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Getting the most without transforming the environment: The bumpy road to the oil mills in the French colony of Dahomey

Introduction

In late 1927, in a laboratory of the *Institut national d'agronomie coloniale* (INAC) in Nogent-sur-Marne, two well-established professors staged a curious experiment. Paul Ammann, a professor of technology, sat before a pile of palm nuts and began rhythmically striking each one with a stone. Max Ringelmann, a professor of agricultural engineering, kept time. For an hour, Ammann mimicked the West African artisanal method of crushing palm nuts, where women traditionally used stones to break the nuts one by one to extract the kernels. By the end of the hour, Ammann had processed just two kilograms of shell. Ringelmann calculated this to be nearly five times less efficient than INAC's smallest mechanical nutcracker. From this experiment, Ringelmann concluded that "mechanical sorting is ideal."[1]

Although the first attempts to introduce cracking machines in West Africa date back to the mid-nineteenth century, this episode shows that as late as the 1920s, experts were still conducting experiments to prove the alleged ineffectiveness of indigenous methods. The fact that it was a professor of technology hitting the stones is particularly indicative of the relationship between development and technology. Technology has been recently defined as "any artifact or system and the knowledge and skill employed to use it."[2] In turn, development is not just about introducing technology but introducing a technology believed to be superior.

Palm products played an important role in the industrial revolution, being used for making soap and candles, as well as for lubricating machinery. From the turn of the century onwards, palm oil also entered the food industry, which remains its primary use to this day. At that time, the main region of production was West Africa. From the twentieth century onwards, colonial powers increas-

1 Max Ringelmann, preface to *Les Concasseurs à Noix de Palme,* by Gilbert Passelègue (Paris: Librairie Émile Larose, 1927), ix.

2 Mikael Hård, *Microhistories of Technology: Making the World* (Cham: Springer, 2023), 6.

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ingly introduced various technologies to develop palm oil and kernel production. Their efforts centred on two main areas: improving the palm tree through breeding high-yielding varieties and improving the processing of palm fruit through mechanization.[3] This chapter focuses on the latter. Mechanization of processing progressed along two paths: one was the introduction of small hand-operated or motorized machines for farmers; the other, more transformative shift, was the establishment of motorized oil mills.

Jonathan Robins has investigated the progress and misfortunes of small palm fruit processing machines in British Africa. He has argued that African farmers did not reject these machines out of cultural backwardness, but because artisanal methods made better economic sense. In doing so, Robins challenges Eurocentric narratives of technology transfer that have attributed the slow mechanization of African agriculture to cultural conservatism.[4] In this chapter, I take a slightly different angle by focusing on the larger oil mills. Rather than understanding why small machines had limited success with African farmers, I explore why the French hesitated to build oil mills for so long, despite considering them the pinnacle of oil palm development. I argue that the colonial administration recognized that the oil mills required a different environment: homogeneous plantations that enabled efficient harvesting. As such a transformation of the environment was costly and politically risky, the French sought to avoid building mills.

This case study illustrates how the adoption of technology often required environmental change. I use environment in a broad sense to refer not only to the physical characteristics of the landscape, but also to the relationships that the people who inhabit it establish with each other and the landscape as a result of its physical characteristics. From James C. Scott's characterization of high modernism as "a nearly limitless ambition to transform nature to suit man's purposes" to the study of the most spectacular development schemes, historiography has often portrayed development as a hegemonic force that profoundly dominates and shapes the environment.[5] In response, some studies have emphasized the unpredictable agency of the environment in thwarting modernization schemes.[6] In this chapter, I

3 For selected plant and tree varieties as technologies, see Suzanne Moon, *Technology and Ethical Idealism: A History of Development in the Netherlands East Indies* (Leiden: CNWS Publications, 2007), 49.

4 Jonathan E. Robins, "Smallholders and Machines in the West African Palm Oil Industry, 1850–1950," *African Economic History* 46, no.1 (2018): 69–103.

5 James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven and London: Yale University Press, 1998), 94.

6 See for example Heather J. Hoag, *Developing the Rivers of East and West Africa: An Environmental History* (London: Bloomsbury, 2013); Martin Kalb, "Water, Sand, Molluscs: Imperial In-

argue that French colonial developmentalists recognized the risks posed by the environmental upheavals required for mechanized palm oil production and sought to avoid them. Rather than embracing environmental change, they aimed to reap the benefits of new technologies without disrupting the status quo.

This chapter is organized into three sections. The first section examines early efforts at mechanization at the beginning of the twentieth century, highlighting the critical importance of controlling the land around oil mills to ensure a steady fruit supply. The second section deals with the interwar period, analyzing the political and economic arguments that either promoted or delayed the construction of oil mills in French West Africa. The third section, which spans the period from the Vichy regime to the end of French colonial rule, explores how France managed to maintain oil mills in Dahomey without fundamentally transforming the environment. Throughout these debates and industrialization attempts, a recurring theme emerges: a growing recognition that oil mills required a specifically adapted environment that could only be created at a political cost. Crucially, an adapted environment was a necessary but not sufficient guarantee for oil palm development.

The first oil mills and the problem of supply

The French conquest of Dahomey was driven by its rich palm groves. After Marseille merchants Victor and Louis Régis established a trading post in Ouidah (1841), Dahomey's palm products became increasingly important in Marseille's soap and candle industries.[7] The appeal of palm products grew in the 1860s when the Germans and Dutch started using previously discarded palm kernel oil by-products for animal feed, improving milk fat content and making firmer butter. While the port of Hamburg received no palm kernels in 1860, it had become the world's largest importer by 1885.[8] In the 1880s, faced with the British occupation of Lagos and the creation of German protectorates in what would become the colony of Togoland, Marseille merchants lobbied the French Foreign Ministry to defend their interests in Dahomey. By then, Dahomey was the leading

frastructures, the Age of Hydrology, and German Colonialism in Swakopmund, Southwest Africa, 1884–1915," *Environment and History* 26, no.2 (2020): 175–206.

