

The “Mobile Plantation” of Charduar: Local Connections, Imperial Portfolios, and the Global Pathways of Assam Rubber

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I. From “Wild” to Plantation Rubber

In 1911, the world’s foremost rubber journal published an article on “Rubber Planting in the East.”¹ It started by describing the first government-sponsored rubber plantation of the British Empire in Asia. This estate had been launched at Charduar, north of the Brahmaputra River in northeast India, by colonial administrators and scientific foresters in 1873:

Perhaps the most widely advertised rubber plantation ever formed has been that of the Indian government at Charduar (...) the details presented in the annual [forestry] reports (...) found their way in one shape or another into many thousands of newspaper publications, often losing entirely their original form and meaning. It was made to appear often that the Indian government had become exceedingly large producers of rubber.

The article explained that the government-run plantation – begun almost four decades earlier in the Assamese borderlands, at the foot of the Himalayas – had not been “formed for commercial purposes, but mainly for scientific study, though of recent years some shipments of rubber well prepared have brought good prices.” The article not only outlined the many layered but related purposes of Charduar. It also suggested how the enterprise had captured the imagination of

¹ “Rubber Planting in the East,” *The India Rubber World* 43, no. 4 (1911): 124. Following quotes from *ibid.*

planters, officials, newspapers and rubber consumers, manufacturers and commodity brokers near and far – its history being told and twisted in “many thousands” of tales, mostly of imperial ingenuity, foresight, frustration, renewed hope and temporary triumph.² While the article highlighted the importance of Charduar as a pioneering venture (as indeed one of the first large rubber plantations in the world), it failed to note – much like Charduar’s existing historiography – that the official plantation had also become a significant “distributive institution”.³ Its role as a testing ground for rubber cultivation meant that the site was never supposed to operate in isolation. On the contrary, it was dedicated to making knowledge and agronomic resources such as seeds and codified planting techniques available in different and accessible forms. It also, though not by intention, became an archive of managerial mishaps and a site of agronomic disasters such as insect attacks. Their study and treatment, in turn, required further collaboration with outside expertise.

It is this crucial if forgotten distributive role that informs the aim of this chapter: to explore Charduar’s regional and global significance and to show how it became the point of origin for various forms of material and immaterial exchanges. Charduar originated new plants, agronomic practices, and scientific research that would inform the expansion of rubber frontiers in other parts of India, the British Empire and, indeed, the tropical world over. While the Charduar staff by no means initiated all schemes of Assam rubber cultivation globally, they significantly helped to popularize the Indian rubber tree *Ficus elastica*. This was, at one point, cultivated on all five continents as a latex-yielding crop. In time, the Assam plantation became the training ground for imperial officials, indigenous rubber planters and cohorts of laborers from the Indian subcontinent that were subjected to the grinding daily work on the estate. The Indian

² “Rubber Planting in the East,” 124.

³ I borrow the phrase from Clare Harris, “Digital Dilemmas: The Ethnographic Museum as Distributive Institution,” *Journal of the Anthropological Society of Oxford* 5, no. 2 (2013): 125-136.

viceroy and other high officials visited Charduar and paid homage to its self-proclaimed civilizing mission amid supposedly wild jungle tracts and “savage” tribes. Foresters and entomologists were invited to document and find cures to large pest outbreaks. Charduar thus sustained and was sustained by very different forms of knowledge transfers, mobilities, and migrations – human and biological, intellectual, and ideological. In many cases, this was a “programmed mobility,” written into the plantation’s DNA.⁴ Its novel insights, plant materials and protocols were from the start intended to be used elsewhere.⁵

The notion of Charduar as a *mobile plantation* stems from this very fact: the continued circulations that underpinned the estate’s operations were not the result of reform or rationalization, but had been envisaged by its original founders and keepers as an essential feature of the plantation’s function.⁶ It would hence be misguided to limit Charduar’s fraught workings and effects merely to the local operations and theatres of capital, labor and extraction. Its purpose and legacy were not limited to the Assamese rubber frontier, which experienced a boom period between c.1860 and 1910.⁷ On the contrary, the materials and knowledge it produced reached other shores and extractive operations, informing – and misinforming – subsequent ventures of resource imperialism.

Yet the notion of the *mobile plantation* rests on a contradiction. After all, there is nothing mobile in the inherent heavy infrastructures such as roads, housing complexes, nurseries, wells,

⁴ I draw on excellent conceptual reflections on the mobility of museological collections in Victorian Britain as developed in Felix Driver, Mark Nesbitt, and Caroline Cornish, “Introduction: Mobilising and Re-Mobilising Museum Collections,” in *Mobile Museums: Collections in Circulation*, eds. Felix Driver, Mark Nesbitt, and Caroline Cornish (London: UCL Press, 2021), 1-20, 4.

⁵ See also Pamela H. Smith, “Science on the Move: Recent Trends in the History of Early Modern Science,” *Renaissance Quarterly* 62, no. 2 (2009): 345-375; James A. Secord, “Knowledge in Transit,” *Isis* 95, no. 4 (2004): 654-672.

⁶ Cf. Driver, Nesbitt, and Cornish, “Introduction,” 4.

⁷ For which see the important works by Bodhisattva Kar, “Historia Elastica: A Note on the Rubber Hunt in the North-Eastern Frontier of British India,” *Indian Historical Review* 36, no. 1 (2009): 131-150; Arupjyoti Saikia, *Forests and Ecological History of Assam, 1826-2000* (New Delhi: Oxford University Press, 2011); Aparajita Majumdar, “The Colonial State and Resource Frontiers: Tracing the Politics of Appropriating Rubber in the Northeastern Frontier of British India, 1810-84,” *Indian Historical Review* 43, no. 1 (2016): 25-41.

and – especially – the planted trees themselves, which in the case of Charduar developed complex and far-reaching root systems that were impossible to transplant. Considering the large land and labor investments required for clearing and planting, such tropical estates presented, in one sense, highly immobile, grounded assets. But to limit Charduar’s operations to mere local operations is to underplay its wide-ranging importance. By putting an emphasis on questions of knowledge transfers and material exchanges emanating out of Charduar, whose physical arrangements and techniques of rubber propagation were to be copied in numerous other (sub-) tropical localities, the following analysis proposes a new understanding of the logics and spatio-temporal limits of purportedly local plantation cultures.

Charduar was a crucial nodal point in a much larger system of Western experiments with rubber cultivation. By the 1870s, dozens of rubber species were known, and more potential yielders were continuously discovered and published.⁸ The global extent of British overseas possessions facilitated the pursuit of such an “inventory science”⁹ of rubber species, including their identification, mapping and cataloguing. I suggest using the concept of an *imperial portfolio* of potentially profitable plants. Like private entrepreneurs and merchants, who diversified their commercial activities and investments with a broad portfolio to guard against risk, empires and in this case British scientists and state institutions, such as the botanic gardens at Kew, Calcutta, Singapore, Peradeniya or Lagos, also pursued the cultivation and tested the viability of a range of possibly rewarding rubber species all at once.¹⁰ This created a multipolar framework of plant competition. The “victorious” varieties could only emerge after a prolonged experimental period and numerous attempted transfers and acclimation projects. Charduar was the British Empire’s

⁸ Emma Reisz, “Knowledge and Political Economy in the Rubber Trade of the British Empire, c.1800-c.1930” (PhD diss., Cambridge University, 2004).

⁹ Suzanne Zeller, *Inventing Canada: Early Victorian Science and the Idea of a Transcontinental Nation* (Montreal: McGill-Queen’s University Press, 2009), 4.

¹⁰ On the simultaneous testing of various rubber species in the French empire, see Michitake Aso, *Rubber and the Making of Vietnam: An Ecological History, 1897-1975* (Chapel Hill: University of North Carolina Press, 2018).

central hub to experiment and promote the endemic rubber tree called *borgāch* (“big tree”) by the Assamese, which European botanists taxonomized as *Ficus elastica* in 1810.

The experimental rubber plantation at Charduar was founded in 1873 by colonial officials and foresters with one aim: to help secure future supplies of tropical rubber from within British controlled territories – a desire that drove other colonial initiatives launched in the same period.¹¹ These government interventions marked a turning point in the commodity’s history: they helped to transform rubber from a wild species to a systematically cultivated plantation crop. The state was at first the key and only driver in the process. Rubber’s experimental cultivation was seen as too costly and unpredictable for private planters. While some imperial servants hoped Charduar could serve as a bridge and lure private capital into the industry (as had been the case with Assam tea, see McCallum’s chapter below), others maintained that the British colonial government should always remain involved in actively growing rubber trees under the direct control of state servants.¹² An expanding patchwork of rubber plantations modelled on Charduar was supposed to rescue Assam’s “wild” rubber trees that faced the specter of exhaustion due to frantic overtapping.

Ultimately, however, after decades of exuberant interest, the Charduar estate was abandoned in the early years of the First World War. Looking into the demise of a plantation and its distant legacies and afterlives can be as instructive as the exploration of its initial establishment. The short but euphoric window when Charduar operated as a commercial venture, and its abrupt abandonment only a few years later, will be investigated by linking local developments in Assam to the changing global conditions of the world rubber industry in the

¹¹ Colin Barlow, *The Natural Rubber Industry: Its Development, Technology, and Economy in Malaysia* (Kuala Lumpur: Oxford University Press, 1978); Warren Dean, *Brazil and the Struggle for Rubber: A Study in Environmental History* (Cambridge: Cambridge University Press, 1987); John Tully, *The Devil’s Milk: A Social History of Rubber* (New York: Monthly Review Press, 2011).

¹² Jayeeta Sharma, *Empire’s Garden: Assam and the Making of India* (Durham: Duke University Press, 2011).

early twentieth century. While it was a groundbreaking experimental site for systematic propagation, Charduar became the victim of the profound shifts in rubber geographies. The superior rate of other latex-yielding plants cultivated elsewhere by the same improving agenda of the British Empire that Charduar's founders had helped to initiate also foretold its decline. Especially the booming *Hevea brasiliensis* plantations in Southeast Asia relied on a tree with vastly superior planting rates, production times, and fewer silvicultural problems than the Assamese species that had mystified officials and foresters for decades.¹³ Only a regionally grounded global history can recover both diachronic developments taking place locally in Assam, and explain how these were, in turn, profoundly shaped by synchronous processes that were seemingly unconnected to Charduar, even if that estate came to feel the full impact of forces that had gathered momentum thousands of miles away.

The analysis will proceed in several interlocking steps: I first trace various intellectual and material transfers that emanated out of the experimental enterprise at Charduar, as the estate became the nucleus for highly ambitious, if often fraught transplantation and cultivation schemes of *Ficus elastica* between the 1870s and early 1900s. The chapter then turns to the plantation's myriad local connections and constraints. It explores official visions of how the site would initiate a fundamental transformation of rubber production in northeast India. This objective again mobilized external collaboration with metropolitan resource institutes and rubber manufacturing firms such as Siemens that I analyze as an instance of "Plantation Research and Development" (R & D). The chapter concludes by tracing the shifts in worldwide rubber production that portended Charduar's sudden decline amidst the outbreak of the Great War.

