

American Globalization, 1492–1850

Trans-Cultural Consumption in Spanish
Latin America

Edited by Bartolomé Yun-Casalilla,
Ilaria Berti, and Omar Svriz-Wucherer

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Chapter 3

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Ecological Limits: The Diffusion
of Hemp in Spanish South
America and Its Ghost Fibers

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3 European Imperialism, War, Strategic Commodities and Ecological Limits

The Diffusion of Hemp in Spanish South America and Its Ghost Fibers¹

Manuel Díaz-Ordóñez

Early globalization owes its existence to sailing ships propelled with thousands of tons of European hemp transformed into cordage and sails. The new American territories could have served to increment its cultivation, increasing what Pomeranz defines as *ghost acreage*, to supply the huge demand for hemp to rig the European fleets. In fact, Spanish-American sources make specific reference to a determined effort to increase its cultivation for use in naval vessels.

On examination, however, we find that the results of measures to encourage the sector fell far short of expectations. Moreover, the numerous historical records of failures and frustrations seem incompatible with the classical explanation of European mercantilist resistance to transfer this agro-industrial activity to the American colonies. Therefore, it seems reasonable to broaden the focus of our investigation to include other scientific disciplines, such as botany and agronomy, in order to present a revised view of the limited introduction of hemp cultivation in Spanish South America.

Hemp: A Strategic Input in the Global History of Consumption

Hemp was a very important commodity for European national economies, given its use in such a wide range of productive sectors, including agriculture, beginning with the cultivation of the hemp plant, but also in livestock, construction, transport, textile manufacturing and, most importantly, as the predominant material in the sails and rigging of the European ships of the day. It was the widespread use of hemp as the main article of naval rigging that was the determining factor in the production of this plant, and its processing industries became a strategic axis of imperial economic policy in the modern era. Its characterization as the predominant fiber in the manufacture of naval rigging

(Díaz-Ordóñez 2006a, 2009), meant that hemp became a fundamental imperial strategic commodity from the fifteenth to the nineteenth century. Its study also provides us with a timely opportunity to analyze the paths through which hemp migrated across the lands of Asia and Europe, its subsequent passage to the American colonies and later to Oceania.

This approach should provide us with a more global understanding of complex processes by observing them as *commodity chains*, which, in the words of Terence Hopkins and Immanuel Wallerstein, would gather together interorganizational networks clustered around hemp (Hopkins and Wallerstein 1986, 159). In this sense, a greater understanding of the peculiarities of the cultivation of this raw material is required, including the edaphological, climatic and environmental constraints characteristic of its agricultural production, in order to quantify the labor force required for its harvest and its subsequent connection to the commercial networks involved in its distribution to manufacturing centers and its transit onwards as an industrial item to its distribution and consumer markets. A critical issue is the fact that these networks of the distribution of hemp and its manufactured articles would become global, because the ships whose rigging and sails were made with it were also entrusted with transporting it to America, when the Europeans discovered that it did not exist in the native biota of America or Oceania (Díaz-Ordóñez 2005).

The production of hemp involves a complex agro-industrial system in which very diverse and distinctive operations are combined, including picking, harvesting, preparation and industrial transformation. For this reason, it seems appropriate that we should give an account of its global expansion on the basis of its strategic nature and its *entangled history*. In doing so we observe how the conditioning factors underlying the existence of the new territories under European imperial dominion underwent processes of economic transformation, which at the same time influenced the political and economic measures adopted by their respective homelands.

Our argument focuses on analyzing the extent of Spanish resistance to moving the hemp agro-industry (cultivation and manufacture) to Spanish South America. If such resistance existed, this would back the argument in favor of the economic policy of mercantilism of the time, which defended restricting and even prohibiting American manufacturing, while the new territories were to be employed solely for the purpose of obtaining raw materials. Conversely, if these reservations in relation to the development and production of hemp in America did not exist, we could say that as a commercial activity with the production of rigging, sail and wick, it received differential treatment in comparison with other European manufacturing sectors (such as textiles, footwear, books, iron and steel, etc.) that were controlled by governments to defend their metropolises' domestic industrial sectors.

A second question, linked to the first, leads us to ask if the Spanish could take advantage of the new American territories to increase the area of cultivable land in the peninsula itself for the agricultural production of a strategic product such as hemp. This was a concept defined by Kenneth Pomeranz for which he coined the term *ghost acreage*, to explain how Europeans of the modern era disposed of additional arable land in the colonies and increased their capacity for economic growth (Pomeranz 2000). Continuing with this line of argument, while *ghost acres* allowed the Spanish colonizers access to more soil for cultivation – in this case of hemp – the new American biota also permitted them to become acquainted with, experiment and consume new raw materials (Pomeranz 2000, 275; De Vries 2001, 431–33). And so the question arises: were the Spanish able to profit from plants and vegetables from that new ecological reserve in order to replace European hemp?

America: Ghost Acreage to Replace the Cultivation of European Hemp?