7 Xavier Daumalin, *Marseille et l'Ouest africain : l'outre-mer des industriels (1841–1956)* (Marseille: Chambre de Commerce et d'Industrie Marseille-Provence, 1992), 23–30.

8 Daumalin, *Marseille et l'Ouest africain*, 112; Yves Péhaut, *Les oléagineux dans les pays d'Afrique occidentale associés au Marché commun : la production, le commerce et la transformation des produits* (Paris: H. Champion, 1976), 385–386.

West African supplier of raw materials to Marseille industries.[9] This led to the first skirmishes in 1889 and ultimately to the military conquest of the kingdom of Abomey, which was completed in 1894 and would prove to be the most difficult French military operation in West Africa.[10]

One of the goals of the newly established colony was to increase the production of palm products. In terms of weight and value, palm kernels were Dahomey's most important export throughout the colonial period.[11] Long before Ammann grappled with the stones, the French were already concerned that the Dahomeans largely discarded the kernels, considering palm kernel oil as inferior to palm oil and the nut-cracking process as too laborious to be worthwhile. In 1901, the first French agronomist to study the Dahomean oil palm, Jean Daniel, estimated that 4,600 tons of kernels were lost annually.[12] In the same year, general inspector of colonial agriculture Jean Dybowski claimed that replacing the Dahomean "barbaric methods" with "industrial" ones could double palm oil and kernel production and improve "the situation of the indigenous people."[13] In 1902, Dybowski became director of the newly founded *École nationale supérieure d'agriculture coloniale* (ENSAC), where he held the chair of colonial agriculture. Among his colleagues were Max Ringelmann and Paul Ammann.[14] Twenty-five years later, the two were still testing the "barbaric" technologies.

The first machines for cracking palm kernels emerged almost simultaneously with the expansion of the kernel trade. In the 1840s, African American settler Samuel Herring introduced mechanical crackers to Liberia, where the first oil-pressing machines were also being tested.[15] In French West Africa, private companies trading palm products introduced cracking machines by the late nineteenth cen-

9 Roland Caty and Eliane Richard, *Armateurs marseillais au XIX siècle* (Marseille: Chambre de Commerce et d'Industrie de Marseille, 1986), 284–285, 293–294.

10 Daumalin, *Marseille et l'Ouest africain*, 120–138; Anthony Clayton, *France, Soldiers and Africa* (London: Brassey's Defence Publishers, 1988), 78.

11 Patrick Manning, *Slavery, Colonialism and Economic Growth in Dahomey, 1640–1960* (Cambridge: Cambridge University Press, 1982), appendix 4.

12 Jean Daniel, "Le palmier à huile du Dahomey," *Revue coloniale* (1902): 201.

13 Jean Dybowski, Rapport au Ministre, 15 March 1901, 3, Archives Nationales de l'outremer, Aix-en-Provence (hereafter ANOM), DAHO III 8.

14 Serge Volper, *Une histoire des plantes coloniales: du cacao à la vanille* (Versailles: Quae, 2011), 39–42; René Tourte, *Histoire de la recherche agricole en Afrique tropicale francophone*, vol.4, *La période coloniale et les grands moments des jardins d'essais: 1885/1890–1914/1948* (Rome: Organisation des Nations Unies pour l'Alimentation et l'Agriculture [FAO], 2005), 93. The ENSAC changed its name to INAC in 1921.

15 Jonathan E. Robins, *Oil Palm: A Global History* (Chapel Hill: University of North Carolina Press, 2021), 60; Robins, "Smallholders and Machines," 73.

tury.[16] The testing and improvement of palm fruit processing machinery had become a trans-imperial undertaking by the early 1900s. The French were familiar with the German presses and crackers of Togo and Cameroon.[17] In 1909, Paul Ammann himself visited the British colony of the Gold Coast to test nut-cracking machines.[18]

After constructing crackers and presses, the next logistical step was to combine them to create steam-driven complexes that extracted both oil and kernels from palm fruit: these were the first oil mills. One of the earliest such initiatives came from Eugène Poisson, an agent of the *Association Cotonnière Coloniale* in Dahomey and the son of Jules Poisson, an eminent botanist specialized in palms. In 1904, in Cotonou, Poisson developed a kernel cracker based on a German model.[19] Three years later, with the help of two Marseille trading companies, Fournier and CFAO (*Compagnie Française de l'Afrique Occidentale*), he set up the first palm oil mill in Dahomey.[20] It consisted of five hydraulic presses, two grinders and two kernel crackers, and was powered by a steam engine fueled entirely by palm shells and fibers.[21] The main innovation of Poisson's process was that the processing was dry, which allowed for more and better quality oil to be obtained.[22]

However, Poisson's enterprise was ultimately undermined by his choice of location. The coastal area around Cotonou had one of the lowest densities of palm trees in southern Dahomey, making a consistent supply of fruit difficult to guarantee.[23] The decision to locate the factory there revealed a disregard for the critical role of the environment. French colonial officials initially understood the environment of southern Dahomey as a vast and self-sustaining plantation of oil palms, ripe for exploitation.[24] Within this idealized, Eden-like environment, colo-

16 Passelègue, *Les Concasseurs*, 8–9.

17 Jean Adam, *Le palmier à huile* (Paris: Augustin Challamel, 1910), 244–245.

18 Yves Henry and Paul Ammann, "Recherches sur le traitement mécanique des fruits de l'eloeis," *L'Agriculture pratique des pays chauds : bulletin mensuel du Jardin colonial et des jardins d'essai des colonies françaises*, no.112 (1910): 137.

19 Adam, *Le palmier à huile*, 248; Auguste Chevalier, *Documents sur le palmier à huile* (Gorée: Imprimerie du Gouvernement Général, 1910), 107; Passelègue, *Les Concasseurs*, 9.

20 Chevalier, *Documents*, 108.

21 Adam, *Le palmier*, 243–244; Chevalier, *Documents*, 111–112.

22 Antoine Bories, "Préparation Industrielle et Indigène de l'Huile de Palme," *Bulletin des Matières Grasses*, no.1 (1919): 43.