¹³ Aparajita Majumdar, "'Objects' of Appropriations: Locating Material Efficacies of Rubber in the Northeastern Resource Frontier of British India, 1810-1906," in *Objects and Frontiers in Modern Asia: Between the Mekong and the Indus*, eds. Lipokmar Dzüvichü and Manjeet Baruah (Abington: Routledge, 2019), 43-67.

II. Charduar's Global Entanglements

The most significant reason for Charduar's appeal was its pioneering character: in the early 1870s, next to nothing was known by European agronomists about the systematic propagation of any rubber tree, while the list of possible latex-yielding species grew continuously with new botanical discoveries.¹⁴ In Assam, indigenous communities had, in contrast, since long planted *Ficus elastica* as a shade-giving and ornamental tree close to their villages, even if never as a strategic source of a valuable export commodity.¹⁵ They were also accustomed to tapping the bark of the tree to extract the latex used to produce various everyday objects such as torches, balls, and impregnated vessels.¹⁶ The initial seeds for starting the Charduar plantation were partly procured from local tribal communities.¹⁷ Additionally, the choice of location for the plantation was the result of testimonies by indigenous rubber collectors that the trees grew abundantly in the area and yielded supreme latex.¹⁸ The officials' dependence on such non-European know-how and provisions partly decenters the view of the Charduar enterprise as resulting purely from imperial ingenuity, agency and material networks. Yet once plantation operations got more securely under way, little further references were made to "native" practices. Instead, the

¹⁴ By the mid-1850s, British naturalists, chemists and officials had compiled a list of 22 different plants in South Asia alone that produced "resinous gum," so that the Government of India employed a chemical analyst of a Gutta Percha Company "to examine into all the indigenous substitutes for this valuable gum", P. L. Simmonds, "On Some Undeveloped and Unappreciated Articles of Raw Produce from Different Parts of the World," *Journal of the Society of Arts* 106, no. 2 (1864): 36.

¹⁵ William Griffith, *Journals of Travels in Assam, Burma, Bootan, Afghanistan and the Neighbouring Countries* (Calcutta: Bishop's College Press, 1847), 192.

¹⁶ George Watt, *A Dictionary of the Economic Products of India*, vol. IV (London: W. H. Allen and Government Printing Press, 1890), 345.

¹⁷ Saikia, *Forests*, 217; Majumdar, "'Objects' of Appropriations."

¹⁸ Gustav Mann, *Progress Report of Forest Administration in Assam for the Year 1874-75* (Shillong: Assam Secretariat Press, 1875), 35.

breakthroughs at Charduar as a living laboratory of plantation capitalism were trumpeted through the channels of imperial correspondence and print culture.



Fig. 1 *Ficus elastica* trees and their myriad root and stem systems, depicted with South Asian laborers at the entrance to the Royal Botanical Gardens, Peradeniya, Ceylon (Sri Lanka). Photograph by William Louis Henry Skeen, 1881-1882, albumen print, Royal Collection Trust, RCIN 2581340.

While imperial foresters had initially sought to tap into rich vernacular knowledge about *Ficus elastica*, they assumed that most intricacies of plantation production would have to be learned from scratch through trial and error. Yet the large investments that government anticipated were believed to eventually pay off: Charduar was launched in response to British fears over the future supplies of rubber, which came at this point predominantly from Brazil. It was an exclusively tropical material on whose “infinite” applications North American and

European industries and manufacturers increasingly relied as the nineteenth century progressed.¹⁹ Some of the principal officials involved in Charduar's establishment believed that the natural rubber reserves of Mexico and especially the Amazon were becoming gradually exhausted, resulting in a possible rubber famine that the preemptive scheme of artificial cultivation was supposed to prevent.²⁰

That the dissemination of data was baked into the project from the beginning can be gleaned from the fact that the first plantation report from 1874 was consequently forwarded by the Chief Commissioner of Assam "to such of the forest officers in Madras, Bombay, North-Western Provinces, Punjab, Oudh, Central Provinces, British Burma, Mysore and Coorg, Ajmere, Hyderabad, as take an interest in the subject".²¹ As a botanist at the Royal Botanic Gardens at Kew near London noted, "[t]hese experiments and facts are most interesting and of the greatest value to those interested in the cultivation of the *Ficus elastica* as a rubber-producing tree".²² As a global hub of economic botany, Kew Gardens regularly included the newest insights from Charduar in its various publication series, thus multiplying the Assam plantation's outreach. Charduar assumed, over time, however, additional instrumentalities of instruction, display, and dissemination. This vital role partly explains why the colonial government continued, after multiple rounds of reevaluations in the 1890s, to support the future extensions and operations of the estate – even in the face of questionable financial returns.²³

¹⁹ Stephen L. Harp, *A World History of Rubber: Empire, Industry, and the Everyday* (Chichester: Wiley, 2016).

²⁰ Gustav Mann to Joseph Hooker; from Debrooghur, Upper Assam, October 26, 1870, Library and Archives at Royal Botanic Gardens, Kew [RBGK], Directors' Correspondence [DC], 153/513.

²¹ C. J. Lyall, Under Secretary to the Government of India, to The Chief Commissioner of Assam, Simla, June 23, 1875, Assam State Archives [ASA], File no-43/51, "Experimental Rubber Plantation in Kamrup, 1873."

²² John R. Jackson, "India Forest Administration," *Journal of Forestry and Estates Management* 1 (1878): 239.

²³ Berthold Ribbentrop, *Review of Forest Administration in British India, 1895-96* (Calcutta: Government Press, 1897), 59. The wishful thinking that the plantation would eventually become profitable once the site had reached a more mature state was still upheld by officials, who also emphasized its strategic importance. As a bureaucrat noted, "[i]n view of the prospective death of natural rubber trees within British limits it would seem advisable to extend the very excellent plantation of this valuable tree in the Darrang district, known as Charduar," in "Review of Annual Forest Administration Reports for Assam and the Central Provinces, 1893-94," *The Indian Forester* 21, no. 9 (1895): 346.

By then, it was not only agronomic protocols and statistics that Charduar produced. When an emerging class of rubber experts and planters began to form their own infrastructure and forums of exchange, including sections at world fairs like the *Exposition Universelle* in Paris in 1878, the Charduar staff participated in the promotion of *Ficus elastica* by sending rubber samples together with a series of “specimens of woods and other forest products” from northeast India to the French capital.²⁴ Assamese “raw materials” and “forest products”, including sample produce of *Ficus* rubber, equally found their way into the collection of the Museum of Economic Botany at Kew and the Botanical Museum and Botanical Laboratory for Product Research in Hamburg.²⁵

But more than that: the long-standing Conservator of Forests in Assam, Gustav Mann (1836-1916), a German-born, Kew-trained gardener who became a naturalized British subject in India in 1871, also became an active agent for the transcontinental of information and seed. Mann had been instrumental in launching Charduar in 1873 in cooperation with other colonial foresters and officials, especially the Conservator of Forests in Bengal, Wilhelm Schlich, and the Commissioner of Assam, Colonel Henry Hopkinson.²⁶ While the actual running of Charduar was done by a succession of foresters including W. R. Fisher, Mann remained formally in charge of the plantation until his retirement from colonial service in 1891. Until then, British planters, agronomists, officials, investors, and manufacturers could explicitly seek the latter’s advice on rubber from his Assam station at any time.²⁷ It was also Mann who was requested by the Government of India to dispatch, in 1890, 50 kilograms of *Ficus elastica* seeds to the Governor

²⁴ Dietrich Brandis, “Introduction,” in *Catalogue of Specimens of Timber, Bamboos, Canes and other Forest Produce from the Government Forests in the Provinces under the Government of India ... Sent to the Paris Exhibition of 1878* (Calcutta: Office of the Superintendent of Government Printing, 1878), 3.

²⁵ Max Lierau, *Das Botanische Museum und Bot. Laboratorium für Waarenkunde zu Hamburg* (Cassel: Gotthelft, 1888), 9.

²⁶ See ASA, File no-43/51, “Experimental Rubber Plantation in Kamrup, 1873.”

²⁷ James Collins publicly encouraged such information exchange in 1872: Collins, *Report on the Caoutchouc of Commerce* (London: W. H. Allen, 1872), 47.

of British-ruled Lagos. Accompanying the seeds, Mann provided the Governor with a long account “of the mode of culture pursued in Assam”, describing the most recent practices adopted in the Charduar plantation down to the minutest detail.²⁸ This dispatch came decades after Mann had travelled himself in West Africa during a bioprospecting mission between 1859-1863, during which he had identified several African rubber species.²⁹ In other words, the seeds and his expertise travelled in the opposite direction from Mann himself, from Assam to the west coast of Africa. The episode adds a human dimension to the global transfer and acclimation of useful plants in the nineteenth century, since personal itineraries like Mann’s mattered and indeed shaped the vectors through which such botanical globalization took place.

Charduar’s rubber expertise was further propagated through print culture across the British Empire and in the metropole in London. Sir Alfred Moloney, Governor of Lagos from 1886 to 1890, informed the Secretary of State for the Colonies, Lord Knutsford, after receiving “three packets of seed of the *Ficus elastica*” and Mann’s extensive report, that the “information supplied is of such general interest and value that I have ventured to issue it *in extenso* as a circular, of which I would ask your Lordship to allow the Director of the Royal Gardens, Kew, to have some copies”.³⁰ Moloney also confirmed that the seeds received in Lagos had been “treated in accordance with the method employed in Assam in the cultivation of this rubber tree”, revealing how locally devised practices of plantation economies could be made to travel to other continents thanks to written instructions and the authority accorded to their author.³¹

²⁸ “Assam Rubber for West Africa,” *Bulletin of Miscellaneous Information (Royal Gardens, Kew)* 49 (1891): 97; Gustav Mann, “Brief Account of How Rubber Trees (*Ficus Elastica*) are Grown in Assam,” *Bulletin of Miscellaneous Information (Royal Gardens, Kew)* 49 (1891): 100.

²⁹ Mann had then been in the service of Kew Gardens, the Royal Navy and the Foreign Office, see Moritz von Brescius, *German Science in the Age of Empire: Enterprise, Opportunity and the Schlagintweit Brothers* (Cambridge: Cambridge University Press, 2019), 83.

³⁰ Mann, “Brief Account,” 98.

³¹ Martin Dusinger and Mariko Iijima, “Editorial. Transplantation: Sugar and Imperial Practice in Japan’s Pacific,” *Historische Anthropologie* 27, no. 3 (2019): 330; Helen Tilley, *Africa as a Living Laboratory: Empire, Development, and the Problem of Scientific Knowledge, 1870-1950* (Chicago: University of Chicago Press, 2011), 10.

