

# 'The Battle for Rubber in the Second World War: Cooperation and Resistance'

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# The Battle for Rubber in the Second World War: Cooperation and Resistance<sup>1</sup>

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## Introduction

Control of certain raw materials assumed an enhanced significance during the Second World War, due to the mechanisation of the armed forces of the world. Together with petroleum and a handful of rare minerals, rubber became crucial to the ability to wage successful war, and every belligerent was short of it at some point during this global conflict.<sup>2</sup> Indeed, shortages of rubber and fuel structurally prevented the Axis powers from mechanising sufficiently to mount a true *blitzkrieg*.<sup>3</sup>

Research on tyres, and on other rubber goods essential for war, remains extremely uneven, with no global history of the industry. Substantial volumes exist for some tyre companies, but not for others, and they are an eclectic mix.<sup>4</sup> Nevertheless, they are often all that is available in print to comprehend the destruction and diffusion of the manufacturing of rubber goods as a result of war.

Writings on raw rubber typically focus on novel aspects attributable to the Second World War, notably the development of synthetic and temperate varieties. Questions of the role of scientists, and of their relations with the state, are at the forefront of these works.<sup>5</sup> The rise of synthetic rubber in Nazi Germany has attracted particular interest.<sup>6</sup> The same is true of developments in the United States, whereas Italy and the Soviet Union have been considered

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<sup>1</sup> A special debt of gratitude is owed to the staff of the Tun Abdul Razak Research Centre (TARRC), Brickendonbury, Hertford, UK, and especially to Linda Hetherington, for helping me in consulting their splendid rubber library. I would also like to thank David Birmingham, Allen Howard, Peter Morris, S. Nawiyanto, Catherine Ngefan, Ian Nish, Declan O'Reilly, Rolf Petri, Andrew Roberts, and Nick Westcott, for generously supplying me with materials for this project.

<sup>2</sup> William N. Medlicott, *The economic blockade*, London: HMSO, 1952-59; Jonathan Marshall, *To have and have not: Southeast Asian raw materials and the origins of the Pacific War*, Berkeley: University of California Press, 1995.

<sup>3</sup> Rolf-Dieter Müller, 'Albert Speer and armaments policy in total war', in *Militär-geschichtliches Forschungsamt* (ed.), *Germany and the Second World War*, vol. V, part 2, Oxford: Clarendon Press, 2003, pp.477-8.

<sup>4</sup> See especially Hugh Allen, *The house of Goodyear: fifty years of men and industry*, Cleveland: [Goodyear], 1949; Maurice O'Reilly & James T. Keating, *The Goodyear story*, Elmsford: Goodyear Tire & Rubber Company, 1983; Alfred Lief, *The Firestone story: a history of the Firestone Tire and Rubber Company*, New York: McGraw-Hill, 1951; Glenn D. Babcock, *History of the U.S. Rubber Company: a case study in corporation management*, Muncie: Indiana University, 1966; Ronald Storrs, *Dunlop in war and peace*, London: Hutchinson & Co, 1946; James McMillan, *The Dunlop story: the life, death and rebirth of a multi-national*, London: Weidenfeld & Nicolson, 1989; Alain Jemain, *Michelin: un siècle de secrets*, Paris: Calmann-Lévy, 1982; Herbert R. Lottman, *The Michelin men: driving an empire*, London: I. B. Tauris, 2003.

<sup>5</sup> William G. Clarence-Smith, 'Synthetic and temperate rubber in the interwar years and during World War II', *Journal of Global History*, 5:1 (forthcoming 2010; review article).

<sup>6</sup> Peter J. T. Morris, 'The development of acetylene chemistry and synthetic rubber by I. G. Farbenindustrie Aktiengesellschaft, 1926-1945', DPhil thesis, Oxford, 1982; Diarmuid Jeffreys, *Hell's cartel: IG Farben and the making of Hitler's war machine*, London: Bloomsbury, 2008.

more briefly.<sup>7</sup> Wartime experiments with temperate rubber plants have recently attracted attention, whether by Americans, Germans, Italians or Soviets.<sup>8</sup> In 1947, J. M. Ball claimed to have published the first full-length book dedicated exclusively to the industrial processing of scrap into reclaim rubber – a mature and unglamorous industry.<sup>9</sup> However, it also seems to have been the last, despite the great significance of reclaim rubber to all belligerents.

Virgin natural rubber from the tropics remained essential for large tyres, so that the Japanese conquest of Southeast Asia, between December 1941 and March 1942, led to a tremendous crisis in the region, suddenly deprived of its most important markets. Some scholars have analysed the boom period before the Japanese invasion.<sup>10</sup> Others have concentrated on the Japanese occupation, albeit focusing on economic policy in general, rather than specifically on rubber. From this perspective, Malaya is now well covered.<sup>11</sup> There is a fine case study of East Java, but Indonesia as a whole has received a rather broad-brush treatment.<sup>12</sup> In the case of French Indochina, one informative PhD thesis remains unpublished, whereas another has been more fortunate.<sup>13</sup> As for Thai rubber, it has been subsumed within a wider perspective than just the economic one.<sup>14</sup>

Tropical producers of rubber in South Asia, Africa and Latin America, crucial to the survival of the Allies after Japan's seizure of Southeast Asia, have been much less studied by

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<sup>7</sup> Peter J. T. Morris, *The American synthetic rubber research program*, Philadelphia: University of Pennsylvania Press, 1989; Declan O'Reilly, 'A fateful friendship: Standard Oil of New Jersey, IG Farben, and the politics of synthetic rubber, 1925-42', unpublished and undated paper (based on MA thesis, London School of Economics and Political Science, 1990); Rolf Petri, 'Opting for methane: Italian synthetic rubber, western European developments, and American technology', in Dominique Barjot (ed.), *Catching up with America: productivity missions and the diffusion of American economic and technological influence after the Second World War*, Paris: Presses de l'Université Paris-Sorbonne, 2002, pp.315-35; Rolf Petri, 'Zwischen Konkurrenz und Kooperation: die deutsche Chemieindustrie und das technische Aufholen Italiens', in Rolf Petri (ed.), *Technologietransfer aus der deutschen Chemieindustrie, 1925-1960*, Berlin: Duncker and Humblot, 2004, pp.253-90; Matthew J. Sagers & Theodore Shabad, *The chemical industry in the USSR: an economic geography*, Boulder (CO): Westview Press, 1990, ch. 7.

<sup>8</sup> Loren G. Polhamus, *Rubber: botany, cultivation and utilization*, London: Leonard Hill, 1962; Mark Finlay, *Growing American rubber: strategic plants and the politics of national security*, New Brunswick: Rutgers University Press, 2009; Susanne Heim, *Plant breeding and agrarian research in Kaiser-Wilhelm-Institutes, 1933-1945: calories, caoutchouc, careers*, New York: Springer, 2008; Giorgio Nebbia, 'Gomma guayule in Puglia', *La Gazzetta del Mezzogiorno*, 5 February 2008; G. Krotkov, 'A review of the literature on *Taraxacum kok-saghyz* Rod.', *Botanical Review*, 11:8 (1945), pp.417-61.

<sup>9</sup> J. M. Ball, *Reclaimed rubber: the story of an American raw material*, New York: Rubber Reclaimers Inc., 1947.