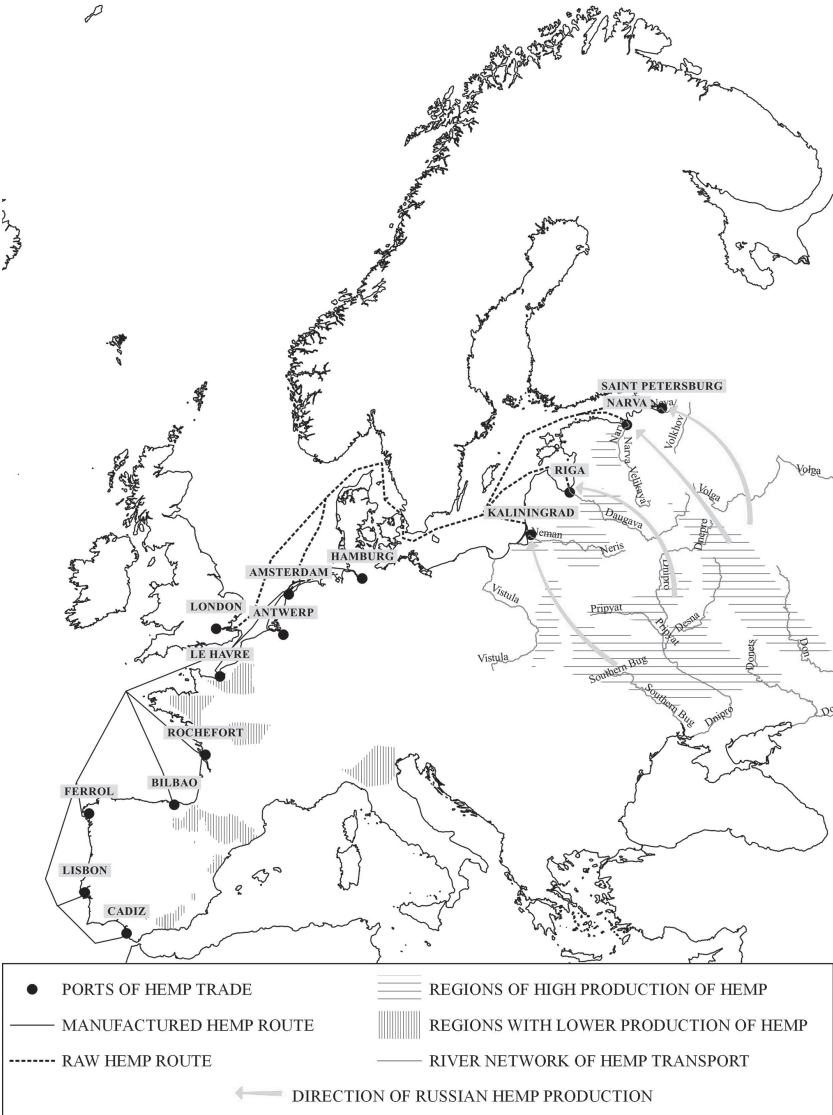
Chronological evidence of hemp, and specifically the species *Cannabis sativa* L., dates far back in the environmental history of our planet (Edwards and Whittington 1992, 85). Scientific studies place its biological origin in Central Asia (Faeti, Mandolino, and Ranalli 1966, 367), in an area close to the Turpan Depression (Mukherjee et al. 2008, 483), from which it would have spread towards eastern Europe (Riera, López-Sáez, and Julià 2006, 127) during the first millennium before the Christian era and continued its expansion through southern Europe during the first centuries CE.² Since the Middle Ages, hemp has been used in different human activities and industries, transformed and manufactured as ropes, sacks, fabrics, livestock feed in its seed form, and in oils for manufacturing, medicinal derivatives and so on.

Our understanding of hemp as a global product entails a number of issues that we deem essential to the research at hand. In the first instance, hemp became a strategic commodity during the early Modern Age, because it was the essential product in the manufacture of maritime rigging for the military and merchant fleets that began connecting the world from 1500 onwards and whose numbers increased spectacularly.³ This increase in total displaced tonnage also prompted the proportionally astronomic growth in European hemp used in the manufacture of sails and rigging (Díaz-Ordóñez 2009, 601–6). Secondly, until the mid-nineteenth century, the Russian Empire was the predominant European hemp producer (Díaz-Ordóñez 2016, 96–99), with vast crops in present-day Ukraine, Belarus, the Baltic Republics and part of Poland. This Russian preponderance is mainly explained by the climatic and soil conditions of some of the regions dominated by the Tsar. The production of industrial hemp requires land, preferably in temperate and cold

climates, which benefits from average annual rainfall of around 635 to 760 millimetres, and where the seeds are sown at dawn in temperatures of 6–8 °C. Such conditions can be easily met in the great plains of Belarus and Ukraine, with a humid continental climate (Dfb in the Köppen-Geiger classification), in which those ideal sowing temperatures are reached by the second half of March, which allowed farmers to plant the land very early and allowed the vegetative growth of hemp to last for more than a hundred days before the summer harvest. This fact also allowed Belarusian or Ukrainian crops to present a high percentage of fiber. The outcome was a significant increase in yield per surface unit, but also a better-quality final product.