The entire West African acclimation scheme was driven by the hope that the *Ficus elastica* species could “replace the wholesale disappearance of the rubber tree indigenous to that country – viz, the *Funtumia elastica*”.³² Contrary to Mann’s great effort to develop a systematic body of knowledge of *Ficus* raising in Assam, it was, however, stated in official correspondence that “little or no skill is required” in the cultivation of the tree, reflecting the hope “that it will soon establish itself in this Colony and the neighbouring States”.³³ Data and local expertise were clearly lost in translation and transfer, pointing to the mere chimera of a frictionless diffusion.³⁴ *Ficus* seedlings were subsequently “distributed in the colony, where the tree soon made itself a home.”³⁵ Yet the imperial ambitions around transplantation went even further. Lagos was supposed to be only the starting point for much wider planting schemes of the Assam rubber tree. Its initial raising in the Botanical Station at Lagos was hoped to lead the way to the official and private adoption of the species in other parts of the African continent. In 1897, for instance, “*Ficus* was introduced into Egypt”, as “efforts are being made to establish plantations of this tree”, while “the Indian Forest Department has been glad to supply seed to the authorities for this purpose”.³⁶ The colonial official and explorer Ernest A. Floyer, who then acted as Director of Plantations, State Railways and Telegraphs of Egypt and who was responsible for the introduction of many economic plants to Egypt, informed Kew Gardens in 1897 that besides growing *Ficus elastica* from seed, he had also put out “some 50,000 cuttings”, of which 97 per

³² William Wicherley, *The Whole Art of Rubber-Growing* (London: West Strand Publishing Co, 1911), 89.

³³ Alvan Millson, “Circular,” Colonial Secretary’s Office, Lagos, September 30, 1890, in “Assam Rubber for West Africa,” 98.

³⁴ Important critical reflections on “circulation” have recently been offered by Stuart Alexander Rockefeller, “Flow,” *Current Anthropology* 52, no. 4 (2011): 557-578; Stefanie Gänger, “Circulation: Reflections on Circularity, Entity, and Liquidity in the Language of Global History,” *Journal of Global History* 12, no. 3 (2017): 303-318; Kapil Raj, “Networks of Knowledge, or Spaces of Circulation? The Birth of British Cartography in Colonial South Asia in the Late Eighteenth Century,” *Global Intellectual History* 2, no. 1 (2017): 49-66.

³⁵ Wicherley, *Rubber-Growing*, 89.

³⁶ Wicherley, *Rubber-Growing*, 91; Berthold Ribbentrop, *Review of Forest Administration in British India, 1896-97* (Calcutta: Government Printing, 1898), 60. However, this scheme proved troublesome, see letter from Ernest Ayscoghe Floyer to the Royal Botanic Gardens, Kew, Cairo, September 13, 1898, RBGK, DC, 179/339.

cent were thriving.³⁷ Yet this was only the beginning of a much larger operation, since he claimed Egypt will “need millions of trees” – especially since he asserted that the “trees here yield more freely than those of the Chardwar experiment”.³⁸

As *Ficus elastica* rubber not only became an object of governance and expertise but also a notable industrial commodity,³⁹ it “held together an extensive imperial network” of officials, foresters, botanists, travelers, private planters, journalists, illustrators, seed merchants, and vernacular advertisements.⁴⁰ Charduar’s keepers not only noted down their experiments in meticulous detail but also published regular reports that helped to justify the costly trial operations. Therein, the authors made use of numeric data to communicate the often-perplexing nature, irregular growth, and yield patterns of the Indian rubber tree and to render it comparable with other species.⁴¹ Visual representations and detailed descriptions of the work in the nurseries, the tapping knives used, the shapes in which the tree barks were cut, etc., all allowed rubber investors and planters to become “virtual witnesses” of this pioneering enterprise.⁴² What could not be personally observed in remote Assam could thus be studied thousands of miles away – and Charduar’s results critiqued and compared with alternative *Ficus* and other rubber species’ trials and temporal calculations.⁴³ One of the key challenges of *Ficus elastica* as a rubber tree were

³⁷ “Assam Rubber in Egypt,” *Bulletin of Miscellaneous Information (Royal Gardens, Kew)*, Additional Series, VIII. III. – Rubber (1906): 169-170. The first experiments with *Ficus* cuttings at Charduar were undertaken in 1875.

³⁸ “Assam Rubber in Egypt,” 169-170.

³⁹ Daniel Morris, “Cantor Lectures on the Plants Yielding Commercial India-Rubber,” *Journal of the Society for Arts* 46 (1898): 745-760; on the comparative value of Assam rubber, see the various “Memoranda” of the United States Rubber Company, 1892, Baker Business Library, Harvard University, U.S. Rubber Company, 1876-1900, V. 1-3, Mss 63, U58.

⁴⁰ See Rohan Deb Roy, *Malarial Subjects: Empire, Medicine and Nonhumans in British India, 1820-1909* (Cambridge: Cambridge University Press, 2017), 67; see, e.g., various rubber notifications in Assamese in *The Assam Gazette*, November 1, 1884, 614-616.

⁴¹ Majumdar, “‘Objects’ of Appropriations.”

⁴² As Steven Shapin noted: “Experimental reports rich in circumstantial detail were designed to enable readers of the text to create a mental image of an experimental scene they did not directly witness.” Steven Shapin, “Pump and Circumstance: Robert Boyle’s Literary Technology,” *Social Studies of Science* 14 (1984): 481.

⁴³ A. H. Berkhout, “De Gouvernements caoutchouc-aanplantingen in Britsch-Indië,” *De Indische Gids: Tijdschrift voor Nederlandsch-Indië* 26 (1904): 707-720.

indeed the extremely long gestation periods between planting and harvesting, which took up to 50 years. While the Charduar staff (and soon numerous imitators across various empires and continents) sought to cut nature's clock in half and alter the tree's natural modes of growth as an epiphyte by planting the seeds directly on the ground, they could not do so at will. The biological rhythms still made *Ficus elastica* – even when made tappable after 18 to 25 years – still vastly inferior to quickly yielding *Hevea* trees that offered a return on investment after four to seven years.

Knowing the economic outcome of a project that “still not turned a profit thirty years” after its foundation has led historians to brush aside Charduar's overall importance.⁴⁴ Historian Bodhisattva Kar, for example, in a pathbreaking article on Assam's wild rubber frontier, avoided writing about “the dull destiny of the government plantations”, which economically proffered only “unsatisfactory results”.⁴⁵ However, as this paper argues, an economic lens alone on the government rubber schemes in Assam obscures the rich history of anticipation and long-term investment in an experimental, knowledge-generating endeavor that contemporaries took very seriously. Indeed, the discussion of “failed projects” – which only gain that stamp with hindsight – can illuminate as much about the logic of imperial resource management and perhaps more than a conventional story of success and expansion.⁴⁶

What we know is that Charduar's reports and manuals remained in circulation for decades, and soon also entered into intra- and inter-imperial circuits of exchange.⁴⁷ With the

⁴⁴ Reisz, “Knowledge and Political Economy,” 225.

⁴⁵ Kar, “Historia Elastica,” 141.

⁴⁶ See also K. L. Budhiraja and R. Beri, “Common Latex Bearing Woody Plants of India,” *Indian Forest Leaflet No. 70* (Dehra Dun: The Forest Research Institute, 1944), 1, who claimed that operations at Charduar had purportedly never advanced “beyond the preliminary stage”. On increasing engagement with histories of imperial “failures” to domesticate nature, see Edward Melillo, “Global Entomologies: Insects, Empires, and the ‘Synthetic Age’ in World History,” *Past & Present* 223, no. 1 (2014): 234, 263.

⁴⁷ For potent reflections on multi-scalar histories, see Jessica Wang, “Plants, Insects, and the Biological Management of American Empire: Tropical Agriculture in Early Twentieth-Century Hawai'i,” *History & Technology* 35, no. 3 (2019): 203-236.

Dutch East Indies becoming an important site of the global rubber economy by the early twentieth century, Dutch officials and planters closely followed developments in Assam, translating planting treatises, comparing outcomes and eventually offering potent critiques of Charduar's calculations.⁴⁸ To be sure, by no means all propagation projects were directly guided or inspired by the Assam venture – but the fact that *Ficus elastica* continued to be seen as a promising plantation crop for so long was undoubtedly linked to the vocal presence that Charduar maintained among trans-imperial groups of planters and governments as the most famous rubber plantation “ever formed”, at least before the 1910s.⁴⁹ In the 1890s *Hevea brasiliensis*, *Manihot glaziovii* (Ceara rubber), *Castilla elastica*, *Funtumia elastica*, and *Ficus elastica* rubber plantations were increasingly established across equatorial regions by various states, while it was not yet clear which of these rubber plants would yield best in different climates, soils and altitudes. In the early 1900s, for-profit schemes to cultivate *Ficus* rubber were simultaneously pursued in Cuba, Karachi, Ceylon, the Belgian Congo, French Indochina, West Africa, Nigeria, Australia, the Philippines, British New Guinea and Papua, in the Seychelles, California, and Singapore – where “the Chinese” were especially keen, Henry N. Ridley noted, to secure supplies from this particular species.⁵⁰ *Ficus elastica* also entered the planting regimes of the German colonial empire in Africa, where it was raised in tropical research stations and planted by African

⁴⁸ See, e.g., “Iets Over De Aanplanting Van Caoutchouc-Boomen in Britsch Indië” [“On the Planting of Caoutchouc Trees in British India”], *Tijdschrift voor nijverheid en landbouw in Nederlandsch-Indië* 21 (1877): 182-194.

⁴⁹ “Rubber Planting in the East,” 124.

⁵⁰ Camille Spire and André Spire, *Le Caoutchouc en Indo-Chine: étude botanique industrielle et commerciale* (Paris: A. Challamel, 1906), 207-210; the first *Ficus elastica* plantation in French Indochina dated from 1882, established at Thuduc (Thù Đức). The planting protocols developed at Charduar were translated and published in French colonial journals, see e.g., “Rapport sur la culture des *Ficus elastica* en Assam,” *Revue des Cultures Coloniales* 12, no. 118 (1903): 84-88. On West African schemes, Félix Faure to Sir David Prain, from Gabon, August 20, 1910, RBGK, DC, 185/416; for the Philippines, see the letter from Cornelius Robert Blair Pickford to Daniel Morris; from Cebu, July 9, 1891, DC, 165/312-313; on Californian experiments, J. L. Sanford to George Nicholson; from San Francisco, August 13, 1887, DC, 199/401-402. For Singapore, see Henry N. Ridley to Sir William Thiselton-Dyer, January 2, 1900, DC, 166/696, and Letter from Ridley to Thiselton-Dyer, Singapore, March 8, 1904, DC, 168/102-104. On the Seychelles and Southern Nigeria, see Imperial Institute, *Colonial Reports - Miscellaneous*, No 82, IV, *Rubber, Gutta Percha*, (London, 1912), 263-434, 339-41, and a global survey of “*Ficus elastica*,” in “The Useful Plants of Nigeria, Part IV,” *Bulletin of Miscellaneous Information (Royal Gardens, Kew)*, Additional Series IX (1922): 623-625.

farmers.⁵¹ Even Brazil, which had been the world's center of natural rubber production until the early twentieth century, acclimated and cultivated *Ficus elastica* "in an attempt at reverse plant transfer".⁵² For a long time indeed, the tree was thought of as a true rival to all other rubber plantation crops.