<sup>10</sup> Peter T. Bauer, *The rubber industry, a study in competition and monopoly*, London: Longmans Green & Co, 1948; D. J. M. Tate, *The RGA history of the plantation industry in the Malay peninsula*, Kuala Lumpur: Oxford University Press, 1996.

<sup>11</sup> Paul H. Kratoska, *The Japanese occupation of Malaya, 1941-45: a social and economic history*, London: Hurst, 1998; Mako Yoshimura, 'Japan's economic policy for occupied Malaya', in Yoji Akashi and Mako Yoshimura (eds), *New perspectives on the Japanese occupation in Malaya and Singapore, 1941-1945*, Singapore: National University of Singapore Press, 2008, pp.113-38.

<sup>12</sup> S. Nawiyanto, *The rising sun in a Javanese rice granary: change and the impact of the Japanese occupation on the agricultural economy of Besuki residency, 1942-1945*, Yogyakarta: Galang Press, 2005; L. de Jong, *The collapse of a colonial society: the Dutch in Indonesia during the Second World War*, Leiden: KITLV, 2002; Shigeru Sato, *War, nationalism, and peasants: Java under the Japanese occupation, 1942-1945*, St Leonards: Allen and Unwin, 1994.

<sup>13</sup> Sachiko Murakami, 'Japan's thrust into French Indochina, 1940-1945', PhD Thesis, New York University, 1981; Man Hung Le, *The impact of World War II on the economy of Vietnam, 1939-45*, Singapore: Eastern Universities Press, 2004.

<sup>14</sup> E. Bruce Reynolds, *Thailand and Japan's southern advance, 1940-1945*, Basingstoke: Macmillan, 1994.

historians, with the important exception of Warren Dean's fine chapter on Brazil.<sup>15</sup> For other Latin American producers, much can be gleaned from technical works on rubber.<sup>16</sup> Sri Lanka, which became the Allies' single largest source of natural rubber, has been surprisingly neglected, apart from the appearance of an official report right after the war.<sup>17</sup> Africa has attracted polemical statements about the forced cultivation of wild rubber, but little of substance.

This article aims to use the war to illuminate latent conflicts in the rubber commodity chain, which tended to be exacerbated under conditions of conflict. In authoritarian regimes, social relations at times degenerated into outright savagery, encapsulated in the chilling Nazi policy of 'extermination through work' adopted from the autumn of 1941.<sup>18</sup> Coercion also increased in liberal democracies, although the extent of this process has probably been exaggerated, particularly in their colonial appendages. While many disputes pitted workers against employers – which could be states – there were also perennial tensions between planters and smallholders. Another type of conflict, not covered here for lack of data, concerned commercial relations: for example, smallholders cheated by merchants.

At the same time, war can also reveal and fortify collaborative relations, for it would be perilous to assume that a commodity chain is little more than a structure of exploitation. Commodities have a way of inspiring a genuine *esprit de corps*, at least across some segments of a chain.<sup>19</sup> Moreover, in the face of a common enemy, appeals to patriotism and the defence of established rights and freedoms could be powerful tools. Generally speaking, however, material incentives appear to have been most effective in coaxing producers to deliver precious rubber.

Throughout this complicated story, one constant strand appears, namely that social relations in the rubber commodity chain were much more violent and oppressive in communist and fascist states than in liberal democracies. In itself, this is not particularly surprising. However, it is rarely appreciated that this even held true in the colonial world. When the colonial power was a liberal democracy, conditions in its dependent territories were generally worse than in the metropolis, but still remained superior to those prevailing in authoritarian regimes. It follows that the worst conditions under which to be involved with rubber existed in the colonial appendages of communist and fascist states.

### **Conflict and cooperation in factories for rubber goods and synthetic rubber**

Numbers employed in rubber factories boomed during the war, whether producing tyres, other rubber goods, synthetic rubber, or reclaim rubber. Conditions of war led all governments to press for labour discipline, but the proportion of carrot and stick applied in industrial relations varied according to circumstances.

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<sup>15</sup> Warren Dean, *Brazil and the struggle for rubber, a study in environmental history*, Cambridge: Cambridge University Press, 1987, ch. 6.

<sup>16</sup> Notably Polhamus (1962) and W. J. Baulkwill, 'The history of natural rubber production', in C. C. Webster and W. J. Baulkwill (eds), *Rubber*, Harlow: Longman, 1989, pp.1-56.

<sup>17</sup> Ceylon, *Report of the commission on the rubber industry in Ceylon, October 1947*, Colombo: Government Press, 1947.

<sup>18</sup> Lewis H. Siegelbaum, *Cars for comrades: the life of the Soviet automobile*, Ithaca: Cornell University Press, 2008, p.162; Jeffreys (2008), p.253.

<sup>19</sup> For the example of one rubber company, see William G. Clarence-Smith, 'The Rivaud-Hallet plantation group in the economic crises of the inter-war years', in Pierre Lanthier & Hubert Watelet (eds), *Private enterprises during economic crises: tactics and strategies*, Ottawa: Legas, 1997, pp.117-32.

One little challenged consequence of war was that the numbers of women employees grew rapidly. The United States lauded the ‘Rosie, the riveter’ character, while Soviet women entered war industries in droves.<sup>20</sup> Michelin plants in France also drew in more women.<sup>21</sup> In Japan, an ordinance of August 1944 specified that 30 percent of workers in the rubber-goods sector had to be female.<sup>22</sup> It was not all plain sailing, however, for applying identical minimum wages for men and women in British rubber factories appears to have given rise to murmurings about the poor skills of “untrained women operatives”.<sup>23</sup>

More contested were ethnic changes in factories. In late 1942, Dunlop sacked thirteen skilled South Asian workers, who were trying to promote the Natal Rubber Workers’ Union in the Durban factory in South Africa. When this provoked a strike, the company played the card of the war effort, received official backing, sacked the strikers and drafted in some five hundred ‘Bantu’, who were trained to replace the more expensive Indians.<sup>24</sup> In Dunlop’s factory in Bengal, nearly two-thirds of Europeans volunteered for military service, and South Asians filling the gaps provoked mixed emotions.<sup>25</sup> When the Japanese seized Java in early 1942, they took over the Goodyear tyre factory, interned all white managers, and transferred the plant to Bridgestone, renamed Nippon Tire in that year. It is unclear whether Indonesian workers welcomed these changes, although some appear to have gained promotion.<sup>26</sup>

Class conflict only temporarily abated in the United States, where the United Rubber Workers of America (URW) had emerged as one of the most militant industrial unions from 1935. The National War Labor Board (NWLB), set up for compulsory arbitration in disputes, sought to stabilise wages at January 1941 rates, making provision for cost-of-living increases. There was a freeze on strikes, and overtime became mandatory.<sup>27</sup> Sherman H. Dalrymple, the URW president, wrote in July 1942: “We know where the majority of our members stand – we know they don’t want to let our boys in the armed forces down;” and he specified that “no handful of men has any right whatsoever to slack the all-out production of needed war materials”.<sup>28</sup> In 1943, he condemned strikes, which “tend to break down the whole machine of vital war production”.<sup>29</sup>

American rubber workers became increasingly discontented, however, as company profits rose, while wages failed to keep up with inflation. Formal grievance procedures were jammed with complaints, and the NWLB was accused of siding with the bosses. Absenteeism grew, slowdowns and ‘disobedience’ became rampant, and wildcat strikes began to multiply from 1943.<sup>30</sup> A wide range of alleged contract violations motivated a major strike against

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<sup>20</sup> Bruce M. Meyer, *The once and future union: the rise and fall of the United Rubber Workers, 1935-1995*, Akron: University of Akron Press, 2002, p.72; Alec Nove, *An economic history of the U.S.S.R.*, Harmondsworth: Penguin Books, 1976, p.278.