This great production of fiber was transported along the Russian river basins to the Baltic ports, such as Narva, Riga, Kaliningrad or St. Petersburg, from where it was distributed across western Europe, with the help of English and Dutch merchants (see Map 3.1). Thirdly, in relation to the latter, the European wars of early modern times altered commercial circuits, thus activating waves of hemp promotion policies in the Western powers and their overseas territories (Díaz-Ordóñez 2017, 72–75).

This complicated scenario, which combined the strategic necessity of the overseas empires to stock up on essential materials to maintain connections with the new territories dominated since the fifteenth century, and the overbearing role of the Russian empire as a supplier, drove the European powers to explore new agro-industrial possibilities in their new peripheries. The solution would have been obvious if the Europeans had found hemp either cultivated or in its wild form in the new American territories or, failing that, had encountered alternative fibers to European hemp for the manufacture of rigging and sails. The second possibility, having established the biological absence of hemp in these parts, would be for the empires to establish hemp agricultural development policies in the new territories, as they became successively incorporated into their domains. Both possibilities link back to the concept of Pomeranz's ghost acreage (Pomeranz 2000, 275). However, although historiography has discussed alternative ghost acreages and their impact on economic growth (Vries 2001, 434–36), either in the form of an increase in arable land or, alternatively, the possibility of resorting to new and alternative supplies and products that could be consumed in England, in particular, or in Europe, in general, it seems reasonable to assume that, in any case, the empires exploited the possibilities offered by the new peripheries. But in the case of hemp, and any prospective substitute raw materials, there is no clear indication of the American territories offering any such resource. First, the Spanish colonizers, and later the English, explored the possibilities offered by the American biotas, but without reaching any decision on new fibers to incorporate into the catalog of commodities that could be transformed into rigging and sails. In initial contacts between Old and New World, the writings of the Spanish explorers mention



Map 3.1 Russian Hemp Routes and Manufactured Distribution in the Early Modern Age in Europe.

Source: prepared by the author from sources and bibliography. Software GIS QSIG 2.18.4.

the plant species used by the Indians of the Caribbean islands (Cuba, San Juan de Puerto Rico and Jamaica). Among these, they highlighted the use of certain species of vines and lianas (climbers) called *magueys* and *damahaguas* (also known as *majagua*), a *Malvacea* of the hibiscus genus.⁴ For its part, the *maguey* (known as *pita*, *cabuya*, *fique*, *mezcal*, etc.) was the plant most used in various pre-Columbian human activities and manoeuvres. Some chroniclers speak of its extended use among the settlers of central Mexico (*Agave americana*)⁵ and the *benequen* (*Agave fourcroydes*) on the Yucatecan coast, in Costa Rica (Fernández 1889, 17) and in Ecuador (Velasco 1833, 1:41–42). Finally, in Paraguay, the use of *chaguar* or *caraguatá* (*Bromelia hieronymi*) fibers was identified among the indigenous *Wichi* and across present-day Argentina and Bolivia.⁶

The existence of these plants that the natives had used for generations before the Europeans' arrival could have led the newcomers to decide to replace hemp with some of them. Nevertheless, none of these plant species clearly replaced European hemp in the manufacture of rigging, but rather served as effective complements to the logistical needs that the Europeans faced in their incursion, occupation, settlement and constitution of an economic system of dominion over the new continent. While a preference for European hemp for rigging remained, this was not the case with sail-making, for which Spaniards readily employed the fabrics manufactured by the indigenous people of Cajamarca and Chachapoyas since pre-Columbian times. With the arrival of the Iberian settlers in these regions, the natives adapted their traditional manufacturing forms to the standards of European rigging. This adaptation required natives to adjust their traditional economies to the newcomers' needs in order to supply a distribution network linking the manufacturing zones to the markets, ports and naval facilities of the Spanish Pacific (Góngora 1970, 453; Juan and Ulloa 1826, 87; Cooney 1979).

However, the production of rigging with American fibers turned out to be much more complicated. Let us, therefore, analyze the interaction between imperial needs and the availability and adequacy of these plant alternatives. From a chronological perspective, the Spanish colonizers first had to meet the rigging demands of the ships bound for the new territories. As dominion over the American continent became increasingly consolidated, the need for these goods increased ostensibly, because in addition to the demand from ocean-going vessels, this now extended to the coastal and river vessels operating along the American coasts. Subsequently, the consolidation of Spanish economic dominion in the new territories would also affect the growth of merchant fleets in America and, simultaneously, the military squadrons that had to defend them (Armada de Barlovento in the Caribbean or the Armada del Mar del Sur in the Pacific) (Pérez and Torres 1987). These commercial and military fleets required naval construction and maintenance centers, such as the Havana arsenal, the Guayaquil and Coatzacoalcos shipyards and the San