23 Service de l'agriculture du Dahomey, Rapport 1909, Archives Nationales du Bénin, Porto-Novo (hereafter ANB), 1R3/3.1; Chevalier, *Documents*, 113; Antony Houard, "Étude sur l'exploitation industrielle du palmier à huile," *Bulletin des Matières Grasses*, no.1 (1919): 184.

24 Giovanni Tonolo, "An Environmental History of Palm Oil Development in Dahomey in the Twentieth Century," *Comparativ* 32, no.6 (2022): 730.

nial agents were likely convinced that any technology could be applied. Poisson's failed factory served as an early warning of the importance of paying attention to environmental conditions.

To secure fruit supply, companies could seek land concessions, but this was difficult in Dahomey. Since the founding of the colony, Governor Victor Ballot rejected numerous requests, arguing that the densely populated Dahomean palm belt left little room for land alienation.[25] In 1897, the Marseille trading company Mante & Borelli requested a concession for building a railway, asking for 2,500 hectares of land for every kilometer of track.[26] The colonial administration rejected this proposal twice, but ultimately relented under pressure from the Ministry of Colonies. In June 1900, despite the hesitancy of the local government, Borelli was granted a 300,000-hectare concession. The decision caused significant unrest. The Dahomean landowners feared losing their lands, while European trading companies worried that Borelli would have a monopoly on palm products. In the end, the Government General of French West Africa, together with the colony of Dahomey, assumed full responsibility for the construction of the railroad. Borelli relinquished the concession, though not without receiving substantial compensation.[27] Most other land concessions in Dahomey quickly dissolved due to conflicts with the local population.[28] In 1902, in a joint venture with Borelli called the *Compagnie Coloniale du Dahomey*, Poisson was also granted a concession of 36,550 hectares scattered in eight parcels in the Dahomean palm belt. This venture too dissolved soon after.[29]

In an economic report from 1910, the colonial administration admitted that the fact that European concessions could not be established in Dahomey posed a major obstacle to industrializing the oil palm sector.[30] The contrast with neighboring colonies like the Ivory Coast was striking. There, the palm region was so much less densely populated that the colonial government enacted by decree the policy of the *cantonnement*, which declared all oil palms that the indigenous

25 C.W. Newbury, *The Western Slave Coast and Its Rulers: European Trade and Administration among the Yoruba and Adja-Speaking Peoples of South-Western Nigeria, Southern Dahomey and Togo* (Oxford: Clarendon Press, 1961), 155.

26 Xavier Daumalin, "Commercial Presence, Colonial Penetration: Marseille Traders in West Africa in the Nineteenth Century," in *From Slave Trade to Empire: Europe and the Colonisation of Black Africa 1780s-1880s*, ed. Xavier Daumalin (Abingdon: Routledge, 2004), 225.

27 Daumalin, "Commercial Presence," 226.

28 Hélène d'Almeida-Topor, *Histoire économique du Dahomey, Bénin, 1890–1920*, vol. 1 (Paris: L'Harmattan, 1995), 270–273.

29 Péhaut, *Les oléagineux*, 591.

30 Service des Affaires Economiques de l'AOF, Exploitation des palmiers à huile en AOF, 13 August 1910, ANB, 1R6/9.2.

were unable to harvest as the private property of the colony. The administration also allowed Europeans to take possession of the land through unequal agreements and, at times, by force. In 1916, farmers were forced to take their harvest to the oil mills.[31]

Following Poisson's experiment, several oil mills were built in other African colonies. They varied greatly in size, with capacities ranging from 2.5 tons of fruit per day, as in the case of the oil mill of Impérié (Ivory Coast), to 300 tons per day.[32] Some of them were explicitly based on the Poisson model.[33] All the oil mills, including those in the Ivory Coast, eventually experienced supply difficulties.[34] This occurred even when they were located near a European concession. A notable example is the case of the *Huileries du Congo Belge* (HCB), a subsidiary of Lever Brothers, which secured significant land concessions in the Belgian Congo in 1911 and established several oil mills. As has been pointed out, the location of the concessions was often decided hastily, as if securing the rights to a certain number of hectares and the approval for constructing a factory would ensure success. As the HCB soon discovered, there were not enough wild oil palms to supply an oil mill.[35] To "improve" the palm groves, the HCB cut away the young palms and kept the tallest ones – a logic that may have corresponded to the European ideal of what a plantation should look like, but that made harvesting more difficult.[36] As Lord Leverhulme, the founder of Lever Brothers, noted, the oil mills had to wage "a war against nature."[37] Securing control of land did not mean having suitable land; the environment had to be understood first.

31 Atta Kouame Jacob Brindoumi, "La création des huileries coloniales et ses conséquences en Côte d'Ivoire de 1912 à 1929," *Revue ivoirienne d'histoire*, no.23 (2014): 49–69.

32 Houard, "Étude".

33 This was the case of the oil mill of Maka, built in German Cameroon in 1911: Rapport de M. Annet sur l'extraction industrielle de l'huile de palme au Cameroun, 1 September 1916, in Antoine Stieltjes, "Machinerie pour la Préparation de l'Huile et des Amandes de Palme," *Bulletin de la Section des Matières Grasses*, no.6 (1918): 32–35.

34 See Houard, "Étude," 189–193.

35 David Kenneth Fieldhouse, *Unilever Overseas: The Anatomy of a Multinational 1895–1965* (London: Croom Helm, 1978), 502.

36 Robins, *Oil Palm*, 111.

37 Cited in Benoît Henriet, *Colonial Impotence: Virtue and Violence in a Congolese Concession (1911–1940)* (Berlin/Boston: de Gruyter, 2021), 146.

