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TECHNOLOGY AND THE COLOMBIAN FIQUE INDUSTRY: DRAWING FROM LATIN AMERICAN EXPERTISE, 1880-1938*

TECNOLOGÍA Y LA INDUSTRIA FIQUERA COLOMBIANA: APROVECHANDO LA EXPERIENCIA LATINOAMERICANA, 1880-1938

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ABSTRACT

This article examines the technological origins and changes of the Colombian fique (henequen) industry throughout the late nineteenth and early twentieth centuries. It argues that the industry was established and reached significant levels of growth, in part due to the input of Colombian intellectuals, entrepreneurs, and scientists who examined global developments, disseminated useful knowledge, and sought to adapt suitable crops, practices, and technologies to Colombia's particular needs, settings, and social traits. These individuals looked mainly at Mexico. This history challenges the traditional assumption that Latin American countries generally developed a technological dependence on the North Atlantic nations. Mid-nineteenth-century Mexican inventions turned out to be particularly useful to Colombians seeking to foster small productive units in rural areas. The Colombian fique industry developed initially as "patrimonio de los pobres" ("heritage of the poor"). Attempts to introduce sophisticated, expensive technologies proved futile.

KEYWORDS

Fique, henequen, natural fibers, textile industry, technology, patents, Mexico, Latin American history.

RESUMEN

Este artículo examina el origen de la industria fiquera colombiana y el cambio tecnológico dentro de esa industria a fines del siglo XIX y principios del XX. Sostiene que esta industria se estableció y pudo alcanzar niveles significativos de crecimiento en parte porque algunos intelectuales, empresarios y científicos colombianos examinaron desarrollos globales, difundieron conocimiento útil y buscaron adaptar cultivos, prácticas y tecnologías adecuadas a las necesidades y rasgos sociales particulares de Colombia. Estos individuos observaron principalmente a México. Esta historia desafía el supuesto tradicional de que los países latinoamericanos generalmente desarrollaron una dependencia tecnológica en las naciones del Atlántico Norte. Invenciones desarrolladas en México a mediados del siglo XIX resultaron ser particularmente útiles para los colombianos que buscaban fomentar pequeñas unidades productivas en las áreas rurales. La industria del fique colombiana se desarrolló inicialmente como "patrimonio de los pobres". Los intentos de introducir tecnologías sofisticadas y costosas resultaron inútiles.

PALABRAS CLAVE

Fique, henequén, fibras naturales, industria textil, tecnología, patentes, México, historia latinoamericana.

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INTRODUCTION

Towards the end of the nineteenth century, various local intellectuals, entrepreneurs, and scientists looked for models of productive agricultural and industrial enterprises worldwide and found that Latin American experiences, rather than the North Atlantic developments, provided more appropriate models to adopt to Colombia's particular circumstances. They examined and sought to adapt to Colombia's different regions, a variety of crops, pastures, and animal breeds, as well as industrial sectors, methods, and technologies that they believed were contributing to the economic growth of neighboring countries, such as Argentina's cattle, wool and manufacturing industries, Chile's wheat production, and Mexico's cotton and henequen-based textile industries. (*Industria algodonera*, 1899; López, 1906a; Observatorio Astronómico Nacional, 1885) Likewise, Colombian intellectuals studied the railway system in neighboring countries. Concerned citizens such as the Colombian priest Federico Cornelio Aguilar also proposed during the 1880s to establish Schools of Arts and Crafts following the example of Argentina, Uruguay, Chile, Peru, Mexico, Ecuador, and Venezuela. (Aguilar, 1884a; *Discusión relativa a la ley nacional sobre fomento de varias mejoras materiales y colonización de tierras baldías*, 1871; "Ferrocarriles de Chile," 1889; *Mensaje que el Vicepresidente de la República encargado del poder ejecutivo dirige al Congreso Nacional en sus sesiones extraordinarias de 1903*, 1903; Pérez Triana, 1911; Railroad Gazette, 1888)