Blas naval station, all reliant on supplies of rigging made with European hemp, dispatched in the vessels of the Carrera de Indias. In fact, the contract to supply processed hemp to the American colonies became a very profitable business for Spanish manufacturers and merchants after 1500, as evidenced by the participation of leading productive organizations such as the Seville cord-makers' association, bidding for the contract to supply rigging to the Carrera in the sixteenth century.⁷

Contemporary correspondence and reports lead us to believe that under Spanish dominion, American fibers normally played a complementary role to European hemp in the manufacture of naval rigging. Nevertheless, American fibers could replace European hemp when the Spanish fleets entered crisis mode, due to possible delays in the arrival of hemp from Europe, or local stock shortages in the American warehouses. It was when crisis situations presented themselves that *pita* and *henequen* were supplied to complete the rigging of the ships attached to the fleet of the Viceroyalty of Peru (Romero and Contreras 2006, 154). Similarly, in 1573, Lorenzo Martínez de la Madrid, mayor of Valencia (current Venezuela), in his exposition recommending that the king create an Armada del Mar del Sur to protect the Spanish Pacific, also argued that the ropes and cables necessary for the cordage of the ships' rigging should be made from *pita* (Cappa 1894, 42). Furthermore, he suggested that major repairs to the rigging of the Spanish ships arriving in the Philippines could be effected, in part, with *abroma* fibers (*Abroma augusta* L.), *Calamus* or sweet flag (*Acorus calamus* L.), and coconut fiber (Cappa 1894, 54). The possibility of using *pita* as a complementary commodity along with European hemp for naval rigging facilitated the development of agro-industrial production centers, such as the one established in the Ecuadorian region of Jaén (under the jurisdiction of the Real Audiencia of Quito). The relevance of this manufacturing enclave is clear because of the connection it generated between the production and the consumption of cordage, textiles and sacks in nearby towns, cities and ports (Torres de Mendoza 1868, 9: 379). These active exchanges between *pita* producers and the consumption of articles for Spanish imperial needs are described in texts such as the *Relación General de las Poblaciones Españoles del Perú* by Juan de Salazar y Villasante (Cappa 1894, 94). According to the author, the shipyard in Guayaquil benefited from its geographic proximity to the island of Puná, where the indigenous population had specialized in manufactures made with *pita* since pre-Columbian times and benefited from the huge demand for yarns, cordage and textiles generated at the Spanish naval installation from the middle of the sixteenth century. This activity continued to develop in the 1730s (Juan and Ulloa 1826, 62). As a final example of the use of American *pita* to complement European hemp in Spanish South America's naval facilities, in 1795 the San Blas settlement recorded an annual consumption of this Mexican fiber of around 55 tons (Mosk 1939, 172).

The fact that the benefits of the *ghost American fibers* – to paraphrase Pomeranz – were not fully exploited, leads us to question the reasons behind this decision: was it solely due to European resistance to altering their customs or consumer habits, as occurred with other crops such as wheat, grapes or olives? Sources do not clearly point to a rejection of American plant fibers for exclusive reasons of consumer traditions, European tastes or resistance to change. On the contrary, Spanish reports generally present fairly precise comparisons detailing the final characteristics of articles manufactured with American plants, compared with those of European hemp. In other words, the Spanish colonizers were not reluctant to use what was available in terms of native plants for the manufacture of cordage and textiles. In fact, we know that American cotton was widely used in the sails of Spanish Pacific-going ships. This seems to point to the fact that the Spaniards were eminently pragmatic and practiced a degree of technical objectivity in their decision-making. The tests carried out on American fibers (resistance, traction, impermeability, etc.) manufactured as rigging showed, according to the results recorded at the time, that European hemp was far superior. The sailors and scientists, Jorge Juan and Antonio de Ulloa, rated the rigging and canvas made with *pita* in the shipyard in Guayaquil as far inferior to that brought from Spain, so it was only used to rig the smaller vessels (Juan and Ulloa 1826, 62). Similar technical opinions were voiced about the *pita* made at the San Blas station at the end of the eighteenth century.⁸ This qualitative differentiation of the fibers used in the Old and New World for their characteristics of greater resistance and tolerance has been discussed in some works, which emphasize that the lack of technical development in the production process would have determined the relatively low quality of American fibers compared to those produced in Europe (Alston, Mattiace and Nonnenmacher 2009, 104–5).

Technical appraisals, which estimated the *pita* to be inferior, were repeated with the parthenium weed (*Parthenium hysterophorus*), with a series of experiments carried out in Mexico around 1778, which concluded with the impression that the cordages manufactured with this plant had barely half the resistance of similar ones made with European hemp.⁹ There are numerous reports underscoring the difficulties and the fact that the fibers extracted from the plants lacked sufficient quality and strength. A similar picture is presented for *henequen*, which could not compete with European hemp in terms of resistance throughout the modern era. *Henequen* was criticized for its low endurance in humid environments to the point of being disqualified for use in Spanish naval rigging.¹⁰ In addition, *henequen* production was very limited; first, until the invention of the mechanical harvester in the United States and its distribution in Mexico in the first half of the nineteenth century, and, second, by the invention and implantation of mechanical scrapers in textile mills in the second half of the nineteenth century (Evans 2013).