<sup>21</sup> Lottman (2003), p.184.

<sup>22</sup> Jerome B. Cohen, *Japan’s economy in war and reconstruction*. Minneapolis: University of Minnesota Press, 1949, p.321.

<sup>23</sup> *India-Rubber Journal*, 15 March 1943; McMillan (1989), p.81.

<sup>24</sup> Peter Alexander, *Workers, war and the origins of apartheid: labour and politics in South Africa, 1939-1948*, Oxford: James Currey, 2000, pp.48-9.

<sup>25</sup> Storrs (1946), pp.84-5.

<sup>26</sup> O’Reilly & Keating (1983), p.101; Allen (1949), pp.586 & 679.

<sup>27</sup> Meyer (2002), pp.29-78; Harold S. Roberts, *The rubber workers: labor organization and collective bargaining in the rubber industry*, New York: Harper & Bros., 1944, pp.321-75, 361-5.

<sup>28</sup> Roberts (1944), p.363.

<sup>29</sup> Meyer (2002), p.73.

<sup>30</sup> Meyer (2002), pp.72-3; Roberts, (1944), pp.364, 383, 387-93.

Goodyear in Akron, from 17 June to 5 July 1945. It was only broken when President Truman sent in naval forces, which did not return the factory to Goodyear till the end of August.<sup>31</sup>

Air raids on British rubber factories seem to have sustained solidarity between employers and workers, although relatively few Dunlop employees lost their lives through bombing, due to carefully rehearsed drills since 1935. Strikes remained legal, but patriotic zeal seems to have contained worker militancy. Holidays were cancelled at short notice by Dunlop to deal with urgent orders, without provoking high rates of absenteeism.<sup>32</sup> As the government increasingly regimented rubber workers, tensions emerged. In early 1943, Scottish ‘girls’ complained about being transferred to English places of work, with poor lodgings and food, and long working hours. The government countered by alleging that workers changed their employment without authorisation, and did not regularly turn up to work.<sup>33</sup>

Stalin’s orchestration of the ‘Great Patriotic War’ may have overcome some class tensions in the USSR. The Soviet rubber industry suffered greatly from the German onslaught of June 1941, which knocked out synthetic rubber and tyre factories in Voronezh and Yefremov, on the front line. In 1943, the Luftwaffe made a concerted effort completely to destroy the synthetic and tyre factories in Yaroslavl.<sup>34</sup> There is a lack of information on labour conditions specific to rubber, but workers in all Soviet war industries were placed under military discipline. Holidays were suspended, overtime became compulsory and job mobility was banned. Already poor living conditions worsened after the mass relocation of workers to the east, and average real factory wages in 1945 were only about 40 percent of the 1940 level. However, wages in war industries were considerably above average, conditions were better and productivity rose sharply. Patriotic fervour and material incentives may have combined to sustain key industries such as rubber.<sup>35</sup>

Workers in occupied Europe, concerned to cling to any job and avoid being sent to Germany to work, lost all traces of militancy. In France, strikes had flared up in tyre factories with the advent of the Front Populaire government in 1936. After France’s humiliating capitulation in June 1940, managers and workers strove together to avoid deportation to Germany, and to keep factories limping along with imported German synthetic rubber, while conceding as little as possible to Nazi demands.<sup>36</sup>

In Germany itself, the labour force was sharply segmented between relatively protected citizens and allies, and foreigners and minorities who were forced to toil under duress. German workers may have reacted patriotically to Allied bombing, but there was nothing to bring forth such a reaction from forced labourers.<sup>37</sup> By October 1944, Germans constituted less than two-thirds of those employed in several of I. G. Farben’s factories in

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<sup>31</sup> O’Reilly & Keating (1983), p.97.

<sup>32</sup> McMillan (1989), pp.81-5; Storrs (1946), pp.35-44.

<sup>33</sup> *India-Rubber Journal*, 23 January 1943.

<sup>34</sup> Sagers & Shabad (1990), pp.272-4; Morris (1982), p.359; John Barber & Mark Harrison, *The Soviet home front, 1941-1945: a social and economic history of the USSR in World War II*, London: Longman, 1991, p.184.

<sup>35</sup> Nove (1976), pp.277-9, 281-2.

<sup>36</sup> Annie Lacroix-Riz, *Industriels et banquiers français sous l’occupation: la collaboration économique avec le Reich et Vichy*, Paris: A. Colin, 1999, pp.158, 541-2; Jemain (1982), pp.118-19, 122-4; Lottman (2003), pp.171-3, 184; Storrs (1946), pp.96-7.

<sup>37</sup> Mark Mazower, *Hitler’s empire: how the Nazis ruled Europe*, New York: The Penguin Press, 2008, ch. 10; Adam Tooze, *The wages of destruction: the making and breaking of the Nazi economy*, New York: Viking, 2007, ch. 16.

Germany proper.<sup>38</sup> The Allies specifically targeted rubber installations, but it is not known how the work force responded.

It was in Auschwitz that relations between employers and forced workers broke down altogether. IG Farben, attempting to build a massive new synthetic rubber factory from February 1941, set up its own separate concentration camp for Jews, staffed by SS guards. Some 35,000 workers may have died on the company's synthetic rubber and oil factory site, in just under four years. Nevertheless, the ill-fed, badly-treated, brutalised and diseased inmates proved adept at wielding the weapons of the weak, ensuring that the plant never actually produced any rubber for the Nazis before Soviet troops occupied the area in January 1945. A number of IG Farben executives were imprisoned for a few years after a war crimes trial held in 1947-48, having been convicted of "aiding and abetting mass murder and slave labour". It could be argued that they got off lightly.<sup>39</sup>

### **Coercion and collaboration in the production of temperate rubber**

For the production of temperate rubber, authoritarian regimes also applied harsh labour coercion, while obliging peasants to comply with heavy-handed official demands. In contrast, US attempts to grow such crops were generally premised on making it worth the while of workers and peasants.