In demonstrating how unforeseeable the ultimate and indisputable global triumph of the species *Hevea brasiliensis* on a global scale still was, William Wicherley wrote in 1911 about the Assamese tree in his authoritative work *The Whole Art of Rubber-Growing*:

Lately large areas in Borneo have been planted with it, and the Dutch greatly favour it as against the Hevea, which they find capricious and uncertain in behaviour. The *Ficus elastica* grows rapidly, and yields a high-class rubber, the percentage of pure caoutchouc in its latex being nearly 87 per cent.⁵³

Driven by the seemingly encouraging results at Charduar and elsewhere, the species thus experienced a global window of opportunity. Its cultivation was contemplated even on European soil by gardeners and officials from the Botanic Gardens in Palermo, Sicily, as well as in various provinces in Spain, France and as far north as Denmark.⁵⁴ The reason for such acclimation schemes within Europe was that *Ficus elastica* was known to thrive in different climates and topographies – from the hot and humid jungle tracts of northeast India to drier planes and even the cold mountain regions of up to 5000 feet, the flora and climates of which were compared with the temperate plant life of Europe. Hence, an Italian agricultural book of 1903 echoed the wishful thinking of the time when it recommended that "[b]y making incisions in the roots and trunk of

⁵¹ A. Zimmermann, "Kultur und Kautschukgewinnung von Ficus-Arten," *Der Tropenpflanzer* 1 (1905): 321-350.

⁵² William Beinart and Lotte Hughes, *Environment and Empire* (Oxford: Oxford University Press, 2007), 238.

⁵³ Wicherley, *Rubber-Growing*, 86.

⁵⁴ John A. Stevenson, *Foreign Plant Diseases. A Manual of Economic Plant Diseases Which are New to or Not Widely Distributed in the United States* (Washington, DC: Government Printing Office, 1926), 76-77; "Camphre et Ficus à caoutchouc en Italie," *Journal d'Agriculture Tropicale* 35 (1904): 152-153; also Italo Gigliolo, *Malessere agrario ed alimentare in Italia* (Portici: Imprimerie E. Della Torre, 1903), 325-326.

this plant, one can collect, as in India and Java, the latex and [thus] begin among us, in the extreme Mezzogiorno [southern Italy and Sicily, MB], an industry, which promises to become more and more gigantic.”⁵⁵

Yet while *Ficus* may have thrived beyond its “native” habitats, the unresolved question was whether the tree would yield any rubber or not in such diverse localities as the Bengal delta, Italy’s southern rim, Florida, or Andalusian plains. As a series of botched attempts would reveal over time, the plant’s possible geography as a thriving tree was never congruent with raising a profitable source of rubber. The notion of Charduar as a *mobile plantation* thus reveals a particular imaginary of its proponents that assumed locally proven cultivating techniques could be easily transported and applied elsewhere – a phantasm that the different soil, climatic and social conditions in other regions often frustrated. Instead, the way in which *Ficus elastica* plantations manifested themselves locally across tropical and non-tropical zones, how they mutated and adapted to diverse localities, demonstrated how cultivating practices had to be kept ‘elastic’ in the context of plantation production.

Quite contrary to the hopes of its founders and keepers, Charduar also became a much-frequented site for the agronomic and entomological study of pests and diseases. The invasion of natural enemies of rubber trees forced this new branch of enquiry and experimentation on the plantation staff and required further outside cooperation. Even decades after the plantation had been launched, little was known among European foresters and officials about the natural enemies and diseases of the Indian rubber tree. At a moment when its global distribution and cultivation as a promising plantation crop was actively propagated, the Assam plantation suffered

⁵⁵ “Di Alcune Vere Questioni Meridionali,” *Rivista d’Italia. Lettere, Scienza ed Arte* 6, no. 2 (1903): 59. See also E. M. Coventry, *Ficus Elastica: Its Natural Growth and Artificial Propagation* (Calcutta: Superintendent Government Printing, 1906); Majumdar, “‘Objects’ of Appropriations.” Besides Assam, *Ficus elastica* was also endogenous to Nepal, Burma, Bhutan, Myanmar, Yunnan in China, and parts of Southeast Asia, including Indonesia and Malaysia. The rubber tree generally favors hot temperatures and an excessive humidity of the atmosphere.

from several separate emergencies and turned also into a living laboratory of pests. By the mid-1890s, it had become clear that in the plantation nurseries, “[t]he young plants are often attacked by insects which must be got rid of at once either with tobacco water or phenyl.”⁵⁶ While this danger to the young plants could be contained, a more substantial attack occurred in October 1905, when a larva of the true silk-worm moth “completely defoliated several compartments” of the plantation.⁵⁷

Consequently, in April 1906, one of British India’s most eminent entomologists, E. P. Stebbing from the Indian Forest Service, left the imperial Forestry School at Dehra Dun to pay a visit to the government estate, “during which some observations were recorded on the life history of the rubber defoliating pest Gunda sikkima and notes recorded on a number of other pests of the *F. elastica*.”⁵⁸ The choice of Stebbing resulted from his widely recognized fieldwork on the “Insect World” and his earlier publications on insect attacks on different rubber species.⁵⁹ At Charduar, he was supposed to observe in particular “the blocks where the tapping of the trees for rubber was in progress”. Once arrived, however, he was forced to widen his pest enquiries to include all spaces of the plantation complex, so widely were rubber-pests detected even during the fortnight of his stay. Stebbing published the pioneering results from Charduar in a comprehensive work on *Indian Forest Insects of Economic Importance* in 1914. He was certain his book would “prove of value to planters and those interested in commercial concerns

⁵⁶ D. P. Copeland, “Rubber Plantations at Charduar in Assam,” National Archives of India, Delhi [NAI], Inspector General of Forests, February 1896, Proceedings no. 1-2, 7. As concerned the method of sowing seeds, it had also become standard by the early twentieth century to have “two to three seers of broken figs, 10 seers of ash and 20 seers of vegetable loam or good soil (...) well mixed” in the nursery beds, and “about a pint of kerosine oil being added to prevent ants and other insects carrying off the seed.” Coventry, *Ficus Elastica*, 10.

⁵⁷ E. P. Stebbing, *A Manual of Elementary Forest Zoology for India* (Calcutta: Superintendent Government Printing, 1908), 122.

⁵⁸ “Charduar Rubber Plantation Pests,” *Annual Report of the Board of Scientific Advice for India, 1906-07* (Calcutta, Superintendent Government Printing, India, 1908), 102.

⁵⁹ E. P. Stebbing, *The Insect World in an Indian Forest, and How to Study It* (n.p.: Indian Forest Service, 1903), 11.

connected with the growth for profit of rubber”, since many of the insects were clearly not contained to the Indian subcontinent.⁶⁰

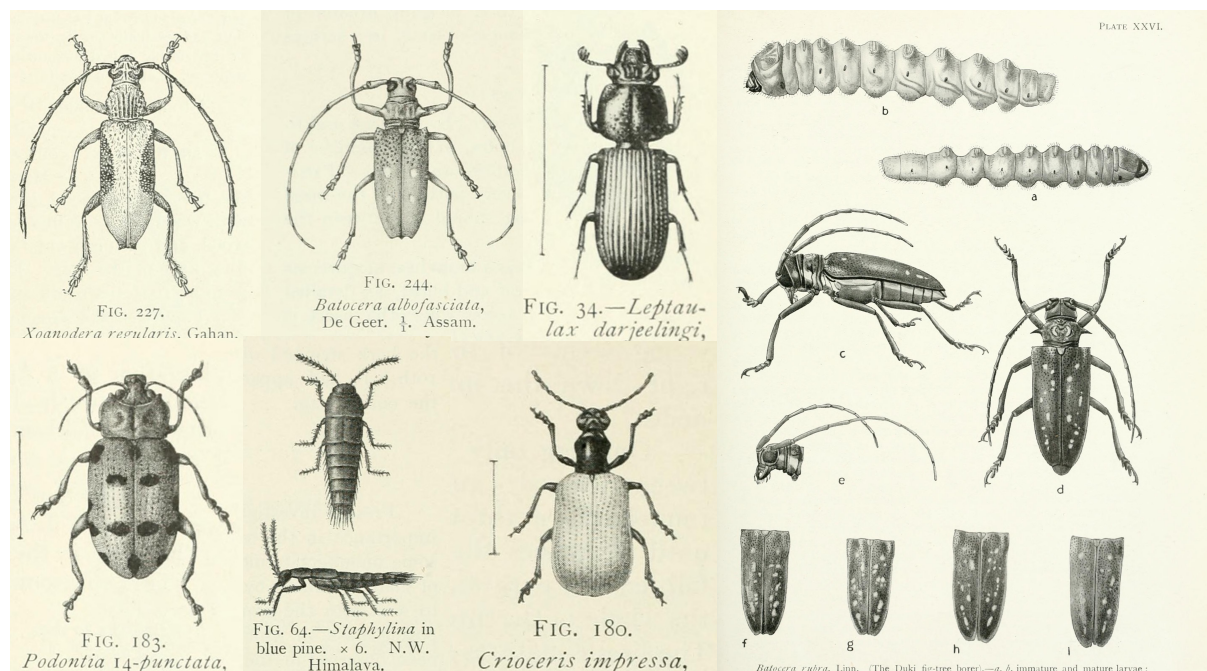


Fig. 2 Selection of *Ficus elastica* pests studied in Charduar and depicted in Stebbing's *Indian Forest Insects of Economic Importance* (1914): on pages 339, 366, 67, 362, 259, 100, 256 (from left to right).

As Stebbing's richly illustrated oeuvre evinced, the cultivated rubber trees suffered from different natural enemies at all stages of plant life, from their fragile beginnings in nurseries to the planted-out lines of young rubber trees to older trunks being tapped for rubber, in whose fresh wounds certain pests laid their eggs. Such discoveries of the pests of a promising latex-yielding species were intended to be distributed and remobilized elsewhere. Within a few years, Stebbing's work

⁶⁰ E. P. Stebbing, *Indian Forest Insects of Economic Importance* (London: Eyre & Spottiswoode, 1914), vi.

on *Ficus elastica*-attacking insects informed numerous entomological treatises, including in the United States where Henry Ford and others tried to cultivate *Ficus elastica* as part of a program of domestic, “temperate” rubber production in the 1920s.⁶¹ For instance, W. Dwight Pierce, an entomologist of the U.S. Department of Agriculture, extensively reported on Stebbing’s findings from Charduar in his widely circulated *Manual of Dangerous Insects Likely to Be Introduced in the United States through Importations*.⁶² Such works often included Stebbing’s original illustrations of *Ficus elastica* pests, which allowed easier identification and thus added to the practical value of the work in the hands of private planters and agronomic practitioners.

