damaged, is still to be seen in Fordlândia.

Whatever the reasons may have been, the end of the experiment proved at least, how costly it was. Overall investment is estimated (no accurate numbers exist) to something between 6 and 30 million US\$ within twenty years (even the ever optimistic Joseph Russell stated already 9 million alone up to 1941; Russell 1942, p. 136), with possibly 20 million US\$ the best guess. The net loss of the sale alone was calculated at 7.8 million US\$ in 1945, which is almost the entire book value of the assets (FMCR Acc. 134, Box 4, folder "Assets transferred to Profit and Loss"). The price of the plantations then, all inclusive, was only US\$ 250,000 (5 million Cruzeiros), which was the amount Ford owed its workers under Brazilian law as severance pay (Dean 1987:105). Thus, the sale in fact took place at a symbolic price, slightly more than 1 per cent of total investment and possibly 3 per cent of the book value of the assets).

## Conclusions

Generally, it would not be an exaggeration to call the venture Ford's "utopia". As Esch puts it: "If Fordlandia became the site for experimentation with *Hevea Brasili[ensi]s*, Belterra became the site for experimentation with people" (Esch 2003:119). Ford was on a self-chosen mission of "civilising savages", the costs of which are relatively clear, while its profits remain very much unclear (as often during his career). The entrepreneurial utility of improved nourishment, health, education and purchasing power, particularly in the environment of a poor and very low developed tropical country, is clear, but to secure possible benefits for the Company (not to talk about avoiding free-rides by outsiders) neither the luxury of American style housing, nor the complete industrial facilities, nor the transplantation of a full-fledged village was necessary. In fact it would have been enough to follow the advice of another expert, who suggested already in the mid-1920s that because of the insecurities of the world market, the instability of all possible cartels, and the foreseeable problems in Brazil, the best solution for the company would be to establish some trading posts along the rivers of the Amazon basin to collect wild rubber as long as this is profitable. History proved that this advice was very accurate. But to exemplify the dilemma clearly: this suggestion was obviously something to "insignificant" for a great man like Henry Ford.

Nevertheless, from the contemporary viewpoint things could also turn out very differently. As has been showed, the choice of Brazil was well-advised, the development of the world rubber market in the early 1920s nurtured reasonable fears of high prices (even a supply shock could be expected), and the rubber plantations fitted well into the overall strategy of the Ford Motor Company (clearly not that well any more, when Ford donated (!) his tire factory to the Soviet Union in the early 1940s, and thus the original idea of controlling all supply channels for cars obviously and significantly had lost ground). However, hardly anyone at Ford had ever to do anything with rubber before this venture, thus consequently it became one of the "experiments" (in retrospect also to be considered as "hobbies"): airplane construction in the 1920s, the opening of Greenfield Village in the early 1930s, parts made of soybeans and excessively used in car production in the late

1930s, or research in plastics in the 1940s.). And while the venture commercially was a disastrous failure, with respect to sanitary, medical, and educational conditions, to personal well-being and even (to a certain extent) socially it has to be considered as a success. The problem was that these two spheres could not be connected, not even in the long run, and that the successful parts could not be paid any more due to a lack of pay-back from the failing ones. Hence, what remains of the project is a strong ambivalence about a venture in fact completely failing in one of its major goals, namely producing rubber, but being somehow successful as experimental ground for rubber research (Dean 1987, pp. 104-7) and in “civilizing” the jungle – although clearly not sustainable in both respects and carried out in a very technocratic way, obviously not really appropriate.

Thus, the main problem for Fordlândia was Ford’s and his employees’ consciousness of their supremacy – over nature as well as over the Brazilians. At the beginning, this was strongly encouraged by the Brazilians, when local newspapers celebrated Ford, whose “enlightened social and economic ideas” have become well-known in Brazil in 1926 after the translation of *My Life and Work*: “With his billions of dollars and his unfailing industrial talents, Henry Ford would begin the transformation of Amazonia, and perhaps three or four Henry Fords would complete it.” (Galey 1979, p. 268) But as clearly traceable in contemporary sources (magazine articles as well as company reports), Ford understood the problem of insufficient purchasing power in Brazil and of bad infrastructure and possible labor shortage in the Amazon basin well, problems he was familiar with. But he did not understand (and hence regarded as negligible) other important challenges, mainly the persistent cultural differences between Brazil and the United States, the importance of expertise on rubber growing for the success of the venture, and most importantly the influence of environmental factors. He either had no idea about these problems at all or he regarded them as easily surmountable.