The Soviets pioneered the cultivation of the Russian dandelion (*Taraxacum kok-saghyz*) from the early 1930s, despite its low rubber yields.<sup>40</sup> On seizing the Ukraine, the Nazis found wide stretches of fertile land devoted to this crop.<sup>41</sup> The dandelion generally replaced vegetables, tobacco and hemp, on good soils. It was extremely labour intensive, and harvesting in the autumn interfered with other tasks. Forced collectivisation had caused much distress, and widespread starvation at times, so that the burden of growing *kok-saghyz* was deeply unpopular. Peasants in the Baltic States ploughed up their dandelion fields as soon as Soviet troops retreated. Such behaviour may explain the reduction in German estimates of the planted area in occupied lands, from 60,000 hectares in September 1941 to 20,000 by the end of the year.<sup>42</sup>

None the less, the Nazi conquerors ordered peasants on collective farms to maintain fields of *kok-saghyz*, and soon ratcheted up the violence. After Heinrich Himmler had won overall control over production in July 1943, he ordered the rounding up of women and children in partisan zones of eastern Europe to grow the crop, and the mobilisation of school children. In 1944, prisoners, juvenile delinquents, orphans, the deaf and dumb and Russian refugees from Stalinism were all pressed into service in the Baltic states. How many people died pursuing Himmler's rubber phantasms is not known.<sup>43</sup> No more than a few hundred tons of rubber was ever delivered to the Reich.<sup>44</sup>

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<sup>38</sup> Morris (1982), p.73.

<sup>39</sup> Jeffreys (2008), chs. 11-15; Morris (1982) pp.74-6, 339-45.

<sup>40</sup> Krotkov (1945).

<sup>41</sup> Armando X. da Fonseca, 'A produção de borracha no nosso império e o consumo nacional', *Boletim Geral das Colónias*, 23:268 (1947), p.52.

<sup>42</sup> Heim (2008), pp.103 (n. 24), 112 (n. 67), 118-19, 124-5.

<sup>43</sup> Heim (2008), pp.108, 120-2, 125 (n. 121).

<sup>44</sup> Morris (1982) p.361.

Paradoxically, the Russian dandelion saved the lives of some Jews in Auschwitz, mainly women. From early 1942, the Nazis moved most of their research facilities on *kok-saghyz* to the neighbourhood of the concentration camps. Claudette Bloch, a French biologist incarcerated in one camp, was selected to run the laboratory. She recruited a number of other Jewish inmates, who were allowed to reside on the premises, and who were treated somewhat better than in the main camps. The German managers were not acting to save Jews, however, but to advance their scientific careers and avoid being sent to fight on the eastern front.<sup>45</sup>

The United States launched their own massive temperate rubber programme in March 1942, shortly after the attack on Pearl Harbor, but generally sought the collaboration of farmers and workers. *Guayule* (*Parthenium argentatum*) was the main crop, and the authorities attempted to persuade southern Californian farmers to sign contracts to supply public processing plants. There were accusations of unfair pressure to sign long-term contracts, but farmers were generally able to hold their ground in the ‘*guayule* wars’ that broke out in late 1942. Most labour came in the form of immigrant Mexican *braceros*, and local farmers complained that the authorities provided luxurious camps and scandalously high wages for these people.<sup>46</sup>

The American record was more dubious in other, marginal, cases. In Hawai’i, the authorities resorted to some convict labour to tap hevea trees left over from earlier agricultural experiments, but produced less than ten tons. Japanese-Americans, interned in south-eastern California in harsh conditions, grew *guayule* for a pittance. However, this was far from being forced labour, as allowing inmates to cultivate *guayule* was actually a concession to people bored out of their minds. The Americans employed German prisoners of war in California, ironically to uproot and burn *guayule* after the war had ended.<sup>47</sup>

### **Labour relations on tropical estates**

Western planters in the tropics had long been accused of harsh labour practices, although there were marked regional variations and reforms had been introduced in the interwar years. Nevertheless, there existed little solidarity between planters and their ‘coolies’, and both sides reacted opportunistically to the opportunities and dangers of war.

Labour tensions grew in Southeast Asia from the late 1930s to 1941, as planters drove up rubber production sharply to meet demand from advanced economies constituting stocks. Militancy on Indochina’s rubber estates flared up in 1936-37, following the election of the Front Populaire government.<sup>48</sup> In May 1941, Indian workers were at the centre of serious strikes affecting nearly all the Selangor plantations in Malaya. Wages had been kept static, despite a sharp rise in the cost of living, and some plantations did not even abide by the legal minimum wage. After nearly three weeks, the British declared a state of emergency, and sent in troops to break the strike.<sup>49</sup>

Asian estate workers generally accepted the Japanese conquerors of Southeast Asia, and many probably welcomed the internment of Western managers. The Japanese kept top

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<sup>45</sup> Heim (2008), pp.130-52.

<sup>46</sup> Finlay (2009), pp.158-9, 202-5.

<sup>47</sup> Finlay (2009), pp.8, 148, 152-7, 199-202, 219.

<sup>48</sup> Pierre Brocheux & Daniel Hémy, *Indochine, la colonisation ambiguë, 1858-1954*, Paris: Editions la Découverte, 1995, pp.202, 319-20.

<sup>49</sup> Tate (1996), pp.485-91.



jobs for themselves, but they promoted Asians, notably clerks and foremen, to positions that they had never before occupied. Indians, and some Chinese, became managers of individual estates in Malaya.<sup>50</sup> Javanese and Bataks were similarly promoted in Sumatra.<sup>51</sup>

Over time, however, the main problem of plantation workers came to be “how to keep alive”.<sup>52</sup> The Japanese did not cut down much rubber, but attempts to pay wages soon ran into difficulties, for external markets for rubber were now extremely limited.<sup>53</sup> Chinese were likely to be arrested as opponents of Dai Nippon, Indians were pressed to join Subhas Chandra Bose’s Indian National Army, and any ‘coolie’ was liable to be sent to perform forced labour on public works, notably the ‘death railway’ between Thailand and Burma. Many thus absconded.<sup>54</sup> On East Sumatran estates, flight, mortality and recruitment for forced labour caused the working population to fall by 15 percent.<sup>55</sup>

The experience of French Indochina differed in some respects. From June 1940, the Vichy authorities clamped down hard on all forms of dissent, but they kept the Japanese at bay.<sup>56</sup> Indeed, it was almost business as usual for French planters, assisted by the government’s creation of enormous rubber stocks.<sup>57</sup> Nevertheless, the Japanese *coup de force* of March 1945 led to severe disruptions, and many labourers then deserted the plantations.<sup>58</sup> About half the Vietnamese workers on Cambodian rubber estates went home. The Vietminh targeted those who remained, and planned a wave of strikes to greet the returning French.<sup>59</sup>

Sri Lanka became vital to the Allied war effort from early 1942, but estates complained of serious labour shortages. An estimated 20,000 workers were required to implement a slaughter-tapping programme in 1943. However, existing workers were employed to meet the rapidly expanding military needs of Allied HQ, and to produce food. South India was the traditional source of ‘coolies’ for the island, but emigration to Sri Lanka had been prohibited in 1939, because Indian public opinion had become inflamed by reports of poor conditions and discriminatory legislation. The colonial authorities experienced difficulties in overturning this ban.<sup>60</sup> Labour shortages were thus partly blamed for the stagnation of the island’s rubber exports, after an initial surge.<sup>61</sup>

Plantation workers in Allied Africa initially faced unemployment, as scarce shipping was allocated in priority to Southeast Asia, and enemy alien planters were interned in places such as British Cameroun; but then, as demand soared, they faced violent recruitment

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<sup>50</sup> C. Northcote Parkinson, *The Guthrie flagship: United Sua Betong*, Kuala Lumpur: Malaysian Branch of the Royal Asiatic Society, 1996, p.114; J. S. D. Rawlins, ‘French enterprise in Malaya’, *Journal of the Malaysian Branch of the Royal Asiatic Society*, 39:2 (1966), p.67.