As I have shown, after its foundation in 1873, the Charduar plantation quickly became the central reference point for *Ficus elastica* cultivation both within and well beyond the British Empire. Even if the divergent environmental and social conditions in specific sites often required adaptation from the agronomic and labor protocols developed and exported from Assam, the experimental government site was nonetheless constantly used as the benchmark for systematic raising and tapping of *Ficus* rubber. British designs to test a broad *imperial portfolio* of potentially profitable plants in numerous climatic zones led officials, botanists, acclimators and projectors to try propagating the Assam rubber tree in colonial possessions across South and Southeast Asia, Australia, Africa, and the West Indies. Charduar, operating as a living laboratory of plantation capitalism, trialed and systematized many planting and harvesting techniques that were subsequently adopted and modified elsewhere. It was here that numerous bark-cutting systems and tapping rhythms were developed and refined over decades. Moreover, since plantations often create their own ecosystems and entomological challenges, the government

⁶¹ Mark R. Finlay, *Growing American Rubber: Strategic Plants and the Politics of National Security* (New Brunswick, NJ: Rutgers University Press, 2009).

⁶² W. Dwight Pierce, *A Manual of Dangerous Insects Likely to Be Introduced in the United States through Importations* (Washington, DC: Government Printing Office: 1917), 100-105.

estate was also ground zero for wide-ranging studies of the cash crop's pests and insects, including their possible treatments. While the trial-and-error approach for domesticating the obstinate *Ficus* tree in a plantation setting required huge official outlays, and never turned Charduar into a source of revenue for the administration, scholars so far have missed its *raison d'être* as a site of groundbreaking experimentation and useful knowledge production. Its extensive costs were for a long time accepted by the colonial state as an investment in the future, in which officials imagined the imperial need to secure a permanent supply of the indispensable raw material from within the empire.

III. *Ficus Elastica* and the Politics of the Local

Charduar's distributive functions and outside connections require serious study also from a local and regional perspective. Next to the global expansion of *Ficus elastica* plantations, there were serious initiatives underway to also restock the increasingly exhausted wild rubber reserves in Assam, for which the government estate played a key role. What had been put into practice in West Africa several years earlier by planting *Ficus elastica* on a large scale was now also proposed for Assamese forests and tribal territories. In 1906, Major Cole, Superintendent of the Lushai Hills, for instance, sought, "with apparently every prospect of success, to introduce the cultivation of *ficus elastica* into his district."⁶³ As officials maintained, due to the harmful overtapping of wild rubber reserves in the past decades, "very few trees" were believed to have survived. In fact, the colonial state had long since noticed that the "trees of ficus elastica are [there] in the same exhausted condition as those in Assam Proper, perhaps more so, since the

⁶³ *Report on the Administration of Eastern Bengal and Assam, 1906-1907* (Shillong: Secretariat Press, 1908), 44.

Lushais make it their business to come in the cold weather from their own country, where there is less rubber now, in search of it to the Cachar forests.”⁶⁴

Since the mid-nineteenth century, colonial officials had sought in vain to come up with appropriate measures and jurisdictions “to put a stop to this raiding of the rubber forest” across various frontier districts.⁶⁵ Officials in Assam also started to prepare forest nurseries themselves. Among the chosen areas was the Lakhimpur division, where rubber seedlings were to be planted out in the government forest reserves. The latter had “to a large extent, become denuded of this tree by bad treatment in the past”, so that the “natural reproduction of *Ficus Elastica* continues to be unsatisfactory”.⁶⁶ It was a destructive spiral: the more natural trees were tapped to death, the less chance *Ficus elastica* trees have of establishing themselves in the jungle, as other species took up space and light that the trees needed to thrive. In the early 1900s, thousands of raised young *Ficus* seedlings were therefore introduced on earth mounds into the forests, 50 feet apart as at Charduar, either “in convenient blanks or by the sides of paths”.⁶⁷

⁶⁴ *Progress Report of Forest Administration in Assam for the Year 1874-75*, 17.

⁶⁵ “India-Rubber in British-India,” *The India Rubber World*, July 10, 1895, 285.

⁶⁶ M. Hill, *Progress Report of Forest Administration in the Province of Eastern Bengal and Assam for the Year 1907-1908* (Shillong: Eastern Bengal and Assam Secretariat Printing Office, 1908), 9.

⁶⁷ A. V. Monro, *Progress Report of Forest Administration in the Province of Eastern Bengal and Assam for the Year 1909-1910* (Shillong: Eastern Bengal and Assam Secretariat Printing Office, 1910), 7.



Map 1: “The Distribution of the Caoutchouc Tree or Ficus Elastica in Assam”, by Gustav Mann, with the added red symbol depicting the location of the Charduar rubber plantation beneath the territory of the “Akha Tribe” at the foothills of the Himalayas and the “[l]ine beyond which no Revenue Control is exercised by Government”. Source: James Collins, *Report on the Caoutchouc of Commerce* (London: W. H. Allen, 1872).

For the purpose of reinvigorating the rubber supplies in their own territory, a handful of representatives of the Lushais were “sent to Charduar for a practical course of instruction and are now teaching the Lushais” back home amidst their ranks.⁶⁸ Charduar’s purported cultivation success with the indigenous tree meant that entire tribal communities were viewed as possible planters. This was not a case of “compulsory cooperation”, as the recruited Lushais participated willingly in the imperial program, even if frictions later arose.⁶⁹ Supplied with seeds and instructions from Charduar, it was stipulated that villagers and chiefs were “entitled to the produce of the trees owned by them, the Government only claiming the royalty of Rs. 17 per

⁶⁸ *Report on the Administration of Eastern Bengal and Assam, 1906-1907*, 44.

⁶⁹ See the potent reflections by Michael Mann how imperialism was generally sustained by compulsory cooperation, which strongly echoed Gallagher’s and Robinson’s famous assertion that the British and other imperial powers depended on “collaboration,” Michael Mann, *The Sources of Social Power* (Cambridge: Cambridge University Press, 1986), vol. 1, 130-178; John Gallagher and Ronald Robinson, “The Imperialism of Free Trade,” *The Economic History Review* 6, no. 1 (1953): 1-15. On the scheme’s voluntarism but also indigenous critiques of exploitation, see Joy K. L. Pachuau and Willem van Schendel, *The Camera as Witness: A Social History of Mizoram, Northeast India* (Delhi: Cambridge University Press, 2015), 174-175.

maund [1 *maund* equaling 37 kg, MB], or whatever rate may be in force for the time being.”⁷⁰ These stipulations were informed by the fact that the trans-frontier rubber trade was entirely in the hands of a group of powerful Indian merchant capitalists, the Marwaris (locally called *kayas*), who directly purchased rubber from the hill tribes and controlled its export trade via the Brahmaputra river to Calcutta.⁷¹ In the wake of World War I, it was at least reported that in “the Lushai Hills 25,418 planted rubber trees” were still “in existence”.⁷² While the scheme fell short of its over-ambitious promise, it was long-lasting and drew the Lushai people into the imperial circuits of planting knowledge and seed exchanges. In the longer history of rubber cultivation, this was a striking arrangement that questions established narratives. After all, indigenous smallholders, who came to produce up to fifty per cent of the world’s natural rubber supplies before the outbreak of the Second World War, are usually seen as the unwanted competition of European plantation economies in the tropics. They were therefore frequently subjected to various forms of state discrimination to undermine their production.⁷³

The Lushai scheme also added another layer to the complexities of the British imperial presence at the Assamese borderland. It showed how the interactions between the colonial state and indigenous communities unfolded on a large spectrum of possible and at times contradictory relationships. Certain communities were, as in this case, perceived as allies, as trained “instruments,” and useful producers of an industrial commodity that imperial Britain craved. At the same time, indigenous Assamese were also perceived as indispensable but undisciplined and

⁷⁰ M. Hill, *Progress Report of Forest Administration in the Province of Eastern Bengal and Assam for the Year 1908-1909* (Shillong: Eastern Bengal and Assam Secretariat Printing Office, 1909), 10.

⁷¹ *Report on the Administration of the Province of Assam for the Years 1874-75 and 1875-76* (Shillong: Assam Secretariat Press, 1877), 14. Also, masterfully, Kar, “Historia Elastica.”

⁷² A. W. Blunt and F. H. Todd, *Progress Report of Forest Administration in the Province of Assam for the Year 1919-1920* (Shillong: Secretariat Printing, 1920), 11.

⁷³ See for contemporary calculations, “Memorandum: Labour and European Supervision,” The National Archives, Kew, AVIA 12/4, Rubber Study Group, December 1944, 4-5. An important early work on the enormous resilience and efficiency of indigenous smallholders is Peter Bauer, *The Rubber Industry: A Study in Competition and Monopoly* (London: Longmans, Green & Co., 1948).

obstreperous plantation “coolies,” including at Charduar. Finally, indigenous rubber tappers and collectors were seen as potential enemies of British conservation schemes of jungle tracts and their natural rubber stocks – and were denounced, policed and punished for “illegally” tapping *Ficus* trees in protected forests or for plundering government plantations such as Charduar.⁷⁴

The government rubber plantation was indeed a highly symbolic space of the colonial re-ordering of nature according to capitalist interests. It was a charged site of imperial ingenuity and ecological engineering at the frontier of wild jungle tracts and supposed “savage tribes.” For that reason, several high-ranking Indian officials, including the Viceroy of India, Lord Curzon, visited the Charduar estate, as part of the state-making program of itinerant governance.⁷⁵ In 1901, Curzon also personally planted a *Ficus elastica* tree as a token of colonial transformation and progress in this frontier region, later regarded as “a worthy memorial of the Viceregal visit.”⁷⁶ Clearly, this first rubber plantation of the British Empire in Asia had much more than merely a pecuniary significance: it embodied a new ecological and extractive vision of how long-term experimental science by plant pragmatists could develop alternative systems for rubber cultivation at a resource frontier perceived to be in decline due to unchecked extraction.⁷⁷ The act of putting out a young rubber seedling reflected how high imperial officials believed in a prosperous future of government rubber production in northeast India, with the growing plant