The interwar stalemate: hopes and fears of industrialization

In 1919, Antony Houard, director of Dahomey's agricultural service, claimed that "the entire future of the industrialization of palm oil" depended on whether oil mills "must necessarily be concessionaries" of palm groves or "could rely solely on the constant supply of fruit from the indigenous population." In his view, the Dahomean landscape, with its homogeneous palm groves and available water, was "sufficient to supply several factories."[38] However, while Houard believed that the Dahomean landscape was suitable for industrialization, the same was not true of its environment, considered in terms of both its physical features and social relations. Homogeneous palm groves were not necessarily available to oil mills. Farmers may not have been interested in harvesting more palm fruit than they needed for their own consumption, either because they considered the oil mills' purchase price too low, or because harvesting other crops took up the majority of their time. Even with the concessions of palm groves, industrial production depended on the availability of indigenous harvesters willing to climb over the trees on behalf of the oil mill. In summary, the industrialization of the oil palm sector required the disciplining of both the environment and its inhabitants, which in turn required financial and political resources that colonial officials recognized that they could not afford. Houard therefore recommended the creation of small-scale oil mills in Dahomey, arguing that "the time has not yet come for the large factories." He directed his criticism at the trading companies operating in the colony, which had "always confined themselves to commercial transactions" and had not "shown the slightest initiative to improve production conditions by creating factories." "Now," Houard concluded, "is the time for them to make up for this mistake and to increase their commercial capacity by setting up oil mills."[39]

Significant obstacles stood in the way, chief among them the weakened state of French companies trading in palm products after the First World War. By the end of the conflict, the United Kingdom had increased its palm kernel imports tenfold, enabling the production of cheaper British soap, which began to enter the French market. Simultaneously, the expansion of the Anglo-Dutch margarine industry prevented the emergence of a comparable French sector.[40] After the war,

38 Houard, "Étude," 194.

39 Houard, "Étude," 201–202.

40 Louis Pierrein, *Industries traditionnelles du port de Marseille: Le cycle des sucres et des oléagineux 1870–1958* (Marseille: Institut historique de Provence, 1975), 248–250.

the dominance of the pound sterling, combined with rising demand from the margarine industry, allowed the British trading companies in Dahomey to gain ground over their French counterparts.[41] Both British and French companies also had to contend with a more distant but significant threat: the rise of the Southeast Asian oil palm sector.

One of the key figures in the oil palm boom in the Dutch Indies was Belgian businessman Adrien Hallet, who had left Africa after a series of unsuccessful ventures, including a short-lived concession in Dahomey in 1900.[42] In Sumatra, he found that adapting the environment to suit oil mill operations was much easier, given that both land and labor could be controlled on a larger scale. Moreover, the ecological conditions, with higher and more evenly distributed rainfall, were much more favorable to the palm tree than in West Africa.[43] For example, while Sumatra's east coast could receive up to 6,000 millimeters of rain annually, southwestern Dahomey averaged just over 1,100 millimeters in the 1920s.[44]

French businessmen involved in the West African trade fought back. Immediately after the war, the Colonial Institute of Marseille sent Belgian scientist Gaston Van Pelt on a mission to West Africa to study how the oil palm sector could benefit from new methods being developed in Asia. Referring to Dahomey, Van Pelt argued that the colonial administration needed to establish "scientific plantations" and factories.[45] His recommendations persuaded both the director of the Colonial Institute, Émile Baillaud, and the general governor of French West Africa, Gabriel Angoulvant, that high-capacity oil mills were essential to prevent Southeast Asia from dominating global palm oil production.[46]

Yet, despite their general support for industrialization, the colonial government remained reluctant to intervene directly. On the one hand, the colonies still had to strive for self-sufficiency, and private companies, weakened by the

41 Cazaux, Rapport d'ensemble sur la situation économique du Dahomey, 25 April 1924, 50, ANOM, 1 AFFECO 876.

42 Péhaut, *Les oléagineux*, 591.

43 Jonathan E. Robins, "Shallow Roots: The Early Oil Palm Industry in Southeast Asia, 1848–1940," *Journal of Southeast Asian Studies* 51, no.4 (2020): 538–560.

44 André Aubréville, Les possibilités de la production d'huile et d'amandes de palme en AOF, undated [March 1938?], 1–4, Archives of the Centre de Recherches Agricoles Plantes Pérennes, Pobè (hereafter ACRAPP), ARMO/1900/0062, "Rapport Palmier à huile – Aménagement, développement, amelioration".

45 Gaston Van Pelt, "Le Palmier à Huile : L'Exploitation des Peuplements Naturels et la Culture Rationnelle," *Bulletin des Matières Grasses*, no.1 (1919): 217–241.

46 Émile Baillaud, "Le Rôle du Palmier à Huile dans la Production Mondiale des Matières Grasses", *Bulletin des Matières Grasses*, no.1 (1919): 132–133; Gabriel Angoulvant, "L'Arachide et le Palmier à huile en Afrique Occidentale," *Bulletin des Matières Grasses*, no.1 (1919): 9.

war and lacking concrete administrative support, were reluctant to undertake such ventures independently. On the other hand, the associationist shift in French colonial policy, which viewed Africans as "traditionally" farmers, emphasized that change should be gradual and respectful of local traditions. This approach, reinforced by workers' strikes in French West Africa in 1919 and 1921, insisted that the industrialization of the colonies and the potential formation of a colonial proletariat had to be resisted.[47] Governor General Jules Carde argued that oil palm development in Africa had to be carried out "by the indigenous people themselves". Without hiding the racist logic through which he viewed the world, he added that "a parallel" between "the Indies" and West Africa revealed "a truly unimaginable ignorance."[48]

Even influential agronomists like Yves Henry and Antony Houard dismissed Southeast Asia's oil palm boom as temporary. As late as 1930, Houard wrote that the oil palm in Malaya was not "in its true environment."[49] In summary, a stalemate emerged during the 1920s: French companies, organized under the Colonial Institute of Marseille, pushed for more rapid intervention, while the colonial agricultural services and the federal government of French West Africa favored a more gradual approach. Only two oil mills were constructed in the late 1920s, both of which encountered supply issues and operated for less than two years.[50]

The Great Depression hit France between 1930 and 1931, leading to a credit crunch and a loss of foreign markets. In response, French companies turned to the Empire as a market for their high-priced goods and as a source of raw materials.[51] However, the selling prices of exportable West African products fell dramatically.[52] With the collapse of the credit system, only the largest trading companies with sufficient cash reserves could continue buying palm products, while

47 Martin Thomas, *The French Empire between the Wars: Imperialism, Politics and Society* (Manchester: Manchester University Press, 2005), 83; James E. Genova, *Colonial Ambivalence, Cultural Authenticity, and the Limitations of Mimicry in French-Ruled West Africa, 1914–1956* (New York: Peter Lang, 2004), 62.