<sup>51</sup> K. J. Pelzer, *Planter and peasant: colonial policy and the agrarian struggle in East Sumatra, 1863-1947*, Leiden: Royal Institute of Linguistics and Anthropology, 1978, p.127; Jong (2002), pp.79-80, 110.

<sup>52</sup> Parkinson (1996), p.114.

<sup>53</sup> Ann L. Stoler, *Capitalism and confrontation in Sumatra’s plantation belt, 1870-1979*, New Haven: Yale University Press, 1985, p.96.

<sup>54</sup> Badriyah Haji Salleh, ‘Malay rubber smallholding and British policy: a case study of the Batang Padang district in Perak, 1876-1952’, PhD Thesis, Columbia University, 1985, p.230; Tate (1996), pp.497-8, 509 (n. 15).

<sup>55</sup> Pelzer (1978), pp.126-7.

<sup>56</sup> Eric T. Jennings, *Vichy in the tropics: Pétain’s national revolution in Madagascar, Guadeloupe, and Indochina, 1940-1944*, Stanford: Stanford University Press, 2001, pp.163-4.

<sup>57</sup> Murakami (1981), pp.401, 409, 460-1.

<sup>58</sup> Raoul Chollet, *Planteurs en Indochine française*, Paris: La Pensée Universelle, 1981, pp.162-85.

<sup>59</sup> Margaret Slocomb, *Colons and coolies: the development of Cambodia’s rubber plantations*, Bangkok: White Lotus, 2007, pp.59, 154.

<sup>60</sup> *India-Rubber Journal*, 30 January and 20 February 1943.

<sup>61</sup> J. Hurstfield, *The control of raw materials*, London: HMSO, 1953, p.168.

practices from early 1942. The Gaullists mobilised thousands of forced workers for the rubber plantations of French Cameroun, in line with pre-existing French legislation.<sup>62</sup> On Liberia's Firestone plantations, chiefs were paid a fixed sum per worker supplied, and the country's independent government ruthlessly suppressed strikes.<sup>63</sup> In the hectic conditions of war, employment on Firestone's estates grew from 12,500 in 1940 to 29,500 in 1947.<sup>64</sup> In Tanganyika (Tanzania), the British authorities decided in March 1942 to bring nearly 6,000 hectares of derelict German plantations of *Manihot glaziovii* in Usambara back into production. Conscription for periods of twelve months was introduced in Central Province, mainly targeting the Gogo. Many died, especially in the early months, when conditions were particularly poor. Although workers' compounds were guarded, others managed to desert. Nevertheless, some Gogo men bought cattle with their wages and voluntarily recontracted themselves for another stint.<sup>65</sup>

Workers in Brazil succumbed to unemployment for ecological reasons. In 1940, there were some 10 million trees planted on 14,000 hectares of Henry Ford's gigantic concessions along the Tapajoz river.<sup>66</sup> However, South American Leaf Blight (*Microcyclus ulei*) devastated even allegedly resistant clones, and millions of trees died in 1944-45. Having lost an estimated US\$20 million, Ford sold the estates to the Brazilian government for a mere US\$0.25 million in November 1945.<sup>67</sup> The authorities used the money to fund redundancy payments to workers.<sup>68</sup>

### **Smallholders versus planters in the tropics**

The 1934 International Rubber Regulation Agreement (IRRA) unfairly penalised South and Southeast Asian smallholders, through limitations on new planting, stiff export taxes and the unequal application of export quotas. Small producers still managed to account for about half the rubber output of Indonesia and Malaya, the largest global producers, but their share would have been greater if a level playing field had existed.<sup>69</sup> Conditions of war led to the loosening of some constraints, but discrimination remained in place.<sup>70</sup>

As IRRA quotas were progressively increased, estate owners fought a tenacious rearguard action against their smallholder rivals, with the backing of the local and metropolitan state. Peter Bauer estimates that more rubber could have been extracted from Malaya and Indonesia before the Japanese overran the region had the complex and discriminatory restrictions on smallholders been entirely abolished. In effect, planters undermined the war effort through a selfish defence of their own narrow interests.<sup>71</sup>

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<sup>62</sup> André-Hubert Onana-Mfege, *Les Camerounais et le Général de Gaulle*, Paris: L'Harmattan, 2006, p.59.

<sup>63</sup> F. P. M. van der Kraaij, *The open door policy of Liberia: an economic history of modern Liberia*, Vol. 1, Bremen: Übersee-Museum, 1983, pp.51, 441-6.

<sup>64</sup> Lief (1951), p.109.

<sup>65</sup> Nicholas Westcott, 'The impact of the Second World War on Tanganyika, 1939-51', PhD thesis, Cambridge University, 1982, pp.84-6.

<sup>66</sup> Wolfgang Jünger, *Kampf um Kautschuk*, Leipzig: Wilhelm Goldmann, 1941, pp.170, 179.

<sup>67</sup> Dean (1987), pp.97-107.

<sup>68</sup> Jean-Baptiste Serier, *Histoire du caoutchouc*, Paris: Desjonquères, 1993, p.191.

<sup>69</sup> Colin Barlow & John Drabble, 'Government and the emerging rubber industries in Indonesia and Malaya, 1900-1940', in Anne Booth et al. (eds), *Indonesian economic history in the Dutch colonial era*, pp.187-209, New Haven: Yale University Press, 1990, pp.203-6; Bambang Purwanto, 'From *dusun* to market: native rubber cultivation in southern Sumatra, 1890-1940', PhD Thesis, University of London, 1992, pp.184, 217.

<sup>70</sup> Andrew McFadyean, *The history of rubber regulation, 1934-1943*, London: George Allen & Unwin, 1944.

<sup>71</sup> Bauer (1948), pp.153-71.

Thailand's small rubber farmers, who accounted for nearly all the harvest in that independent country, initially benefited from Japan's need for rubber, but lost out when Malaya and Indonesia were seized.<sup>72</sup>

As for the Japanese occupiers, they could never decide whether to favour estates, which were handed over to Japanese businesses, or to back smallholders, who might support the cause of the Greater East Asia Co-Prosperty Sphere.<sup>73</sup> In any event, smallholders proved flexible in their responses to the crisis, temporarily abandoning their rubber plots to squat elsewhere and produce food crops.<sup>74</sup>

African smallholders were only occasionally included in Allied plans to boost output, although the British did distribute seed to smallholders in mid-western Nigeria.<sup>75</sup> Hevea was already a well-established cash crop in this area, and farmers brought non-harvested trees into production as prices rose from 1942.<sup>76</sup> Administrative compulsion to grow hevea, as practiced in the Belgian Congo from 1933, proved much less successful.<sup>77</sup> African smallholders had at times been wrongly regarded as collectors of wild rubber. In Oubangui-Chari (Central African Republic), much rubber actually came from *Manihot glaziovii* trees (Ceará rubber), planted in the early 1920s and rescued from neglect as prices rose.<sup>78</sup> Portuguese Guinea's rubber exports were attributed to the exploitation of wild *Landolphia* vines, but some probably came from *Manihot* trees, used as hedges by Cape Verdean immigrants.<sup>79</sup>

### **The collection of wild rubber**

The revival of the collection of wild rubber in times of war was widely condemned as a retrograde move, which stained the reputation of the Western powers. However, accusations of a return to the scandals associated with King Leopold's red rubber seem to be wide of the mark. Thinly spread collectors in forest and bush were hard to control, and overly harsh intervention might provoke rebellions, at a time when repressive capabilities were tied up in fighting the war. It was difficult, if not impossible, to motivate such people in terms of patriotic or other ideological discourses, so that prices, of both raw rubber and trade goods, emerged as the key determinants.