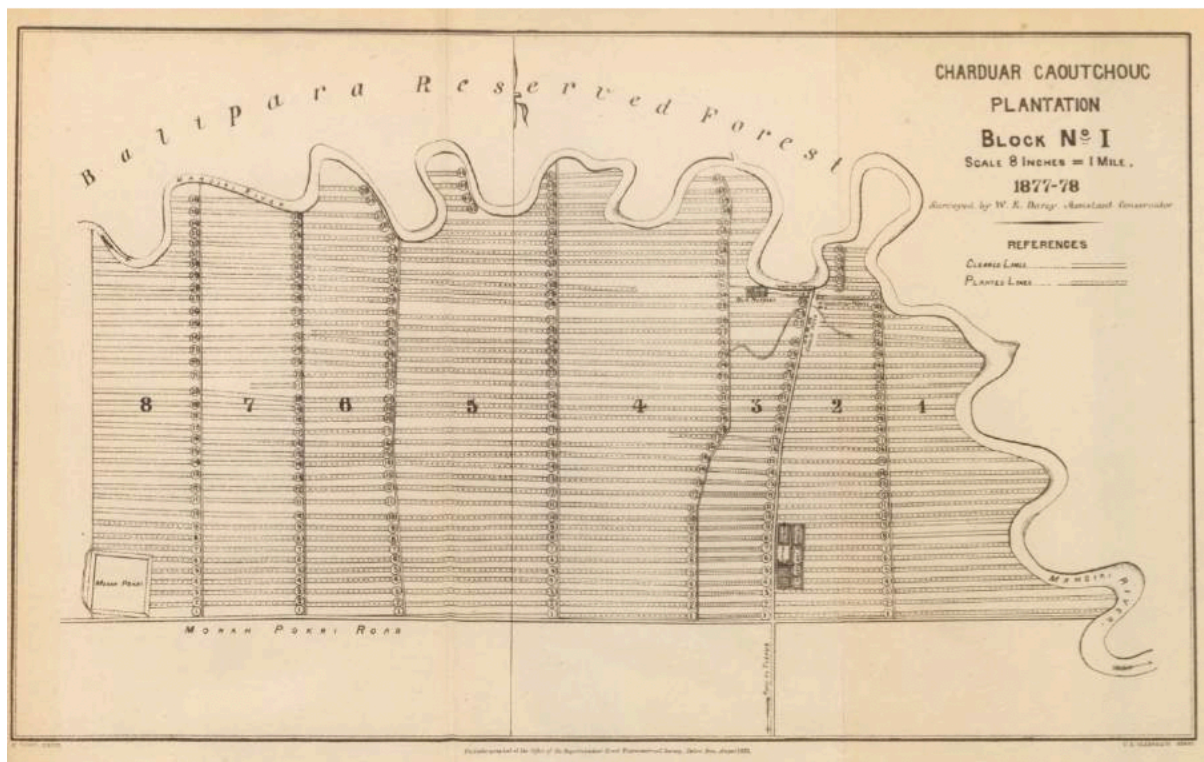
⁷⁴ E. S. Carr, *Progress Report of Forest Administration in the Province of Assam for the Year 1902-1903* (Shillong: Assam Secretariat Printing Office, 1903), 6.

⁷⁵ See Kristopher Radford, “Curzon’s Cruise: The Pomp and Circumstances of Indian Indirect Rule of the Persian Gulf,” *The International History Review* 35, no. 4 (2013): 884-904; On itinerant governance as a state-making practice, see also Bérénice Guyot-Réchar, “Tour Diaries and Itinerant Governance in the Eastern Himalayas, 1909-1962,” *Historical Journal* 60, no. 4 (2017): 1023-1046.

⁷⁶ R. N. G., “The Charduar Rubber Plantation: Enterprise of the Assam Government,” *The Englishman’s Overland Mail*, March 31, 1904, 17.

⁷⁷ The concept was coined by Jason W. Moore, “Sugar and the Expansion of the Early Modern World-Economy: Commodity Frontiers, Ecological Transformation, and Industrialization,” *Review (Fernand Braudel Center)* 23, no. 3 (2000): 409-433, and continues to attract, even with a different agenda, significant interdisciplinary interest; see for an overview and ambitious new research program, Sven Beckert et al., “Commodity Frontiers and the Transformation of the Global Countryside: A Research Agenda,” *Journal of Global History* 16, no. 3 (2021): 435-450.

symbolizing the lasting commitment of the state to its strategic propagation under the protective umbrella of empire. Charduar’s perfectly parallel structure of lines of cleared forest and artificially planted rubber trees as depicted in a contemporary map stood in marked visual contrast to the swirling natural trajectory of the nearby Mansiri river, evoking a striking juxtaposition of geometrical and wild forms – the colonial aesthetic of the plantation itself.



Map 2: “Charduar Caoutchouc Plantation, Block No. 1, scale 8 inches = 1 mile,” surveyed by W. E. D’Arcy in 1877–78, depicting “cleared lines” and “planted lines”. Source: *Progress Report of Forest Administration in Assam for the Year 1877-1878*.

As a range of scholars have demonstrated, the Assamese forests presented revered landscapes, and the majestic *Ficus elastica* tree had its place in indigenous cosmologies. Assamese communities had for centuries planted the tree for protection, as a shade giver, for its beautiful

foliage, and to perform religious rites under it.⁷⁸ The tree grew naturally scattered across 10,000 square miles in the region, mostly as a solitary tree, or in small groups of two or three that usually towered the surrounding jungle. The arrival of systematic, densely planted *Ficus elastica* plantations in the form of grid-locked lines disrupted these sacred forests. It also alienated the Assamese from their hereditary lands through government enclosures, with their own practices of forest use and *jhooming* agriculture labelled barbaric, destructive and shortsighted by imperial foresters and officials. Crucially, “[p]rotection was always, of course, also the language that masked acts of expropriation.”⁷⁹

But Assamese tribal communities were not only the silent, passive victims of the expansion of British rule, forest enclosures, and government plantations. The example of the “Aka” tribe traditionally living north of the Charduar estate is particularly instructive in this regard. As colonial officials knew by the 1870s, “[r]ubber is the chief source of wealth of the Akas”.⁸⁰ When scholars and administrators considered the conflictive “political relations of the Akas with the British”, it was usually mentioned that it dated back to the year 1868, when “the Akas first became alive to the fact that they possessed a valuable and marketable commodity in the form of rubber. It is really to the rubber question (i. e., whether the Akas [have] the right, which they claim to have, to cut rubber down)” in specified areas that a great deal of debate and violence on both sides must be attributed.⁸¹ The Charduar plantation, from the Aka point of view, was symbolic of the loss of access to traditional woodlands and their valuable products, and the appropriation of land to systematically cultivate a commodity that in its natural dispersal across

⁷⁸ Philip Richard Thornhagh Gurdon, *The Khasis* (London: David Nutt, 1907), 34, 116. Gurdon was superintendent of ethnography in Assam.

⁷⁹ Kalyanakrishnan Sivaramakrishnan, “Ethics of nature in Indian environmental history: A review article”, *Modern Asian Studies*, 49 (2015): 1295.

⁸⁰ Major Macgregor, “Notes on Akas and Akaland,” *Proceedings of the Asiatic Society of Bengal*, 17, no. 3 (1885), 205.

⁸¹ Macgregor, “Notes on Akas and Akaland,” 199.

the jungle served as their main source of income.⁸² Charduar embodied this alienation and displacement of traditional social ecologies. Even colonial officials knew that the Akas were aware that the government rubber estates were explicitly intended to make the British Empire independent of “wild” rubber supplies such as those the Akas used to procure money, provisions and manufactured products from the Assam plains.

The Akas therefore attacked a village and a forestry office in Assam in 1884, taking two officials as hostages and through such “disturbances” forcing the Charduar plantation to halt activities for several months.⁸³ This violent incident was avenged by a punitive military expedition.⁸⁴ The Aka expedition was, however, also used to initiate new rubber planting experiments beyond the border of British rule. Its members set young *Ficus elastica* plants into the forks of trees whose growth was to be observed and recorded later. This presents a striking interplay between military operations and the expansion of the experimental rubber schemes in Assam beyond the gated plantation.⁸⁵

Yet, for other groups of South Asians, the incremental expansion of the Charduar plantation also opened opportunities for employment and income.⁸⁶ While Charduar was a site of subjugation under foreign and strict temporal and manual regimes, it was also an estate where hired indigenous people learned new planting and cultivating techniques, skills that were transferable to silvicultural schemes in their home territories. Rubber tapping on the estate was

⁸² Besides violent acts of resistance, the Akas also submitted petitions to the colonial government to protest loss of lands, see “Claims of Kopas Chor Aka Chief to Certain Lands,” NAI, Foreign Department, Political A, Progs. June 1874, no. 223/228, “Translation of a Petition from Midhi Aka Raja, Paru Raja, and Other Five Aka Rajas, to the Deputy Commissioner of Durrung.”

⁸³ D. P. Copeland, “Rubber plantation at Charduar in Assam”, NAI, Inspector General of Forest, Working Plans, 1896, Proceedings Nos 1–2, 46.

⁸⁴ R. G. Woodthorpe, “The Aka Expedition,” *Journal of the United Service Institution of India* 18 (1889): 432.

⁸⁵ Berthold Ribbentrop, “Observations and Suggestions Recorded by the Inspector General of Forests to the Government of India in Connection with his Inspection of the Charduar Rubber Plantation in the Darrang district,” ASA, Revenue A, 1897, no. 164-165.

⁸⁶ While tappers received between six and 8 annas a day, the cleaning of the rubber was arranged for separately at one anna a seer. In 1875, the establishment had also included one Mohurrir on Rs. 14 per mensem, for nine months, one Mohurrir on Rs. per mensem 20 for two months, and one Watcher on Rs. 7 per mensem for 9 ½ months.

also less dangerous than “wild” rubber extraction in the forest from the huge *Ficus elastica* trees that often reached a height of 100 to 120 feet.⁸⁷ As an Indian government report noted, “[i]t is only necessary to see the tree to appreciate the fearful risk encountered by the gum gatherers, who by no means confine their operations to the base, but climb up as high as the roots extend and higher along the horizontal branches, chopping with their *dhaus* [knives] at intervals of every few inches, the cuts answering as well for their foothold as for the sap to exude them” – a risky operation that cost numerous anonymous Assamese collectors their lives.⁸⁸

Finally, to the Assamese, Charduar was a site of extraction. While the foresters employed several watchmen to control the estate, as it grew to 30,000 trees their tight oversight became impossible and opened the door for illegal operations. Hence, in 1893, a forester acknowledged that the estate “is rendered tolerably safe against everything but illicit tapping.”⁸⁹ This formulation tantalizingly left open whether rubber was illegally removed by the contractually hired plantation staff or outside intruders, or both. In either case, it showed how Assamese and distantly recruited plantation “coolies” (including Mikir, Garo and Nepalese tappers) saw Charduar as a site of disruption and marginalization, but also as an opportunity for personal gain.⁹⁰ Since the government strictly recruited only male laborers onto the plantation, given the backbreaking work of jungle clearing and tapping it required, and paid Nepalese and other groups more than the supposedly indolent and ineffective Assamese, the plantation reified gendered divisions of labor and reflected racist views of *Adivasi* peoples from the region.⁹¹ However, since shortages of labor perennially threatened plantation operations to shut down, and with the

⁸⁷ Coventry, *Ficus Elastica*, 2.

⁸⁸ Charles Brownlow quoted in George Watt, *Economic Products of India*, VI, 349.

⁸⁹ “The Charduar Rubber Plantations in Assam”, *The Indian Forester*, 19 (1893): 347.

⁹⁰ E. G. Chester, “The Tapping of Rubber Trees in the Charduar Rubber Plantation, Assam, 1899,” *The Indian Forester* 36, no. 5 (1900): 175-179.