These machines facilitated more profitable extraction of the *maguey* fibers and, at the same time, improved the quality of the articles manufactured from this vegetable. Both inventions led to what, in the words of some authors, became known as the *henequen boom* in Mexico during the second half of the nineteenth century (Alston, Mattiace, and Nonnenmacher 2009, 106).

The Introduction of Hemp to Spanish South America: Prohibition or Advocacy? Sixteenth Through Nineteenth Centuries

Having established the moderate impact of the use of *alternative ghost fibers* on Spain's requirements for major strategic naval equipment, the second way in which Pomeranz defined imperial dominions' extraordinary contribution, in terms of the greater availability of arable land, bears scrutiny. Some scholars and primary sources suggest that European mercantilism subjugated the American economies to protect the old continent's markets and manufacturing sectors (Mörner 1990). Without engaging in that debate or providing new evidence regarding the peculiarities of the Spanish empire's mercantilist model, it seems necessary to discuss how true or applicable this image of mercantilism proves with respect to the expansion of hemp cultivation in America.

Referring specifically to hemp, the idea that Spain had also curbed American economic possibilities in order to defend peninsular agricultural and manufacturing interests has been put forward repeatedly since the beginning of the nineteenth century. Among others, German geographer Alexander von Humboldt criticized the excessive control that Spanish colonizers imposed on the American hemp economy. Although Humboldt qualified this negative view of Spanish hemp policy in America in different editions of his works (Humboldt 1836, 373–75) with an explanatory note detailing the significant measures taken to promote the cultivation of European fiber in Mexico over the last quarter of the eighteenth century (Serrera Contreras 1974), for him, Spain had preferred to see the American population consume Asian products carried aboard the Manila galleons or European products rather than to encourage the manufacture of goods in America. More specifically, he explained that the Council of the Indies had hampered cultivation of hemp and the manufacture of hemp and textiles in Spanish America, and that only the arrival of the Bourbon reformers in the eighteenth century eventually permitted some degree of relaxation in its control (Humboldt 1822, 2: 376). However, our sources call into question Humboldt's depiction of this prohibitionist attitude on the part of the Spanish government and paint quite a different picture. It would appear that the Spanish monarchy endorsed and financed the physical transfer of the plant species to

America, encouraged its cultivation in all its domains and fostered the creation of hemp manufactures from the early 1500s.

The very evidence of European hemp's physical transfer to America transcends political decisions and gives us an idea of the logistical needs imposed by the complex transatlantic voyage. The seeds of *C. sativa* plant species (*cañamones*) were used to feed birds and some pack animals (donkeys, mules and horses) transported aboard the first ships that explored the Caribbean and later, the American continent. The first news of the plant's physical transfer with a view to its cultivation in the New World dates from 1513, with the dispatch of twenty kilograms of hemp seeds. As indicated in the texts of the provisions and royal writs, Spanish establishments should obtain the hemp they needed to cultivate and process it on the new continent. The documents also express the desire that the indigenous people become involved in the production of hemp-derived manufactured goods, underscoring their importance for the empire and for the local economy. In short, the royal provisions would appear to form part of a more ambitious plan that envisaged a certain degree of self-sufficiency in strategic hemp materials as imperial explorations and expansion in America progressed (Rio Moreno 1991, 299; Iglesias Gómez 2008, 268; Campos 2012). Similar dispatches were recorded in 1514 (with seeds sent aboard the fleet Pedrarias Dávila commanded), 1520, 1532,¹¹ the writ of 1537¹² and that of 1545 (Council of the Indies 1681, 117), which for some time was considered to be the initial date of the physical migration of European hemp to America;¹³ and finally the writ of 1554.¹⁴

Spanish sources highlight the difficulties faced by the first American hemp crops, emphasizing their limited extension, low profitability and poor acceptance among the native work force as well as the Spanish *encomenderos* (Gerhard 2000, 11). Efforts to foment the agro-industrial development of hemp originated from the royal officials, such as the president of the Real Audiencia de Nueva España Sebastián Ramírez de Fuenleal (J. de Torquemada 1615, 664), and even from members of the church (Zavala 1987, III: 60; FJ de Torquemada 1983, III: 307) who thought that the production of hemp and the manufacture of processed fiber could provide a suitable occupation for large numbers of natives. However, these measures do not seem to have achieved success. Of course, competition from other European produce for immediate consumption – mainly the production of wheat, wine and oil – was an important conditioning factor and to a considerable extent dictated certain preferences with regard to the use of land and the Indian work force (Crosby 1986). Furthermore, the Spaniards had to face crucial environmental problems, since the climate of many of their American dominions strongly differed from the ideal continental humid conditions of Belorussia and the Ukraine. Many regions of New Spain, New Granada and

Peru were close to the equator and the daily lowest temperatures rarely got down to 10°C.