48 Quoted in Gaston Van Pelt, 'La culture du Palmier à Huile et la préparation des huiles et amandes de palme', in *Mémoires et Rapports sur les Matières Grasses*, vol. 4, *Le Palmier à Huile* (Marseille: Institut Colonial, 1930), 109–110.

49 Antony Houard, Le palmier à huile au Dahomey, 21 February 1930, 40–41, ACRAPP, ETAG/2014/0003.5. See also Yves Henry, "Documents sur le palmier à huile à Sumatra," *Bulletin économique de l'Indochine* (1926): 1–19.

50 Jules Marcel de Coppet, Note pour le Gouverneur à la suite du rapport de l'Inspecteur Général sur l'exploitation de la palmeraie, undated [January 1934?], 31, ANOM, 1 AFFECO 101BIS.

51 Thomas, *The French Empire between the Wars*, 105–107.

52 Péhaut, *Les oléagineux*, 663–664.

smaller companies went out of business.[53] Although these companies were hesitant to commit capital to the construction of oil mills in the fragile economic climate of the 1930s, the debate about the mills continued. Antony Houard contended that it was not possible to transform the environment of Dahomey, as had been done in the Dutch Indies, because it would mean displacing farmers who already owned the land. If the environment could not be changed, he suggested, then the people should be changed. One issue with the oil presses introduced in the 1930s was that the farmers preferred their palm oil to come exclusively from their own palm fruit and not be mixed with others. As a result, the machines could not be used to their full capacity. Houard argued the Dahomeans needed to be taught to work cooperatively, so that they could be persuaded to bring their own share of palm fruit to the factory for processing.[54]

As the economic situation improved and in response to Asian competition, the Minister of Colonies appointed a commission in 1938 to study how to improve the West African oil palm sector. Professor of technology Paul Ammann was among the experts involved. The commission's final report once again recommended the construction of oil mills.[55] In the meantime, André Rancoule, the new director of Dahomey's agricultural service, set up a small experimental oil mill in Pobè.[56] The colonial government also began to take a more proactive approach. In July 1939, the administration decided to establish a cooperative oil mill in Coli, north of Allada. Although there were no specific plans for a cooperative, farmers were instructed to bring the fruit to the oil mill. In return, they would receive the same amount of palm oil that they would obtain from artisanal processing, along with an additional quantity of kernels. The onset of the Second World War interrupted and ultimately ended the project before it could progress.[57]

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53 Xavier Daumalin, "Le patronat marseillais face à la politique de la préférence impériale (1931–1939)," in *L'esprit économique impérial (1830–1970): Groupes de pression & réseaux du patronat colonial en France & dans l'empire*, ed. Hubert Bonin, Catherine Hodeir, and Jean-François Klein (Paris: Publications de la SFHOM, 2008), 291.

54 Antony Houard, Le palmier à huile au Dahomey, 21 February 1930, 30–35, ACRAPP, ETAG/2014/0003/5. On the problems encountered by the oil mills, see Germain Moulères à Armand Annet, 28 June 1938, 2, ANB, 1R1/9.

55 Ministre des colonies au Gouverneur Général de l'Afrique Occidentale Française, 6 May 1938, ANB, 1R1/9.

56 André Aubreville, L'aménagement des palmeraies, 18–21, attached to Léon Geismar à Ernest Gayon: Aménagement des palmeraies, 24 October 1938, ACRAPP, ARMO/1900/0062, "Palmier à huile – Aménagement, développement, amelioration".

57 André Rancoule, Observations sur l'huilerie coloniale à feu nu Colin et sur son fonctionnement éventuel dans un centre de traitement coopératif, 18 July 1939, ACRAPP, ARMO/1900/0062, "Palmier à huile – Aménagement, développement, amelioration". On cooperative and rural de-

The shaky foundations of late colonial oil mills

Many of postwar France's modernization policies had their roots in the Vichy government.[58] The regime's most ambitious economic plan for France, although ultimately not ratified by the government, explicitly called for public intervention in the industrial sector of the colonies. Industrial investment in the colonies was planned to exceed that in metropolitan France in relative terms, but it was limited to industries that could not directly compete with those in France.[59] A distinctive feature of the Vichy planning policy was corporatism, which empowered representatives of large companies and state technicians to steer the course of modernization. In December 1940, the regime created the *Groupements Professionnels Coloniaux* (GPCs), hierarchical corporatist bodies that brought together all the French companies in the colonies with the aim of reconciling state interventionism and private interests.[60] Within the GPC for agriculture and forestry, the president of the subsection for oleaginous products was Robert Michaux, a prosperous planter of rubber and oil palm in Malaya.[61] In July 1941, the Secretary of State for the Colonies, Charles Platon, asked him to prepare a development program for West African oilseed products.[62]

The GPCs developed a harsh critique of the practices of the colonial administration and the trading companies operating in West Africa.[63] These criticisms

velopment, see Nikolay Kamenov, "Pooling Resources in the European Countryside: Cooperative Models, Rural Capitalism, and Beyond," in *Living with the Land: Rural and Agricultural Actors in Twentieth-Century Europe – A Handbook*, ed. Liesbeth van de Grift, Dietmar Müller, and Corinna R. Unger (Oldenbourg: De Gruyter, 2022), 109–132.

58 Philippe Mioche, *Le plan Monnet: Genèse et élaboration 1941–1947* (Paris: Publications de la Sorbonne, 1986); Christophe Bonneuil and Frédéric Thomas, "Purifying Landscapes: The Vichy Regime and The Genetic Modernization of France," *Historical Studies in the Natural Sciences* 40, no.4 (2010): 532–568.