In the tropical New World there was a chronic shortage of tappers, and independent governments were not prepared to apply force to remedy this situation. The Brazilian authorities merely decreed in 1943 that a man could serve a two-year stint as a *seringueiro* (rubber collector) in lieu of military service. Despite drought in Brazil's Nordeste, the traditional recruitment ground for collectors, the high cost of scarce consumer goods acted as

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<sup>72</sup> James C. Ingram, *Economic change in Thailand since 1850*, Stanford: Stanford University Press, 1955, pp.94-7, 102-3, 110; Reynolds (1994), pp.61-3.

<sup>73</sup> Yoshimura (2008), pp.122-6; Jong (2002), p.253; Pelzer (1978), pp.122-3, 127.

<sup>74</sup> Haji Salleh (1985), p.230.

<sup>75</sup> J. A. S. Edington, *Rubber in West Africa*, London: Rex Collings, 1991, p.5.

<sup>76</sup> Gerald K. Helleiner, *Peasant agriculture, government, and economic growth in Nigeria*, Homewood: Richard D. Irwin, 1966, pp.120-2

<sup>77</sup> Samuel H. Nelson, *Colonialism in the Congo basin, 1880-1940*, Athens: Ohio University, 1994, pp.153, 168-9.

<sup>78</sup> Catherine Coquery-Vidrovitch, *Le Congo au temps des grandes compagnies concessionnaires, 1898-1930*, Paris: Mouton, 1972, pp.430-1, 435-6; Brian Weinstein, *Éboué*, London: Oxford University Press, 1972, p.268.

<sup>79</sup> Ricardo Vaz Monteiro, 'Relatório do governador', Bissau (typescript), 1944, pp.172-4, 180-1; Fonseca (1947), p.56.

a disincentive, together with the risks and hardships of life in the jungle far from home.<sup>80</sup> Although about 100,000 *seringueiros* were eventually recruited in Brazil, the North Americans estimated that 500,000 were required.<sup>81</sup>

Irritated by slow progress, the American Rubber Development Corporation, an official body, attempted to short-circuit the merchants who controlled credit, supplies and purchasing in the Amazon. However, traders ran rings round the inexperienced North Americans. Under the effective leadership of Chamié, a prominent Syrian merchant, they threatened to bring collection to a shuddering halt. The North Americans thus backed away, agreeing to disburse three times what they paid for rubber from Liberia and Sri Lanka.<sup>82</sup>

Collecting wild rubber in Africa led to more forceful methods, notably in the case of Vichy and Gaullist France.<sup>83</sup> Indeed, the French stood accused of endangering the food supplies and health of their African wards. In 1944, the Free French destroyed a village in Guinea-Conakry, because “people fled rather than supply rubber”.<sup>84</sup> In French Equatorial Africa, Pierre Kalck denounced unspecified abuses in rubber collection “that discredited Free France in the eyes of the peasant masses”.<sup>85</sup>

In reality, though, it was prices that mainly impelled the collection of wild rubber in Africa during the war. Governments sought to set the remuneration for different qualities of rubber at levels that would stimulate indigenous people to seek out latex-bearing plants in forests and savannas, while still protecting cash-strapped treasuries.<sup>86</sup> Attempts to extract rubber from re-conquered Ethiopia became a case study in how wrong this could go, with the British ending up paying way over the odds for a paltry 25 tons of rubber.<sup>87</sup> Officials also attempted to make consumer goods available for purchase by rubber collectors, and to provide essential services, notably transport, as in the Belgian Congo.<sup>88</sup>

Indeed, Tamara Giles-Vernick has recorded oral testimonies from south-western Oubangui-Chari, which lament the passing of rubber gathering after 1945. Despite the abuses that accompanied it, collecting rubber entailed ready access to consumer goods, in an area where there were no obvious alternatives. As one informant put it, rather sadly: “Africa had to close the road of rubber... America didn’t need rubber anymore”.<sup>89</sup>

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<sup>80</sup> Serier (1993), pp.184-6.

<sup>81</sup> Allen (1949), pp.430-4; Babcock (1966), p.392.

<sup>82</sup> Dean (1987), pp.93-5, 104.

<sup>83</sup> R. W. Johnson, ‘French imperialism in Guinea’, in Roger Owen and Bob Sutcliffe (eds), *Studies in the theory of imperialism*, London: Longman, 1972, pp.234, 240-1.

<sup>84</sup> Jean Suret-Canale, *French colonialism in tropical Africa, 1900-1945*, London: C. Hurst, 1971, pp.479-80.

<sup>85</sup> Pierre Kalck, *Réalités oubanguiennes*, Paris: Berger-Levrault, 1959, p.159.

<sup>86</sup> *India-Rubber Journal*, 4 July 1942, citing Harold Macmillan in parliament.

<sup>87</sup> Hurstfield (1953), pp.168, 370.

<sup>88</sup> A. Becquet, ‘Le caoutchouc’, in *Congo belge 1944*, [Léopoldville]: Imprimerie du Gouvernement-Général, c. 1945, p.72; H. A. A. Cornelis, ‘Belgisch Congo en Ruanda-Urundi tijdens de Tweede Wereldoorlog: de economische en financiële situatie’, in *Le Congo Belge durant la deuxième guerre mondiale*, Brussels: Académie Royale des Sciences d’Outre-Mer, 1983, pp.60-1, 70.

<sup>89</sup> Tamara Giles-Vernick, *Cutting the vines of the past: environmental histories of the Central African rain forest*, Charlottesville: University Press of Virginia, 2002, p.166.

## **Conclusion and epilogue**

The war shattered some of the old links in the rubber commodity chain, and forged new ones, throwing up both winners and losers. Neither the collection of rubber from the wild nor the cultivation of temperate rubber plants survived the exceptional circumstances of war. The Japanese invaders broke the arrogant confidence and unquestioned political supremacy of Western hevea planters in Southeast Asia, even if the decline of plantations was to prove a slow process. African and Asian smallholders faced new challenges, in the form of predatory independent states at home and a thriving synthetic rubber industry in advanced economies abroad. The geographical dispersal of Western producers of tyres and footwear accelerated. Non-Western producers of rubber goods initially faced an uphill struggle in competing with multinational corporations, although the recent American imposition of punitive duties on Chinese tyres shows how much things have changed in this field.

Everywhere the state assumed a much greater prominence during the war, whether as a direct participant or as a regulator of the activities of the commodity chain; and it is a moot point how much of that new power was relinquished after the conflict ended. Laissez-faire certainly suffered considerably from the Great Depression and the Second World War. While it was in the newly independent and expanded communist worlds that states proved most reluctant to step aside, officials everywhere continued to intervene in the workings of the rubber world for decades to come.