Some Colombian political and intellectual leaders came to conclude that, as in the case of government systems and institutions, the productive structure of a nation was grounded in specific geographical, political, social, and cultural traits. However, although the North Atlantic was actively producing innovative know-how and technologies to mechanize agricultural and industrial production, the process of technology transfer from the north was not straightforward.² In fact, for most of the nineteenth century, to reach Colombia's main urban hubs in the Andean highlands, imported merchandise and technologies were required to travel several weeks by antiquated transportation systems (including indigenous *silleteros* and *cargueros*) through turbulent rivers, rough mountains, muddy roads, and tropical forests. Technological hardware was scarcely introduced and adopted in Colombia until the 1900s when, aided by a few rail lines connecting major productive centers with the Magdalena River, which was the sole trade artery flowing into the Atlantic during the nineteenth and most of the twentieth centuries. Local entrepreneurs began a gradual process of mechanization of production in regions like Antioquia. (Botero Herrera, 1984; Brew, 1977; Campuzano Hoyos, 2006; Grupo de Historia Empresarial Eafit, 2013; Montenegro, 2002) In a context of limited introduction of North Atlantic technologies, technical expertise remained as the privilege of a few, including some foreigners and local inventors and engineers who built foundries

² *Technology transfer* "denotes not just successful adoption and commercial use, but also the local assimilation of the knowledge and expertise necessary to troubleshoot, repair, modify, adapt, and perhaps replicate imported technologies. Such technological capabilities can stimulate and sustain local creativity, invention, and innovation." (Beatty, 2015, p. 17)

and ironworks to supply technologies appropriate to Colombia's emerging industrial settings. (García Estrada, 2006; Mayor Mora, 2005; Valero, 1999) Some Colombian intellectuals, entrepreneurs, politicians, and scientists came to realize that new types of machinery and methods responded largely to the particular questions, needs, and circumstances that differed radically from the issues, needs, and conditions of late nineteenth-century Colombia. During that time, examining neighboring countries became highly relevant, as it offered to the observer's eyes a context more similar than the North Atlantic. Just as many Colombians perceived Porfirio Díaz's administration as a reliable and efficient government which had established peace, order, and progress—in spite of its many critiques—these concerned Colombians found that Mexico's productive enterprises could be an appropriate model to adapt to Colombia's context (Ospina Vasquez, 1955).

From a historical perspective, and by examining a variety of primary data like statistics, laws, official reports, newspaper articles, and travelogues, this article examines the origins and technological changes of the Colombian fique industry through the late nineteenth and early twentieth centuries. It argues that the industry was established and reached significant levels of growth in part because of the contributions of Colombian intellectuals, entrepreneurs, and scientists who examined global developments, disseminated useful knowledge, and sought to adapt suitable crops, practices, and technologies to Colombia's particular needs, settings, and social traits. These individuals looked primarily at Mexico. This article challenges traditional assumptions that identify the North Atlantic as the quintessential provider of models for Colombia and Latin America in general. Some historians, such as the Colombian Germán Colmenares and the Spaniard Josep Barnadas, had pointed this out in the late 1980s, however, little attention has been paid to Colombia's history within wider hemispheric contexts. (Maignashca, 2011).

The Colombian fique industry comprised both the cultivation and exploitation of fique, and the manufacture of goods out of its fiber. Originally from tropical America, the Colombian fique (*furcraea*) and the Mexican henequen (*agave*) are essentially the same plants. Closely related, but taxonomically different, they yield a similar stiff fiber. Primarily known as *fique*, *cabuya*, and *pita* in Colombia, this thread was commonly used to handcraft a wide variety of items like rope, coarse clothes, shoes, baskets, shoulder bags, blankets, and hats. Due to its quality and resistance, this natural fiber had fulfilled functions of protection, mooring, and packing since pre-Columbian times (Correa, Restrepo de Moreno, & Velasquez M., 1983; Restrepo Tirado, 1892; Zamosc, 1981). During the second half of the nineteenth and first half of the twentieth centuries, some Latin American countries looked to develop a textile industry by exploiting this filament and focused on growing selected plant genera. While henequen had been cultivated and industrially exploited in Mexico since the 1850s, fique became the second most crucial textile plant in Colombia (after cotton) decades later (Hermano Justo Ramón, 1960; Nickel, 2011; Topik & Wells, 1998). During the first half of the twentieth century, both growing fique and handcrafting

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cabuya goods became the primary economic activity of many smallholder and artisan families in rural Colombia. Although some Colombians did look at North Atlantic models and technologies, many found them not appropriate for Colombia's particular conditions. In fact, this expansion responded to the successful adoption and local assimilation of affordable and suitable technologies that had been inspired primarily by Mexican models since the 1900s. Although three kinds of technologies were key to this industry (defibering machines and steam pumps to prepare the fiber as raw material, and looms to manufacture fique products), this article focuses on one specific technology transfer: the Mexican *Rueda de Solís*, an original Mexican invention that was adapted to Colombia's particular circumstances.