⁹¹ *Progress Report of Forest Administration in Assam for the Year 1876-77* (Shillong: Assam Secretariat Press, 1877), 22; Sharma, *Empire’s Garden*.

workforce fully conscious of their indispensable labor, Charduar saw various acts of laborer resistance, including successful strikes against poor working and health conditions, which at times resulted in raises to their meagre salaries of 6-8 annas a day.⁹²

As more *Ficus elastica* rubber schemes emerged out of the government plantation by the late nineteenth century (including in Burma, Bengal and Madras), they increasingly included private capital and European planters as well. Similar to the way the Assamese tea estates had received considerable state support through the provision of infrastructure and affordable land, so was Assam's Chief Commissioner in 1897 "anxious to encourage private enterprise in rubber planting". He therefore gave "a lease of land on favorable terms for this purpose".⁹³ To promote private rubber planters, colonial officials "relaxed" existing rules for land grants.⁹⁴ Charduar's plant life thus spread out and started to influence the cultivation choices on other Assam estates. As a rubber journal noted approvingly in 1900, "the tea-planters lately have begun to grow *Ficus elastica* on their waste lands, seeing a possible source of extra income from the rubber-tree".⁹⁵ It was widely held that "[i]n this adventure they should receive every encouragement."⁹⁶ Since the "Assam rubber industry" was seen as being "well worth fostering", the surplus saplings from the Charduar nurseries were to be distributed free of charge to private plantation – a policy supported

⁹² On strikes, see *Report on the Administration of Eastern Bengal and Assam, 1906-1907* (Shillong: Eastern Bengal and Assam Secretariat Press, 1908), 44; on improved salaries and housing conditions, see A. V. Monro and H. Carter, *Progress Report of Forest Administration in the Province of Eastern Bengal and Assam for the Year 1910-1911* (Shillong: East Bengal and Assam Secretariat Press, 1911), 9; and *Report on the Administration of the Province of Assam for the Year 1878-1879* (Shillong: Assam Secretariat Press, 1880), 87. Shortages of labor resulted also from clashes between the rhythms of plantation operations and the seasonality of indigenous subsistence culture; see F. H. Todd, "Memorandum of the Charduar Rubber Plantation," in NAI, Government of India, Department of Revenue and Agriculture, Forests, October 1920, A, Proceedings no. 18-19, "Disposal of the Charduar Rubber Plantation in the District of Darrang, Assam," 5-6.

⁹³ As noted by Mr Campbell in "Forest Administration Reports for 1896-97 for Assam, Central Provinces and Ajmere", *The Indian Forester*, XXIV (1898): 211.

⁹⁴ See "Waste Land Applied for by Mr. M. Chamney for Cultivation of India Rubber Trees, Darrang," ASA, File No 111, Land Revenue Department, Commissioner's Office, 1898.

⁹⁵ "The Rubber Industry in India," *India Rubber and Gutta Percha and Electrical Trades Journal: A Record of the Caoutchouc, Gutta Percha, Asbestos, and Allied Industries* 20 (1900): 234.

⁹⁶ *Ibid.*

from the top, by the Inspector General of Forests, Berthold Ribbentrop.⁹⁷ The site was, in other words, envisioned as a kind of mother plantation that would have numerous progenies across the wild Assam forests and private estates. Charduar's most ardent promoters in the imperial bureaucracy, like W. R. Fisher, considered it as nothing less than the revolutionary nucleus for a profound transformation of Assam rubber production, as the tree was to be cultivated within small but growing islands of order amidst the perceived chaos of the unmanageable wild rubber trade of the region.⁹⁸

IV. Plantation Research & Development

There existed also much less enthusiastic voices about Charduar in the bureaucracy, but for surprisingly long, the hopes of imperial officials dominated the decision-making of the state.⁹⁹ For the latter, controlled plantation production promised to solve, once and for all, the long-standing issue of the inferior quality of Assamese rubber, which often contained a number of added impurities such as bark, wood and stones that depressed world market prices for the "brand".¹⁰⁰ The reason was that by far the largest exports of Assam rubber were tapped in the forests by indigenous collectors without supervision or control. The tappers then sold on the

⁹⁷ "India Rubber," *Homeward Mail from India, China and the East*, July 30, 1900, 1020. See also Berthold Ribbentrop, *Forestry in British India* (Calcutta: Office of the Superintendent of Government Printing, 1900), 199-200.

⁹⁸ See, e.g., W. R. Fisher, "Cultivation of India-Rubber," *Nature* 1113, no. 43 (1891): 390-391.

⁹⁹ Most derogatory was the one-time assessment of *Ficus* government plantations by the Chief Commissioner of Assam in 1882 that "work of this kind should be looked on as a toy, to occupy the leisure hours of officers whose main task it is to explore and utilize the immense existing resources of the forests, to make them accessible to the public, and to prevent excessive and indiscriminate destruction of the trees. The plantations of Teak and Rubber-trees at Kulsu and of Rubber-trees at Balipara, promising and interesting as they are, make as little call on the powers of a trained Forest Officers as a plantation of cabbages would make." See "Resolution on the Assam Forest Report for 1880-81," *The Assam Gazette*, January 21, 1882, 66.

¹⁰⁰ "The Production of India-Rubber in British India," *Board of Trade Journal* 18, no. 105 (1895): 415-417.

produce by weight mostly to Marwari merchants, the unchallenged intermediary traders, and in doing so sought to increase profits by adding adulterations of up to 35%.

To improve the preparation of the plantation product, Charduar's outside connections became again significant. They entailed new kinds of expert exchanges with British metropolitan scientists and rubber manufacturers that informed the commercial operations on the government field. Earlier assumptions that "the Charduar plantation had its last extension in 1893 and gradually lost its appeal as a viable economic activity" cannot be supported by the archival evidence.¹⁰¹ The estate was regularly and sometimes considerably extended in the early years of the new century; and serious tapping and sale experiments were only started in 1899.¹⁰² It is striking to note, however, that, at least initially, there was little market interest and low enthusiasm among the British public and manufacturers for the government-grown rubber.¹⁰³ When the Assam Forest Department "sold in London the first produce of the Charduar Rubber Plantation @ Rs 2-8-6 per lb.", it resulted in a meagre profit of only Rs 1-2-6 per lb., after the transport costs from Tezpur and the agent's and sale expenses were deducted.¹⁰⁴ In other words, empire rubber did not land with a bang.

However, the next year marked an upward trend, as some 4,280 lbs. of Charduar produce were sold in England at the profitable price of three shillings and seven pence per pound. As was noted with growing pride: "The agents through whom the sale was effected, reported that it was the finest rubber ever sent from Assam; and that, if it could be delivered in larger quantities and with regularity, it would realise a price still nearer to the rate paid for fine Para rubber" from

¹⁰¹ So Arupjiyoti Saikia in an otherwise excellent chapter: "From Jungle to Forests: Aspects of Early Scientific Conservation in Assam, 1839-1947," in *Science and Modern India: An Institutional History, c. 1784-1947*, ed. Uma Das Gupta (New Delhi: Pearson Longmann, 2011), 261.

¹⁰² However, earlier experimental samples of Charduar rubber had already been tested and assessed by the Reporter on Economic Products to the Government of India.

¹⁰³ "Tapping was first begun on a considerable scale in 1899, and the receipts under this head in 1903 amounted to Rs. 13,700", B.C. Allen, *Assam District Gazetteers, Vol. 5, Darrang* (Allahabad: Pioneer Press): 149.

¹⁰⁴ "Sale of Rubber from the Charduar Plantation in Assam," *The Indian Forester* 25, no. 11 (1899): 440.

Brazil.¹⁰⁵ The old dream that Assam rubber could be equal to, if not superior to the world-market dominating *Hevea* rubber had not yet vanished.¹⁰⁶

Through external evaluation and chemical analysis, the Charduar product was to be further improved. For this purpose, various samples of Charduar rubber were sent to the Imperial Institute in London. This government-sponsored resource institute, whose Scientific and Technical Department (including numerous laboratories) was led by the Professor of Chemistry Wyndham R. Dunstan, was tasked with testing out various natural resins, dyestuffs, food crops and any other natural products that could be grown, extracted and sold for profit.¹⁰⁷ Dunstan was expected to attend to the scientific analysis of the Charduar rubber, to make suggestions for its enhancement and to communicate his findings to brokers and manufacturers who would in turn provide their own feedback to Charduar. This presented an entangled system of commodity production on tropical estates with direct feedback loops from metropolitan producers and manufacturers that I call “Plantation R & D”. The first Charduar samples were tested in 1899 but considered as the result of a “defective operation”.¹⁰⁸ Consequently, upon receiving Dunstan’s suggestions for optimized methods, a second sample was provided in 1900.¹⁰⁹ This was unanimously judged to be of “a very much better appearance than the first”.¹¹⁰

¹⁰⁵ “Rubber Production in Assam,” *Indian Engineering* 29 (1901): 42.

¹⁰⁶ See also Morris, “Cantor Lectures.”

¹⁰⁷ As a contemporary bulletin explained the Institute’s role: “In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists (...) carry out the investigation of the chemical constitution and properties of new dyestuffs, tanning materials, seeds and foodstuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization.” See: “Notice: The Scientific and Technical Departments of the Imperial Institute,” *Agricultural Bulletin of the Straits and Federated Malay States* 1, no. 4 (1902), i-ii.

¹⁰⁸ Wyndham R. Dunstan, “Report on a Second Sample of Rubber (*Ficus elastica*) from the Charduar Plantation, Assam”, *The Imperial Institute, Indian Section. Annual Report for the Year 1899-1900* (London: Majesty’s Stationery Office, 1900), December 8, 1899, 36-37.

¹⁰⁹ “These suggestions have been successfully carried out by the Inspector General of Forests, with the result that a much superior sample of Charduar rubber has now been received and a large consignment has already been sold at a greatly enhanced price.” Dunstan, “Quarterly Report by the Director of the Scientific Department on Enquiries conducted for the Government of India”, January 17, 1900; *ibid.* 29–30.

¹¹⁰ *Ibid.*

While the consulted rubber manufacturer in London found the second Charduar sample of good quality and “free from foreign admixture”, it was nonetheless considered too soft for the manufacture of insulated wires.¹¹¹ Electrical purposes required hard rubber. In consequence, the suggestion was made to mix the Charduar product with superior Para rubber for “the manufacture of soft rubber articles”. To increase the number of expert verdicts, the Inspector General of Forests, Berthold Ribbentrop, also directly enlisted the service of one of the world’s leading producers of cable and other electrical devices: Messrs. Siemens, Brothers, & Co, Limited, the well-known manufacturing electricians. The company was not only asked for an industrial assessment of samples (their verdict remains unknown) but was also informed about the total amount of the same quality rubber being shipped to Britain that year: around 4 tons. Dunstan, in turn, offered to coordinate these multiple evaluations of the commodity, “and, if desired, to accept for the Forest Department the highest tender for the consignment.”¹¹²

No efforts were spared to help the self-grown rubber enter British industrial production. The cooperation of Charduar with the Imperial Institute continued for years. Improved production methods meant that by 1905, Charduar rubber could “be used for the manufacture of ebonite”, or hard rubber – thus greatly widening the range of possible industrial applications.¹¹³ The cooperation of the Indian foresters with metropolitan specialists, resource institutes and commercial producers demonstrates how even remotely stationed agents deeply immersed in local forest production and management thought consistently about both ends of global

¹¹¹ Dunstan, “Report on a Second Sample of Rubber”, 36, also next quote from *ibid.*

¹¹² Dunstan, “Report on a Sample of Rubber, February 7, 1899,” *Imperial Institute, Indian Section, Extracts from the Annual Reports, 1898-99*, Appendix N, 149.