That said, it remains unclear to what extent the Second World War actually changed social relations in the rubber commodity chain, and how much it merely speeded up or delayed existing processes. What is clear is that when a raw material becomes crucial to the military survival of a state at war, the likelihood is that much archival and oral information will be generated for historians. Armed conflict can act as a major revelatory mechanism, and much remains to be discovered about how social relations in the rubber commodity chain responded to conditions of war.

## References

- Alexander, Peter, *Workers, war and the origins of apartheid: labour and politics in South Africa, 1939-1948*, Oxford: James Currey, 2000.
- Allen, Hugh, *The house of Goodyear: fifty years of men and industry*, Cleveland: [Goodyear], 1949.
- Babcock, Glenn D., *History of the U.S. Rubber Company: a case study in corporation management*, Muncie: Indiana University, 1966.
- Ball, J. M., *Reclaimed rubber: the story of an American raw material*, New York: Rubber Reclaimers Inc., 1947.
- Barber, John, and Harrison, Mark (1991) *The Soviet home front, 1941-1945: a social and economic history of the USSR in World War II*, London: Longman.
- Barlow, Colin, and Drabble, John, 'Government and the emerging rubber industries in Indonesia and Malaya, 1900-1940,' in Anne Booth et al., eds., *Indonesian economic history in the Dutch colonial era*, New Haven: Yale University Press, 1990, pp.187-209.
- Bauer, Peter T., *The rubber industry, a study in competition and monopoly*, London: Longmans Green & Co, 1948.
- Baulkwill, W. J., 'The history of natural rubber production,' in C. C. Webster and W. J. Baulkwill (eds), *Rubber*, Harlow: Longman, 1989, pp.1-56.
- Becquet, A., 'Le caoutchouc,' in *Congo belge 1944*, [Léopoldville]: Imprimerie du Gouvernement-Général, c. 1945, pp.72-3.
- Brocheux, Pierre, and Hémy, Daniel, *Indochine, la colonisation ambiguë, 1858-1954*, Paris: Editions la Découverte, 1995.
- Ceylon, *Report of the commission on the rubber industry in Ceylon, October 1947*, Colombo: Government Press, 1947.
- Chollet, Raoul, *Planteurs en Indochine française*, Paris: La Pensée Universelle, 1981.
- Clarence-Smith, William G., 'The Rivaud-Hallet plantation group in the economic crises of the inter-war years,' in Pierre Lanthier and Hubert Watelet (eds), *Private enterprises during economic crises: tactics and strategies*, Ottawa: Legas, 1997, pp.117-32.
- Clarence-Smith, William G., 'Synthetic and temperate rubber in the interwar years and during World War II,' *Journal of Global History*, 5:1 (forthcoming 2010; review article).
- Cohen, Jerome B. *Japan's economy in war and reconstruction*, Minneapolis: University of Minnesota Press, 1949.
- Coquery-Vidrovitch, Catherine, *Le Congo au temps des grandes compagnies concessionnaires, 1898-1930*, Paris: Mouton, 1972.
- Cornelis, H. A. A., 'Belgisch Congo en Ruanda-Urundi tijdens de Tweede Wereldoorlog: de economische en financiële situatie,' in *Le Congo Belge durant la deuxième guerre mondiale*, Brussels: Académie Royale des Sciences d'Outre-Mer, 1983 pp.51-81.
- Dean, Warren, *Brazil and the struggle for rubber, a study in environmental history*, Cambridge: Cambridge University Press, 1987.
- Edington, J. A. S., *Rubber in West Africa*, London: Rex Collings, 1991.

- Finlay, Mark, *Growing American rubber: strategic plants and the politics of national security*, New Brunswick: Rutgers University Press, 2009.
- Fonseca, Armando X. da, 'A produção de borracha no nosso império e o consumo nacional,' *Boletim Geral das Colónias*, 23:268 (1947), pp.1-5.
- Giles-Vernick, Tamara, *Cutting the vines of the past: environmental histories of the Central African rain forest*, Charlottesville: University Press of Virginia, 2002.
- Haji Salleh, Badriyah, 'Malay rubber smallholding and British policy: a case study of the Batang Padang district in Perak, 1876-1952,' PhD Thesis, Columbia University, 1985.
- Heim, Susanne, *Plant breeding and agrarian research in Kaiser-Wilhelm-Institutes, 1933-1945: calories, caoutchouc, careers*, New York: Springer, 2008.
- Helleiner, Gerald K., *Peasant agriculture, government, and economic growth in Nigeria*, Homewood: Richard D. Irwin, 1966.
- Hurstfield, J., *The control of raw materials*, London: HMSO, 1953.
- Ingram, James C., *Economic change in Thailand since 1850*, Stanford: Stanford University Press, 1955.
- Jeffreys, Diarmuid, *Hell's cartel: IG Farben and the making of Hitler's war machine*, London: Bloomsbury, 2008.
- Jemain, Alain, *Michelin: un siècle de secrets*, Paris: Calmann-Lévy, 1982.
- Jennings, Eric T., *Vichy in the tropics: Pétain's national revolution in Madagascar, Guadeloupe, and Indochina, 1940-1944*, Stanford: Stanford University Press, 2001.
- Johnson, R. W., 'French imperialism in Guinea,' in Roger Owen and Bob Sutcliffe, eds., *Studies in the theory of imperialism*, London: Longman, 1972, pp.230-47.
- Jong, L. de, *The collapse of a colonial society: the Dutch in Indonesia during the Second World War*, Leiden: KITLV, 2002.
- Jünger, Wolfgang, *Kampf um Kautschuk*, Leipzig: Wilhelm Goldmann, 1941.
- Kalck, Pierre, *Réalités ousbanguiennes*, Paris: Berger-Levrault, 1959.
- Kratoska, Paul H., *The Japanese occupation of Malaya, 1941-45: a social and economic history*, London: Hurst, 1998.
- Krotkov, G., 'A review of the literature on *Taraxacum kok-saghyz* Rod.', *Botanical Review*, 11:8 (1945), pp.417-61.
- Lacroix-Riz, Annie, *Industriels et banquiers français sous l'occupation: la collaboration économique avec le Reich et Vichy*, Paris: A. Colin, 1999.
- Le, Man Hung, *The impact of World War II on the economy of Vietnam, 1939-45*, Singapore: Eastern Universities Press, 2004.
- Lief, Alfred, *The Firestone story: a history of the Firestone Tire and Rubber Company*, New York: McGraw-Hill, 1951.
- Lottman, Herbert R., *The Michelin men: driving an empire*, London: I.B. Tauris, 2003.
- Marshall, Jonathan, *To have and have not: Southeast Asian raw materials and the origins of the Pacific War*, Berkeley: University of California Press, 1995.
- Mazower Mark, *Hitler's empire: how the Nazis ruled Europe*, New York: The Penguin Press, 2008.