59 Catherine Coquery-Vidrovitch, "Vichy et l'industrialisation aux colonies," *Revue d'histoire de la Deuxième Guerre mondiale* 29, no.114 (1979): 81–83.

60 Christophe Bonneuil and Patrick Petitjean, "Les chemins de la création de l'ORSTOM, du Front Populaire à la Libération en passant par Vichy, 1936–1945," in *Les sciences coloniales : figures et institutions*, ed. Patrick Petitjean, vol. 2, *Les sciences hors d'Occident au 20. siècle* (Paris: ORSTOM, 1996), 129–130.

61 "Robert Michaux (1901–1962)," *Journal d'agriculture tropicale et de botanique appliquée* 9, no.11–12 (1962): 540–541.

62 Robert Michaux, "Le développement du palmier à huile en Afrique française," in *Semaine du palmier à huile et du cocotier* (Paris: IRHO, 1943), 106.

63 Mesures proposées par la Conférence des oléagineux, tenue à Vichy du 12 au 13 novembre, 14 November 1941, ANOM, 1 AFFECO 77; Christophe Bonneuil, "Mettre en ordre et discipliner les

opened the door for planters and managers, such as Michaux, who had not been directly involved in the development of West African palm products during the previous decade. The Japanese occupation of both the Malay Peninsula and the Dutch East Indies in late 1941 also redirected these businessmen's focus back to the African colonies.[64] Michaux aimed to transplant the intensive oil palm cultivation methods developed in Asia to Africa. He urged the creation of medium or large oil mills with an annual capacity of at least 2,000 tons of palm oil, warning that insisting on "the creation of a multitude of small workshops would be like bowling a regiment on roller skates to catch up with a motorized enemy."[65]

In June 1943, the *Institut de recherche pour les huiles et oléagineux* (IRHO), a research institute established at Michaux's suggestion eighteen months earlier, organized a week-long conference on palm oil and coconut in occupied Paris. The first day of the conference was devoted to Asian oil palm plantations, held up as the exemplary model to follow. The first speaker revealed that when he first visited a West African palm grove, having come from Malaya, he did not even recognize the tree. It was so much more delicate and taller than the Asian palm that he initially thought it was a coconut. African processing methods, he added, were "a curious spectacle at the very least."[66] The speaker argued that the industrial plantation was the best solution for Africans, whom he described as "indolent by nature," lamenting that the French had not followed the examples of the Belgian Congo and Malaya.[67] He claimed that Africans' supposed inferiority necessitated a form of shock therapy through agricultural intensification. It should be noted that the racist views of the businessmen differed in certain respects from those held by colonial agronomists. Both argued that Africans' backwardness prevented them from appreciating technological innovations. However, while the agronomists remained confident that the farmers could be persuaded to adopt new machinery, the planters believed that nothing could be expected from them, so high-capacity oil mills and large plantations had to be introduced.

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tropiques: Les sciences du végétal dans l'empire français, 1870–1940," (Phd diss., Université de Paris VII, 1997), 496.

64 Valeria Giacomin, "The Transformation of the Global Palm Oil Cluster: Dynamics of Cluster Competition between Africa and Southeast Asia (c. 1900–1970)," *Journal of Global History* 13, no.3 (2018): 390.

65 Robert Michaux, Le palmier à huile en AOF et le développement de la production d'huile de palme. Rapport de mission (mai-juin 1942), Annexe A – Plan de réorganisation de la production de palme en AOF, 13 September 1942, 5, ACRAPP, ARMO/1900/0062, "Palmier à huile – Aménagement, développement, amelioration".

66 H. Regnauld, "Le palmier à huile dans le monde," in *Semaine du palmier à huile et du cocotier* (Paris: IRHO, 1943), 7.

67 Regnauld, "Le palmier," 10–12.

The next speaker was Michaux himself, who boasted of the most spectacular achievements in Malaya. He insisted on the ability of Europeans to clear jungle land and to bring in Tamil labor, which was "neither more industrious nor more favored than the majority of the races of black Africa."[68] During his presentation, Michaux focused on the establishment of the Johore Labis plantation, which was constructed on a 10,000-hectare concession and projected to produce as much palm oil as the total exports of French West Africa. As he described it, "eighteen months after the first axe fell, 3,000 hectares had been planted [...] 120 kilometers of roads completed, a permanent population of 2,000 souls, all imported, supervised, trained, housed, treated, etc."[69] Michaux showed an impressive series of images illustrating the transition from the ecocide of the pre-existing forest to the new plantation. For Michaux, environmental destruction was not accidental but methodically orchestrated. He commented:

> The felling technique is very advanced: the undergrowth is felled first, followed by the large trees. The aim of this technique is to ensure that the total height of the felled wood does not exceed one meter, so that when the block is set on fire a few months later, most of the leaves, branches and trees that have fallen to the ground will disappear in one fell swoop [*d'un seul coup*].[70]

The GPC was not without its opponents. Jean Desanti, former lieutenant governor of Dahomey before being made responsible for political affairs for the Secretary of State for the Colonies, criticized Michaux's plan on several grounds. Concerning the oil mills, he argued that the solution lay in "the multiplication of small factories [...] less expensive and wisely distributed."[71] Oblivious to the ambitious plans being devised in Paris – French West Africa remained under Vichy's control only until the end of 1942 – colonial officials in Dahomey continued to debate the best location for a small cooperative factory similar to the one in Pobè.[72] Rancoule maintained that, due to supply constraints, only small oil mills with a maximum annual capacity of 1,250 tons could operate in southern Dahomey.[73] In December

68 Robert Michaux, "Les palmeraies modernes d'extrême-orient," in *Semaine du palmier à huile et du cocotier* (Paris: IRHO, 1943), 23–24.

69 Michaux, "Les palmeraies modernes," 24.

70 Michaux, "Les palmeraies modernes," 34.

71 Jean-Hyacinthe Desanti, Note au Directeur des Affaires Economiques: Bureau du palmier à huile, 16 May 1944, 3–4, ANOM, 1 AFFPOL 2555.