¹¹³ “Ficus Elastica Rubber from the Charduar Plantations, Assam (1905),” in *Selected Reports from the Scientific and Technical Department*, No. 82, IV: Rubber and Gutta Percha, part of *Accounts ad Papers, Colonies and British Possessions*, LIX, ed. Wyndham R. Dunstan (London: n.p., 1912-1913), 338.

commodity chains.¹¹⁴ Scientific foresters were not backwoodsmen with a parochial view of the political economy of colonial forests, but producers of industrial commodities, albeit with an urge to maintain an equilibrium between patterns of extraction and necessary conservation and, if needed, strategic reproduction.¹¹⁵

V. Conclusion: The Change of Global Rubber Geographies and Charduar's Decline

The 1911 article in *The India Rubber World* on the Charduar plantation (with which this chapter opened) already alluded to the estate's uncertain future. While the plantation then contained 30,000 raised trees, put out across 2700 acres, these were exclusively of the *Ficus elastica* variety, said to be "now less favored for planting" than the Brazilian *Hevea brasiliensis* tree.¹¹⁶

The editors saw that the estate was at a crossroads, its existence threatened. And indeed, over the next few years, *Ficus elastica* would experience a sudden fall from grace as a global plantation crop. As John Carruthers, a government botanist in Malaya, noted in 1909: "Four years ago the question of the relative advantages of planting *Hevea brasiliensis* (Para rubber), or *Ficus elastica* (Rambong), was considered an open one, and the fact that the latter was a native tree and grows freely in Malaya induced some to prefer it to the Brazilian plant."¹¹⁷ Yet, in a eulogy to the species, under the telling heading "The Passing of *Ficus Elastica*", the botanical practitioner gave

¹¹⁴ Foresters like Brandis also discussed quality requirements directly with rubber "manufacturers in London," G. T. Pearson, "The Preparation of India-Rubber in Assam," May 1872; ASA, 43/51, "Experimental Rubber Plantation in Kamrup, 1873."

¹¹⁵ Henry E. Lowood, "The Calculating Forester: Quantification, Cameral Science, and the Emergence of Scientific Forestry Management in Germany," in *The Quantifying Spirit in the Eighteenth Century*, eds. Tore Frangsmyr, J. L. Heinbron, and Robin E. Rider (Berkeley: University of California Press, 1991), 315-342; Ravi S. Rajan, *Modernizing Nature: Forestry and Imperial Eco-Development, 1800-1950* (Oxford: Clarendon Press, 2006).

¹¹⁶ "Rubber Planting in the East," 124.

¹¹⁷ J. B. Carruthers, "Report of the Director of Agriculture for the Year 1908," *Agricultural Bulletin of the Straits and Federated Malay States* 8, no. 9 (1909): 400.

several reasons for the eclipse.¹¹⁸ Above all, the planters' decision to supplant *Ficus* in Malaya and elsewhere with its Brazilian competitor was due to the greater regularity of resource extraction from *Hevea* trees – their much greater uniformity of growth that allowed their more routine, mechanical tapping. This aligned *Hevea* much more closely with the standardized work of a “plantation machine”.¹¹⁹ Carruthers indeed stressed the greater standardization and mechanization of resource extraction with *Hevea* as the principal cause of its triumph:

There are various difficulties attending the treatment of *Ficus* in regard to pruning it or allowing it to form its aerial roots unchecked, in relation to tapping and preventing of entrance of boring insects and fungi into the wounds, also the direction and shape of the branches and stems make the collection of latex no easy matter. (...) The symmetrical stem of the Para, the facilities for running the latex into the single cup at the base of the tree, regularity of its growth and its reaction to a wound, have especially commended this tree to the rubber grower.¹²⁰

The same eyewitness account described the strategic destruction of cultivated *Ficus* species to make room for the higher-yielding and more profitable *Hevea* type in British Malaya.¹²¹ The integration and dis-integration of *Ficus* regimes on rubber plantations shows, in other words, the enormous capacity of modern agronomic systems to acclimatize new species around the world if commercial demand was assumed. Moreover, it sheds light upon their capacity to quickly correct earlier decisions and re-align global planting decisions with changing planter and industrial demands. This restructuring was “in principle irreversible: this is the essence of *transformation*,

¹¹⁸ Carruthers, “Report,” 400.

¹¹⁹ European colonial agronomists sought to align the natural growth patterns of cash crops with a regulated, factory-like production. Monocultures and increasing mechanization of plantation work ultimately led some “to see the plant as a machine” (my translation). See Ernst Fickendey, “Die Plantage, eine industrielle Unternehmung,” *Deutsche Wacht: Niederländisch-indische Monatsschrift für Handels- und Kolonialpolitik, Volkswirtschaft und Völkerrecht* 8 (1923): 16. On this, see Moritz von Brescius and Christof Dejung, “The Plantation Gaze: Imperial Careering and Agronomic Knowledge between Europe and the Tropics,” *Comparativ* 31 (2021): 572-590.

¹²⁰ Carruthers, “Report,” 401.

¹²¹ *Ibid.*

in contrast to mere change. When transformations occur, the processes of change are condensed and accelerated, new actors appear, and the winners and losers become easier to tell apart”.¹²²

When Malayan and Indonesian planters ripped out raised *Ficus* to cultivate *Hevea* rubber instead, the changing global context could no longer be ignored; the world came crashing into the Charduar plantation to bury earlier goals and visions. It showed how quickly and unexpectedly seemingly thriving plantations could end, even in the midst of optimistic if not euphoric evaluations. The strategy of specialization was always high risk, high gain. After 1908, repeated government efforts to sell the Charduar estate to private planters did not come to fruition. A few years later, operations came to a near halt: no more extensions were made after 1916, and an elaborately devised rotation system for scientific and commercial tapping was entirely thrown out. Towards the final years of the First World War, it was computed that the “low price of Assam rubber continued which makes tapping prohibitive except with free labour.”¹²³ This led the British officials to take desperate steps. For several years the once carefully guarded government estate, with its myriad temporal and spatial logics of neat compartments as distinct laboratories of *Ficus* cultivation, was now opened for uncontrolled tapping by outsiders. Hence, “forest villagers” were allowed to extract latex from any part of the plantation, unchecked, unpaid and undocumented. The former system of precisely recording every step of plantation operations collapsed.

The most painstakingly coordinated effort of turning Assam rubber into a plantation crop thus lingered and faltered. Nevertheless, the idea of liberating the British Empire from external sources of import remained vital for decades to come, and partly explains the vast expansion of *Hevea* planting in Southeast Asia after the turn of the twentieth century. Meanwhile, colonial

¹²² Jürgen Osterhammel, “Geschichtskolumne: Große Transformationen,” *Merkur* 65, no. 7 (2011): 627.

¹²³ A. W. Blunt and W. F. L. Tottenham, *Progress Report of Forest Administration in the Province of Assam for the Year 1917-18* (Shillong: Assam Secretariat Printing Office, 1918), 10.

servants, foresters and private planters in Assam had little time and maneuvering space to react to the sudden and profound changes in the global rubber industry. *Ficus elastica* plantation cultures and wild extraction petered out in the wake of the Great War, as world market demands ceased to exist – while the rubber trees, now untouched by axes or tapping knives, continued to grow.

Colonial archives and the records of private firms that had invested in Assam rubber fell silent.¹²⁴

Additionally, several attempts since the late nineteenth century to acclimate and grow *Hevea* in India's northeastern frontier proved of little significance, even if some notable government-owned *Hevea* plantations existed in neighboring Burma by the early twentieth century.¹²⁵

By 1919, among the concerned government circles involved with Charduar, it had become “a matter for consideration whether further expenditure on this plantation is justifiable for it appears that there is practically no demand now for rubber obtained from the *Ficus elastica* and even when a sale is effected the price is so low that it does not cover the cost of tapping.”¹²⁶ This was an astonishing twist of fate: After decades of enormous government investment in the experimental estate, no private buyers signaled any interest and thus officials conceded that “the question of *abandoning* the plantation will be taken up.”¹²⁷ As a contemporary explained Charduar's predicament: “The extensive plantations of Pará rubber in the East (...) have sealed its doom as a commercial proposition.”¹²⁸ This point needs stressing: the enormously successful *Hevea* plantations in Southeast Asia were also the result of British imperial efforts to propagate rubber. The co-existence of competing rubber schemes within the empire was the following of an

¹²⁴ Indicative of the larger shift is that the prominent “Assam Valley Rubber Company, Ltd.,” incorporated in 1897, at the height of rubber exports, was dissolved during the war. See National Archives, Kew, Trade and Commerce, BT 31/7279/51502, 1897-1916.

¹²⁵ Voon Phin Keong, “The Rubber Industry of Burma, 1876-1964”, *Journal of Southeast Asian Studies*, 4, no. 2 (1973): 216-228; “Rubber Planting in the East,” 124.

¹²⁶ A. W. Blunt and F. H. Todd, *Progress Report of Forest Administration in the Province of Assam for the Year 1918-19* (Shillong: Assam Secretariat Printing Office, 1919), 10.

¹²⁷ “Resolution on the Report of Forest Administration in Assam for the year 1918-19,” in Blunt and Todd, *Progress Report of Forest Administration in the Province of Assam, 1918-19*, 2.

¹²⁸ Robert Scott Troup, *The Silviculture of Indian Trees* (Oxford: Clarendon Press, 1921), 865.

old recipe: that of keeping up and testing what I call an *imperial portfolio* of potentially profitable plants. Various species were part of systematic cultivation experiments, with the new rubber estates in the eastern colonies now proving *Hevea* to be the superior crop, raising above and marginalizing every other global rubber plant in the process. It had taken the European botanists and planters more than a century to establish a definitive global hierarchy of rubber species. Once this had been established, the “inferior” plants fell by the wayside.

After the First World War, land-hungry tea gardeners had irrevocably set their prying eyes on the Charduar plantation. In 1929, a forestry report contained a brief and unceremonious panegyric that seemed to capture its erasure. It merely recorded that “[t]he extensive *ficus elastica* rubber plantation of 2,500 acres (...) put out at great labour and expense by the department have been disforested, the demand for this type of rubber having gone out.”¹²⁹ There is some irony in the moment of the plantation’s purported death: almost exactly half a century since operations had begun – or precisely at the time when its trees had reached their full maturity and the founding foresters had envisioned output to reach a triumphant climax. The long gestation period of *Ficus* rubber had, however, become entirely out of sync with the shorter production times of other species, with Charduar presenting a mere relic of past futures of the global rubber industry. It was now a future in ruins.

¹²⁹ F. H. Cavendish, *Quinquennial Review of Forest Administration in the Province of Assam for the Period 1924-1925 to 1928-29 with the Progress Report of Forest Administration for 1928-29* (Shillong: Assam Government Press, 1929), 4.