Hemp's poor development on Mexican soil meant that the rigging required by the Spanish empire continued to be supplied by the homeland¹⁵ (Díaz-Ordóñez 2019, 191–93). Nevertheless, the growing demands of Spanish settlement in the New World in terms of construction, transport and navigation once again triggered measures to promote American hemp in the last quarter of the century. A notable example of such measures entailed the assignment of royal lands in New Spain to a lace maker, Martín Jiménez, from 1575 for the purpose of sowing hemp.¹⁶ These efforts appear to have been unsuccessful, according to contemporary sources, such as the texts of Horacio Levanto, who blamed their failure on an American preference for Asian fabrics over those made with Mexican hemp (Levanto 1620, 1). At the end of the sixteenth century, hemp harvests in Spanish America were very limited and widely dispersed, with hardly any in Mexico and Chile (Foster 1996, 72). The earliest crops, located in the vicinity of Mexico City, gradually began to disappear after 1600 and the only remaining major focus of hemp production in the new century was in Chile.¹⁷

Apart from the modest Mexican and Chilean harvests, hemp production was practically nonexistent in the remainder of Spanish America. Sources indicate a complete absence of the crop in Panama, Ecuador, Colombia and Peru.¹⁸ With the end of the Twelve Years' Truce in 1621, the Spanish empire began to suffer a major crisis due to the lack of Russian hemp arriving at the Cantabrian ports (Díaz-Ordóñez 2017, 72–74; Goodman 2001, 199). The Dutch and English merchants, who had been supplying the Spanish ports with such articles produced in Russia, would now and for several decades be enemies of the empire. The shortage triggered the reactivation of measures to promote the plantation of hemp in America, with the monarchy giving continuous instructions to the Council of the Indies and the American officials of the Río de la Plata, Paraguay and the Viceroyalty of Peru (Díaz-Ordóñez 2017, 74). In 1626, these orders were extended to Chile (Díaz-Ordóñez 2017, 74), where extensive crops already existed since the last quarter of the previous century. Some Spanish *encomiendas* on the outskirts of Santiago, in particular those located in Valparaiso region (Quillota¹⁹ and La Ligua²⁰), had specialized in the cultivation of hemp and had developed manufacturing industries for the process of hemp-derived products, including wick, cordage and rope for construction and transport and rigging for Chilean and Peruvian ships. These regions had the advantage of having a Mediterranean-type climate, but with continental influences, which permitted farmers in the Valparaiso region to sow hemp at temperatures below 10°C, therefore allowing the plants to grow for several weeks until harvest.

Two decades later, around 1640, most of the crops in Spanish South America had not grown, either geographically or quantitatively, except

for the hemp planted in Chile. Thus, the Chilean harvests became an important resource enabling the empire to overcome the problem of having to supply strategic products from Europe to these areas, which were both geographically remote and at war, while Spain was struggling to meet domestic demand. Chilean hemp, transformed into wick, essential for the operation of short- and long-barrel firearms, and the manufacture of rigging for the boats operating in the Pacific, guaranteed dominion over the region and its defense. In the first decades of the seventeenth century, the manufacture of rope wicks became an important economic resource for the Chilean *encomiendas*,²¹ enabling them to meet the persistent and considerable demands of the Spanish military forces defending the Mapuche frontier. It ended up developing into an important regional market, linking Chile with the Viceroyalty of Peru, with the sale of Chilean articles such as rigging and cordage for mining and for urban construction, in addition to the rope wick for troops stationed there (Quiroz 2010, 183). This connection between Peruvian demand and the Chilean supply of hemp is also revealed with the growing number of applications from 1600 onwards for licenses to go to the Indies from people involved in Spanish hemp manufacture, demonstrating that the sector was acquiring appreciable relevance in the Chilean economy (Díaz-Ordóñez and Rodríguez-Hernández 2017, 9). The intensity of this Chilean-Peruvian connection is underscored by the flow of financial settlements between the Royal Savings Banks of Lima and Santiago which refer to payments of regular annual purchases of rigging and rope destined for the officers of the viceroyalty from 1646 (Marichal 2017; Alcedo 1788, 4:61).

In 1627, the governor of Chile, Luis de Córdoba y Arce (1625–1629), recognized the central strategic and economic role of Chilean hemp production within the Spanish defense system (Díaz-Ordóñez and Rodríguez-Hernández 2017, 12). He stated that the ninety-two tons of hemp produced annually by Chile were concentrated in the fields around La Ligua and Quillota.²² In 1636, his successor at the head of government, Francisco Laso de la Vega, argued that the harvest could be increased if the port of Valdivia was integrated as an export platform, with the establishment of new plantations in the adjacent rivers (Díaz-Ordóñez and Rodríguez-Hernández 2017, 13). Just a decade later, in 1645, the Audiencia of Chile estimated the annual hemp harvest to be lower, situating it between sixty-nine and eighty tons, but nevertheless sufficient to meet the demands for rigging the ships operating in the Pacific. He contended that if the monarchy committed to purchasing the crop in advance it could boost the production of hemp in Chile and increase the harvest to 500 tons per year, given the favorable climate and physical characteristics of the region. The Audiencia added that the decrease in indigenous labor force and the Portuguese rebellion of 1640, which reduced the slave trade in Buenos Aires and created a deficit of slave labor to attend to the sowing, harvesting, preparation and manufacture of so many crops,

would dictate the final figure (Díaz-Ordóñez and Rodríguez-Hernández 2017, 14). These quantities coincide with later information, such as the *arbitrista* project of 1644, put forward by the rancher Martín de Espinosa and Santander (Góngora 1970, 53–54) who estimated that, if supported, the sector could grow to about 345 tons per year.