72 Colonie du Dahomey, Rapport économique: année 1943, 85; Colonie du Dahomey, Rapport économique pour les années 1944 et 1945, 43, ANOM, 1 AFFECO 912.

73 André Rancoule, Traitement mécanique de la production du palmier à huile au Dahomey, 25 October 1944, 2–3; Id., Plan de mise en valeur de l'AOF, 5 March 1945, 10; ACRAPP, ARMO/1900/0062, "Palmier à huile – Aménagement, développement, amélioration".

1944, the agricultural service of Dahomey drafted a long-term plan to install 81 small cooperative mills between 1947 and 1960.[74]

The liberation of France did not result in a change of experts, and Michaux remained in charge of the development plan for colonial oilseed products. At the same time, the main use of palm oil shifted from soap-making to margarine production, increasing the demand for refined palm oil from oil mills and further sidelining artisanal production.[75] The authors of the postwar French plan for the development of West African palm products, led by Michaux, admitted that even "the most ingenious tricks of modern technology" could not "entirely correct the unsuitability of the environment" of Dahomey for oil palm cultivation.[76] Michaux's approach closely resembled that of the experts who, around the same time, were designing the East African Groundnut Scheme. As Joseph Hodge aptly put it, they were "like Goethe's Faust, driven by an insatiable and illusory vision of what was possible which blinded them to the basic economic and ecological facts."[77] Although it was well known that irregular rainfall prevented the Dahomean oil palms from yielding as much as elsewhere, this did not alter the plan's core commitment to constructing four large mills. These mills were financed by the *Fonds d'Investissements pour le développement économique et social* (FIDES), the French development fund created in 1946. However, despite the grand ambitions, the environment surrounding the factories remained largely untouched.

This disregard for environmental constraints meant that the first oil mill, inaugurated in Avrankou on 13 July 1949, with a capacity of 4,000 tons of palm oil, encountered serious supply problems from the outset. The mill operated only a few days a week, as local farmers rejected the purchase prices it offered, which were lower than those paid by Dahomean women who continued to trade and produce artisanal palm oil for both export and domestic consumption.[78] Shortly thereafter, the Gbada oil mill was also built. Both Avrankou and Gbada were run by Fournier-Ferrier, the same company that had been involved in the construction of Poisson's oil mill nearly half a century earlier.[79] In its first year of op-

74 Service de l'Agriculture du Dahomey, Programme de mise en valeur de la palmeraie du Dahomey, December 1944, ACRAPP, ARMO/1900/0062, "Palmier à huile – Aménagement, développement, amélioration".

75 Pierrein, *Industries traditionnelles*, 297.

76 Commissariat Général du Plan, Développement de la production de matières grasses d'origine végétale dans les territoires d'Outremer, undated [1946?], ANB, 1R16/9.

77 Joseph M. Hodge, *Triumph of the Expert: Agrarian Doctrines of Development and the Legacies of British Colonialism* (Athens: Ohio University Press, 2007), 213.

78 Rapport agricole de l'année 1950, 182, ANOM, 14 MIOM 1923

79 Péhaut, *Les oléagineux*, 852.

eration, Avrankou produced only 1,150 tons of palm oil instead of the planned 4,000 tons. Rumors of the project's "total failure" soon circulated, casting doubt on the viability of the two existing mills and raising the prospect that the construction of the other mills would be abandoned.[80]

In February 1952, to save the oil mills, the French state obliged metropolitan consumers to buy oil products from the French Union instead of foreign products.[81] This protectionist measure allowed the mills to pay more to Dahomean farmers, but both Avrankou and Gbada remained closed during the low season.[82] The Gbada mill remained shut throughout 1953 as well. As experts from Dahomey's agricultural service noted, these modern factories were forced to compete with "a huge factory of artisanal production."[83] The Bohicon oil mill, inaugurated in 1953, was assigned to the IRHO because no private company wanted to take it over, as was the case with the Ahozon factory, which began operating the following year.[84] By 1954, the Gbada oil mill was still operating as a buffer-factory, absorbing the peak of production between March and May. French managers argued that Gbada could only become profitable if it were supported by a dedicated plantation.[85]

In the first half of 1954, thanks to French trade policies, most palm products exported from Dahomey came from the oil mills for the first time.[86] Metropolitan users, forced to buy overpriced products from West Africa, received a form of compensation in March 1954. Overseas producers of low-acid vegetable oils, namely the oil mills, could benefit from an import price much higher than the world market rate. In return, metropolitan users were allowed to purchase a proportional quantity of duty-free foreign palm oil.[87] In October, all export duties on the low-acid palm oil produced by the oil mills were abolished.[88] These measures temporarily saved the oil mills, but their economic viability continued to be uncertain. Avrankou and Gbada, which had the potential to produce 6,500 tons of palm oil per year, produced an average of 4,700 tons in the period between 1955 and 1963. Similarly, Ahozon and Bohicon, with a combined potential of 6,000 tons, pro-

80 Rapport économique 1951, 112–13, ANOM, 14 MIOM 1938.

81 Péhaut, *Les oléagineux*, 838.

82 Rapport annuel 1952, 6 February 1953, 62, ANB, 1R17/3.1.

83 Service de l'agriculture, Rapport agricole de l'année 1953, 36, ANOM, 14 MIOM 1973.

84 IRHO, Rapport annuel 1953, 41–42, ACRAPP, ARMO/1900/0066.

85 Procès-verbal du Comité consultatif créé auprès de la SHMD – Séance du lundi 22 novembre 1954, 4–5, ANB, 2Q1.

86 Subdivision Banlieue, Rapport économique 1er semestre 1954, 2–3, ANB, 1R18/8.

87 Péhaut, *Les oléagineux*, 839.

88 René Carrière de Belgarric, "Les huileries de palme du plan: équipement et exploitation rationnelle des palmeraies naturelles de l'Afrique française," *Oléagineux* 10, no.6 (1955): 385.