Interestingly enough, these problems are still an issue in development. Usually projects do not necessarily fail due to economical reasons or unforeseeable warfare causing damages, but due to cultural misunderstandings, environmental ignorance, and an insufficient transfer of expertise, last but not least due to destructive and inept feelings of supremacy of whatever kind. Particularly the history of the Amazon basin is full of stories about ventures that failed because of bad preparation and the ignorance of local factors, often due to the misconception that certain rules can be applied universally and independently from the circumstances on site, so common in economics.

One reason, why the venture was finally abandoned, while it was continued despite of any problems, definitely has been that the prospects of natural rubber in general were not considered as bright. Thus the fact that profits could not be earned immediately and the plantation constantly lagged far behind forecasts, made it clear for company officials that the various positive reports about future potentials could not be believed in. Another point connected to that is the argument published by the Ford Motor Company in November 1945 as official reason for the sale: the war experience had convinced Ford that future is in synthetics, and not in natural rubber (The Rubber Age 1945, p. 357).

But the same was true a year before. What changed in 1945 (besides the resignation of Johnston), were some big events, changing the circumstances dramatically. At the largest scale, Japan was defeated in August and it was clear, that the South East Asian rubber plantations will return into production within a short period, annihilating all possible shortage-induced profits. At a smaller scale, the Brazilian government was overthrown by a “democratic” revolution in October, which changed the environment for negotiations, relatively favorable before. But the event most crucial for the fate of this particular venture was that in September Henry Ford finally retired (at the age of 82) and handed the Company over to his grandson Henry Ford II. The young man (then only 28 years old) immediately started restructuring and identified as primary targets all ventures not earning money. The rubber plantation was prominent on that list and was sold within three months. In the moment, when strict business considerations finally regained supremacy, there was no chance for a project with a production record that bad than that of Henry Ford’s Brazilian rubber plantations, even within his own company.

One of Ford’s credos, articulated in his first autobiography *My Life and Work* in 1923, thus was not well followed in this endeavor: “We learn more from our failures than from our successes”. Or put correctly: Ford learnt a lot from this failure, but then he once again failed – in utilizing this knowledge. And one of his conclusions from the same book he even proved being wrong: “What will the future bring? We will learn to be the masters, not the slaves of nature ...” In fact, insects and blight clearly showed their supremacy over men in the Brazilian jungle. The only way to get rid of it would have been the complete destruction of the environment and thus the destruction of the basis nurturing the product. Furthermore, the venture also shows that proper research has its point. The problems Ford faced in Brazil (pests and diseases, labor shortage, proper terrain for a rubber plantation, cultural differences between urban Michigan and the Amazon jungle, problems in cooperation with the officials) have all been well known in advance. It is that he simply ignored a lot of these problems. He was absolutely sure that his men – or if necessary, he himself – would be able to solve whatever will disturb the development of the project (by the way, no member of the Ford family ever visited any site of the plantations at any time).

In Fordlândia, some day with more than 10,000 inhabitants the third largest city in the Amazon basin, still some Michigan-style houses with all the amenities common to US-Americans in the 1930s, and the ruins of industrial equipment can be visited. Some hundred people are still living there, making use of the schools Ford built and even of the hospital, once being the best within a thousand miles, and today served by a single nurse. Belterra is a regular settlement accessible by road within two hours from the local center, the city of Santarem, while Fordlândia is still accessible exclusively by the river. There is even some rubber gathering going on and a factory produces surgery gloves in Belterra – for which it uses rubber neither from Fordlândia nor from Belterra, but from elsewhere in Brazil.

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