Chile's strategic role as supplier of hemp to the Spanish Pacific was closely linked to the region's economy and especially to the empire's defense. The port of Valdivia as a dispatch center for hemp wares provides a cogent example of its importance. However, indigenous conflicts or the presence of rival European fleets, such as the 1646 rumors announcing the presence of a Dutch squadron like the one Hendrick Brouwer commanded years before, accelerated the shipment of defensive materials, in particular wick and rigging.²³ This strategic economic activity had considerable impact on Chilean society as a whole, as it strengthened the connection between the Indians and the *encomiendas* or *estancias* and obliged them to undertake activities completely foreign to their tradition. And on many occasions this gave rise to cases of abuse on the part of the Spaniards in charge of these establishments and complaints of the overexploitation of the Indians assigned to them (Barros Arana 1890a, 4: 420). At the same time, Chilean hemp products became a bargaining chip in the purchase of services sold by the monarchy (Díaz-Ordóñez and Rodríguez-Hernández 2017, 15) and were widely used by Chilean merchants and producers as barter in the purchase of Asian and Spanish products that reached the Peruvian markets (du Biscay 1943, 82).

But to what extent did this South American production of hemp serve Spanish imperial global needs? As discussed, it would appear that it served to meet regional demands in the Pacific, although it was not viewed as a solution on a global scale for Spain partly due to production costs in Chile; but, more importantly, the elevated cost of its carriage to the peninsula (freight, insurance, loading and unloading, etc.) rendered it inadvisable. However, the fact that the South American production could not be used as ghost acreages for the Spanish empire dictated a new connection with the Spanish mainland, because from the 1720s the crown was obliged to once again instigate measures to promote the cultivation of hemp in traditional fiber-producing regions, such as La Rioja and Granada (Goodman 2001, 204–6).

In the first decades of the eighteenth century, as shown in Map 3.2, Spanish South America continued to show a marked presence of hemp cultivation in Chile and its contrasting absence in the rest of its geographical landscape (Juan and Ulloa 1826, 84; Cooney 1979, 105). However, even in Chile Spaniards failed to obtain abundant harvests, especially in the area around Valparaíso, due to the belligerence of the natives who had not been subjugated (Juan and Ulloa 1826, 47). Although we have not been able to quantify Chilean hemp production for the eighteenth century, it seems that it did not increase above the approximate ninety



Map 3.2 Distribution of Goods Manufactured from Hemp in Spanish South America (1570–1800) and Places of Cultivation.

Source: prepared by the author from sources and bibliography. Software GIS QSIG 2.18.4.

tons per year, which Governor Córdoba mentioned in his reports for the previous century (Barros Arana 1890a, 4: 302). The Jesuit establishments had spread in the region, and by the end of 1767 they operated a vertical production structure, from the sowing of hemp to the manufacture of rigging and wick (Barros Arana 1890b, 6: 252). Around 1780, according to the authors of the time, Chile continued to produce less than one hundred tons per year (Arteta de Monteseuro 1783, 137). The quality of its sowings was so well recognized by the Spanish authorities that, in 1796, seeds of this hemp were sent to New Spain (Serrera Contreras 1974).²⁴ However, the importance of the hemp economy persisted with the end of Spanish dominion. Accordingly, within the framework of the Chilean emancipation movement of 1818, the independence faction offered Great Britain the export of its hemp harvests at very low prices in exchange for support in the conflict against the Spanish government (Barros Arana 1890c, 12:47).

Conclusion: Towards an Ecological Explanation

During the whole colonial period Spanish settlers in South America managed to establish the constant cultivation of hemp only in specific areas in Chile. The case of hemp contradicts the mercantilist thesis that defended European versus American economic prioritization, presenting two key arguments: first, the Spanish empire, far from promoting its prohibition or limitation, put in place measures to support the plant's migration and agro-industry in America; second, continuous experiments were carried out to obtain *alternative ghost fibers*, given the existence of different plant species in the American biota (*pita*, *benequen*, *maguey* and *caraguatá*), while it is true that the Spanish authorities had to conclude that these could not compete with European hemp on account of its very distinctive technical characteristics suitable for the construction of rigging. The use of cotton, woven by the inhabitants of Cajamarca and Chachapoyas, in the manufacture of sails destined for Pacific ships is the best example of Spanish duality in the strategic supply of these materials in America: tested and integrated into the supply of naval equipment for the region and, at the same time, replacing the scarce supply of European hemp canvas imported from Spain. In short, this overall context coincides with Pomeranz's concept of colonial *ghost acreage*.