duced only 3,600 tons.[89] While women in eastern Nigeria organized riots against the competition posed by the oil mills starting in 1948, the Dahomean oil mills – despite having significantly higher capacity than the "Pioneer" mills introduced in Nigeria – never became truly competitive. For farmers, selling palm fruit directly to women remained more profitable. The Dahomeans brought only the surplus fruit that the women could not process to the oil mills.[90]

In 1960, Dahomey gained formal independence, and its first development plan prioritized the creation of plantations of high-yielding selected palms, with the explicit goal of enhancing the profitability of existing oil mills and facilitating the construction of new ones.[91] Through a system of so-called "compulsory cooperatives," the state could expropriate farmers and tie their labor to the plantations.[92] The perceived greater political legitimacy of the postcolonial state, combined with increased funding from international aid organizations, enabled environmental transformations that the colonial administration had previously been unwilling to undertake. Even then, however, the plantations could only partially meet the capacity of the three new oil mills built in the late 1960s, which often had to reduce their processing volumes.[93] One of the key reasons for this was that the price offered by Dahomean women producing artisanal oil was higher than what the oil mills were willing to pay. Additionally, the yield of the plantations was severely affected by theft.[94] Eventually, the oil mills built under colonial rule, which continued to rely mainly on subspontaneous palm groves, were closed at the end of the 1970s due to supply shortages. Avrankou, Gbada and Pobè closed

89 SNAHDA au Ministre des finances, 8 April 1964, Historical Archives of the European Commission, Brussels (hereafter HAEC), BAC 249/1980_123.

90 Jean Baudot, Untitled document, 2 May 1958, 22–32, ANB, 1Q11/2. On the riots in Nigeria, see Gloria Chuku, *Igbo Women and Economic Transformation in Southeastern Nigeria, 1900–1960* (New York and London: Routledge, 2005); John Oriji, "Igbo Women, Technological Changes and Protests (1946–1953)," *Moebius* 1, no.1 (2003): 11–21; Anthony I. Nwabughugu, "Oil Mill Riots in Eastern Nigeria 1948/1951: A Study in Indigenous Reaction to Technological Innovation," *Africa Development* 7, no.4 (1982): 66–84; Nina Emma Mba, *Nigerian Women Mobilized: Women's Political Activity in Southern Nigeria, 1900–1965* (Berkeley: Institute of International Studies, 1982).

91 Société générale d'études et de planification, *Dahomey, plan de développement économique* (Leiden: IDC, 1962), 13–14.

92 Moïse Mensah, "L'expérience dahoméenne en matière de coopératives de production dans le cadre des périmètres d'aménagement rural," *Études dahoméennes*, no.6–7 (December 1965): 73–80.

93 SOBEPALH, Enquête dans la palmeraie naturelle du Bénin – Deuxième partie : Caractéristique de la palmeraie naturelle, July-August 1976, 24, ACRAPP, ARMO/1900/0058.

94 Christian Blanchard à la DGVIII, 14 January 1977, 2–3, HAEC, BAC 190/1992, 943; IRHO, Étude de la rénovation de la palmeraie naturelle et de l'amélioration de la collecte en République Populaire du Bénin, November 1984, 2, ACRAPP, ETAG/2014/0008/2, "1984 départ".

between 1977 and 1978, with Ahozon following soon after. The Bohicon mill was converted into a mixed seed oil mill in 1981.[95]

Conclusion

This chapter has explored the relationship between development, environment, and technology through the case of oil palm development in colonial Dahomey. I have focused on oil mills because this technology was designed based on specific assumptions about the environment and its future transformation. Although French experts almost unanimously advocated for the creation of oil mills, very few were actually built, revealing a great deal of caution on the part of both the colonial administration and private entrepreneurs. Part of the reason why colonial ambitions failed to meet industrial expectations lay in the French administration's reluctance to fundamentally alter the colony's environment.

The construction of oil mills required significant changes to the environment, whether through the reorganization of existing palm groves or through the creation of entirely new plantations directly controlled by the mills. The rise of the Southeast Asian palm sector seemed to prove that the plantation-factory model was the way forward and that West African landscapes should be similarly adapted. However, the conditions in Dahomey were quite different: land was scarce and labor was difficult to control. Private companies were hesitant to embark on such high-risk ventures without strong backing from the colonial administration, which, in turn, was reluctant to make environmental changes that might provoke unrest or destabilize local communities. Instead of a grand, Promethean effort against a hostile environment, colonial development unfolded as a continuous search for technologies that would minimize environmental change: officials aimed for smooth improvements rather than radical upheavals.

Under Vichy, French businessmen with experience in Asia played a key role in advancing the large factory model: four oil mills were built in Dahomey in the 1950s. The margarine industry's demand for low-acid palm oil, combined with the protectionist measures taken by the French state, made it possible for the oil mills to operate in Dahomey without dramatically altering the environment. Although the agricultural service had distributed hundreds of thousands of high-yielding palms in the colony from the late 1920s, most of these selected palms died shortly

95 E. Edoun au Directeur Général de la SOBEPALH, 6 December 1978, ACRAPP, ETAG/2014/0004.3, dsn; Esther Mètolé Catraye, 'La Société Nationale pour l'Industrie des Corps Gras: Un exemple d'agro-industrie en République Populaire du Bénin' (Master's thesis, Abomey-Calavi, Université Nationale du Bénin, 1988), 2, 22.

after being planted. By the late 1950s, it was generally agreed that the introduction of selected oil palms had no impact on the palm groves of Dahomey.[96] Plant breeding was a technology aimed at *adapting* the environment.[97] In contrast, while oil mills did transform the environment – for example, through industrial discharges into watercourses and the construction of connecting roads – their establishment ultimately depended on an *adapted* environment. The tumultuous history of Dahomey's postcolonial oil mills, built within standardized plantations, suggests that even an adapted environment was insufficient to ensure their survival. Although the environmental context was crucial, it was only one among many factors influencing the outcomes of development projects.

96 Jean Baudot, Untitled document, 2 May 1958, 21, ANB, 1Q11/2.

97 On this kind of technologies see Sverker Sörlin and Nina Wormbs, "Environing Technologies: A Theory of Making Environment," *History and Technology* 34, no.2 (2018): 101–125.