- McFadyean, Andrew, *The history of rubber regulation, 1934-1943*, London: George Allen and Unwin, 1944.
- McMillan, James, *The Dunlop story: the life, death and rebirth of a multi-national*, London: Weidenfeld and Nicolson, 1989.
- Medlicott, William N., *The economic blockade*, London: HMSO, 2 vols., 1952 and 1959.
- Meyer, Bruce M. *The once and future union: the rise and fall of the United Rubber Workers, 1935-1995*, Akron: University of Akron Press, 2002.
- Morris, Peter J. T., 'The development of acetylene chemistry and synthetic rubber by I. G. Farbenindustrie Aktiengesellschaft, 1926-1945,' DPhil thesis, Oxford, 1982.
- Morris, Peter J. T., *The American synthetic rubber research program*, Philadelphia: University of Pennsylvania Press, 1989.
- Müller, Rolf-Dieter, 'Albert Speer and armaments policy in total war,' in *Militärgeschichtliches Forschungsamt, ed., Germany and the Second World War, vol. V, part 2*, Oxford: Clarendon Press, 2003, pp.293-831.
- Murakami, Sachiko, 'Japan's thrust into French Indochina, 1940-1945,' PhD Thesis, New York University, 1981.
- Nawiyanto, S., *The rising sun in a Javanese rice granary: change and the impact of the Japanese occupation on the agricultural economy of Besuki residency, 1942-1945*, Yogyakarta: Galang Press, 2005.
- Nebbia, Giorgio, 'Gomma guayule in Puglia,' *La Gazzetta del Mezzogiorno*, 5 February 2008 (review of Alberino Cianci, *SAIGA: il progetto autarchico della gomma naturale; dalla coltivazione del guayule alla nascita del polo chimico di Terni*, Terni: Edizioni Thyrus, 2007).
- Nelson, Samuel H., *Colonialism in the Congo basin, 1880-1940*, Athens (OH): Ohio University, 1994.
- Nove, Alec, *An economic history of the U.S.S.R.*, Harmondsworth: Penguin Books, 1976 (2<sup>nd</sup> ed.).
- Onana-Mfège, André-Hubert, *Les Camerounais et le Général de Gaulle*, Paris: L'Harmattan, 2006.
- O'Reilly, Declan 'A fateful friendship: Standard Oil of New Jersey, IG Farben, and the politics of synthetic rubber, 1925-42', unpublished paper, n.d. (based on MA thesis, London School of Economics and Political Science, 1990).
- O'Reilly, Maurice, and Keating, James T., *The Goodyear story*, Elmsford: Goodyear Tire and Rubber Company, 1983.
- Parkinson, C. Northcote, *The Guthrie flagship: United Sua Betong*, Kuala Lumpur: Malaysian Branch of the Royal Asiatic Society, 1996 (abridged by J. M. Gullick).
- Pelzer, K. J., *Planter and peasant: colonial policy and the agrarian struggle in East Sumatra, 1863-1947*, Leiden: Royal Institute of Linguistics and Anthropology, 1978.
- Petri, Rolf, 'Opting for methane: Italian synthetic rubber, western European developments, and American technology,' in Dominique Barjot, ed., *Catching up with America: productivity missions and the diffusion of American economic and technological influence after the Second World War*, Paris: Presses de l'Université Paris-Sorbonne, 2002, pp.315-35.



- Petri, Rolf, 'Zwischen Konkurrenz und Kooperation: die deutsche Chemieindustrie und das technische Aufholen Italiens,' in Rolf Petri, ed., *Technologietransfer aus der deutschen Chemieindustrie, 1925-1960*, Berlin: Duncker and Humblot, 2004, pp.253-90.
- Polhamus, Loren G., *Rubber: botany, cultivation and utilization*, London: Leonard Hill, 1962.
- Purwanto, Bambang, 'From dusun to market: native rubber cultivation in southern Sumatra, 1890-1940,' PhD Thesis, University of London, 1992.
- Rawlins, J. S. D., 'French enterprise in Malaya,' *Journal of the Malaysian Branch of the Royal Asiatic Society*, 39:2 (1966), pp.50-94.
- Reynolds, E. Bruce, *Thailand and Japan's southern advance, 1940-1945*, Basingstoke: Macmillan, 1994.
- Roberts, Harold S., *The rubber workers: labor organization and collective bargaining in the rubber industry*, New York: Harper & Bros., 1944.
- Sagers, Matthew J., and Shabad, Theodore, *The chemical industry in the USSR: an economic geography*, Boulder (CO): Westview Press, 1990.
- Sato, Shigeru, *War, nationalism, and peasants: Java under the Japanese occupation, 1942-1945*, St Leonards: Allen and Unwin, 1994.
- Serier, Jean-Baptiste, *Histoire du caoutchouc*, Paris: Desjonquères, 1993.
- Siegelbaum, Lewis H., *Cars for comrades: the life of the Soviet automobile*, Ithaca: Cornell University Press, 2008.
- Slocumb, Margaret, *Colons and coolies: the development of Cambodia's rubber plantations*, Bangkok: White Lotus, 2007.
- Stoler, Ann L. *Capitalism and confrontation in Sumatra's plantation belt, 1870-1979*, New Haven: Yale University Press, 1985.
- Storrs, Ronald, *Dunlop in war and peace*, London: Hutchinson & Co., 1946.
- Suret-Canale, Jean, *French colonialism in tropical Africa, 1900-1945*, London: C. Hurst, 1971.
- Tate, D. J. M., *The RGA history of the plantation industry in the Malay peninsula*, Kuala Lumpur: Oxford University Press, 1996.
- Tooze, Adam, *The wages of destruction: the making and breaking of the Nazi economy*, New York: Viking, 2007.
- Van der Kraaij, F. P. M., *The open door policy of Liberia: an economic history of modern Liberia*, Bremen: Übersee-Museum, 1983.
- Vaz Monteiro, Ricardo, 'Relatório do governador,' Bissau (typescript), 1944.
- Weinstein, Brian, *Éboué*, London: Oxford University Press, 1972.
- Westcott, Nicholas, 'The impact of the Second World War on Tanganyika, 1939-51,' PhD thesis, Cambridge University, 1982.
- Yoshimura, Mako, 'Japan's economic policy for occupied Malaya,' in Akashi, Yoji, and Yoshimura, Mako, eds., *New perspectives on the Japanese occupation in Malaya and Singapore, 1941-1945*, Singapore: National University of Singapore Press, 2008, pp.113-38.

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In the Commodities of Empire project we explore the networks through which such commodities circulated within, and in the spaces between, empires. We are particularly attentive to local processes – originating in Africa, Asia, the Caribbean and Latin America – which significantly influenced the outcome of the encounter between the world economy and regional societies, doing so through a comparative approach that explores the experiences of peoples subjected to different imperial hegemonies.

The following key research questions inform the work of project:

- 1) The networks through which commodities were produced and circulated within, between and beyond empires;
- 2) The interlinking 'systems' (political-military, agricultural labour, commercial, maritime, industrial production, social communication, technological knowledge) that were themselves evolving during the colonial period, and through which these commodity networks functioned;
- 3) The impact of agents in the periphery on the establishment and development of commodity networks: as instigators and promoters; through their social, cultural and technological resistance; or through the production of anti-commodities;
- 4) The impact of commodity circulation both on the periphery, and on the economic, social and cultural life of the metropolises;
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