While the ships sailing in the Spanish Pacific were supplied with this Chilean production of hemp and the sails made with native American cotton, the Atlantic continued to suffer a marked shortage of these manufactured goods required in shipbuilding. For this reason, an establishment such as the naval dockyard of Havana, which launched more than one hundred ships during the eighteenth century, continued to depend on the rigging and sail mostly made with Russian hemp at factories located at the Spanish mainland ports of Ferrol and Cadiz. The limited Spanish

success with hemp on American soil brings us closer to the concept of connected stories, in which the motherland, which had previously acted as the driving force of this agricultural development in its overseas possessions, was forced, partly by the difficulties it faced as a result of interruptions in the supply of Russian hemp brought about by European wars, to reactivate policies of national agricultural development that ended up altering the agrarian landscapes of large areas of domestic Spanish territory, such as La Rioja and Granada.

Our current research will try to clarify why Spanish authorities were unable to secure adequate hemp crops in America, while they managed to increase its production on the Peninsula (Díaz-Ordóñez 2016, 2006b). At the time, some observers blamed Indians who had “no instruction in the matter, no knowledge of the plant, no idea to form the spinning machine, and weave”.²⁵ But this explanation seems inadequate as many practitioners and experts in the field, who could have trained the natives, obtained licenses in Spain to travel and settle in the Indies. In the eighteenth century, the dispatch of technical instructions to guide the farmers in their harvesting activities intensified. Therefore, hemp’s failure to prosper in southern Spanish America derived from neither a lack of Spanish interest nor farmers’ poor agricultural knowledge in the New World. The ecology of hemp itself suggests further explanations for its limited spread in America. Political, commercial and social considerations may have influenced the growth of hemp less than other requirements, including light, climate and soil, may have influenced. As has been pointed out, the conditions of the sowing temperature, which benefited the Russian territories of Belarus or Ukraine, seem to have harmed the Spanish in their American enterprise. Hence, environmental contexts and ecological constraints require more attention in the future.

Notes

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2. Bouby 2002, 89–92; Kroll 2001; Wild 2002, 7.
3. Romano 1962, 575; Unger 1992, 248; Van Zanden 2000, 82; Maddison 2001, 77; Aldcroft and Sutcliffe 2005, 36.
4. López de Velasco 1894, 95; Sánchez Valverde 1862, 66; Benítez 2013.
5. Zorita 1909, 1:128; García Icazbalceta 1858, 1:244; La Renaudière 1844, 40.
6. Charlevoix 1910, 1:42; López de Velasco 1894, 551; Napp 1876, 273.
7. Archivo General de Indias (hereafter AGI), Indiferente, 443, L.35. Cord-makers’ guild to the officials of the Casa de la Contratación. Madrid; 25 October 1689.
8. AGI, Indiferente, 101. Capellán de San Blas; Mexico, 19 June 1792.

9. AGI, Indiferente, 100. Andrés Gómez Moreno a José de Gálvez; Madrid, 12 November 1778.
10. Archivo Histórico Nacional (hereafter AHN), CODICES, L. 729. Indies dictionary of government and legislation. C. Tom. I (CAB- CER). Voz Cañaño.
11. Puente y Olea 1900, 416; Iglesias Gómez 2008, 268; Rio Moreno 1991, 166.
12. AHN, CODICES, L. 729. Indies dictionary of government and legislation. C. Tom. I (CAB- CER). Voz Cañaño.
13. Dewey 1913, 291; Mosk 1939, 171; Hill 1983, 56; Small and Marcus 2002, 284.
14. AHN, CODICES, L. 729. Indies dictionary of government and legislation. C. Tom. I (CAB- CER). Voz Cañaño.
15. Archivo General de Notarías de Ciudad de México (Hereafter AGNCM), SDHN/371, Notary 1, Vol. 8, Leg. 4. 11 October 1563.
16. AGNCM, SDHN/5224, Notaries Office 1, Vol. 9, Leg. 12, 421/421v. 12 January 1575.
17. Díaz-Ordóñez and Rodríguez-Hernández 2017, 7; Díaz-Ordóñez 2005.
18. Serrano y Sanz 1908, 170; Torres de Mendoza 1868, 9:291 and 428; Cobo 1891, II:418; Díaz-Ordóñez 2017, 77.
19. Díaz-Ordóñez 2005; Keller and Silva Castro 1960, 24; Alcedo 1788, 4:356; Gay 1862, 15.
20. Góngora 1970, 25; Contreras Cruces 1999.
21. Errázuriz Valdivieso 1881, 1:411; De Ramón 1960, 90.
22. AGI, Chile, 19, R. 7, N. 69. Luis de Córdoba y Arce; Concepción, 1 February 1627.
23. AGI, Audiencia of Chile, Leg. 11. Santiago de Chile, 24 May 1646
24. AGI, Indiferente, 1559. Viceroy of New Spain to Viceroy of Peru; Mexico, 12 January 1796.
25. Royal Heritage. Royal Library, Manuscripts II/622, f. 82v-84v

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