Mexico's henequen industry had grown exponentially and had introduced cutting-edge machinery since the 1870s. However, older Mexican inventions turned out to be particularly useful to Colombians seeking to foster small productive units in rural areas. The Colombian fique industry developed initially as "*patrimonio de los pobres*" ("heritage of the poor"). Attempts to introduce sophisticated, expensive technologies proved futile. This article focuses on several Colombian scientists and intellectuals like Alejandro López, the foremost promoter of and one of the major contributors to the expansion of the fique industry in Colombia during the first half of the twentieth century. He examined and drew appropriate models to adapt to Colombian technologies and expertise from neighboring countries like Mexico, nations that the historiography on business and economic history have traditionally considered as consumers rather than producers of useful knowledge and technology.

FROM THE PRE-COLUMBIAN CARRIZO TO THE MODERN RUEDA DE SOLÍS

The defibering machines developed in Mexico during the nineteenth century would revolutionize the fique industry in Colombia decades later. During the 1840s and 1850s, the first modern defibering machines were invented in Yucatán, with relatively good results (Benítez, 1985). Adapting knives to one of the wheels of his carriage, the Franciscan priest Florencio Cerón solved the major mechanical problem regarding the henequen defibering process. His invention became known as the result of the pamphlet that Efraín Rivadeneira Ramírez published in 1846, entitled "*El principio de la rueda desfibradora de hojas de henequén. Pbro. Florencio Cerón.*" (Monsreal Boldo, 1986, p. 35) The rotary scraping principle that Cerón conceived became the model for several different machines of the same type. Necessary adaptations were made according to the kind of blade and other variables considered by the respective inventor (Cardona Sánchez, 2002). In 1863, four different defibering machines, whose inventors were the Mexicans José María Millet, Ramón Juanes Patrulló, Manuel Cecilio Villamor and José Esteban Solís, were performing relatively well (Barba, 1895). In 1872, the Venezuelan intellectual Ramón Páez highly regarded this piece of Mexican invention. In a book he published to promote useful technologies within Latin American countries, Páez stated that "for many years, the mechanical ingenuity of Europe and the United States has been exercised, with very little success, in

inventing machines to clear the maguey stalk, instead of the slow and painful work of scraping it by hand, as has been done in Yucatán and other parts of America from time immemorial. This honor was reserved for two Yucatecans, Solís and Patrulló, who have finally managed to perfect their inventions to the point of being able to clear with them a large number of stalks per day,” (Páez, 1872, pp. 264-265). Solís’ invention, however, seemed to have offered the best results, because “the machine that is normally used in our farm fields has taken his name,” said the Mexican engineer Rafael Barba in 1895 (Barba, 1895, p. 7). According to the Colombian inventor Alejandro López, who would carefully study these creations at the dawn of the twentieth century, the Mexican scraper (or *Rueda de Solís*, as some called it), was “a steering wheel with bronze blades on the periphery and with beveled edges; a curve that is applied exactly to the circumference described by the blades, and that can be made out of wood or bronze; [it also has] a press, whose design varies with each manufacturer, and whose function is to strongly hold half the plant sheet while the other half is being defibered,” (López, 1932b, pp. 1513-1514). During the last two decades of the nineteenth century, the popularization of this and other similar machines contributed to the expansion and progress of the henequen industry in Mexico, and later to the adoption and development of industries alike in regions producing similar fibers within the Americas, like Colombia.

Based on the example of Mexico during the 1880s, several Colombian intellectuals, entrepreneurs and politicians regarded henequen and fiber plants alike as an opportunity to develop an export commodity, rather than a product to supply national market needs in Colombia. This search for cash crops in Colombia, and overall for a more extensive variety of natural sources of state revenue, was part of a broader export boom that Latin America was experiencing during the 1870s (Beckman, 2013; Sánchez, López-Uribe, & Fazio, 2010; Topik & Wells, 1998). Further, Colombian intellectuals believed that as fiber plants grew naturally in the intertropical areas, its production and commercialization could be suitable to Colombia’s natural, social, and economic circumstances. During the 1880s, official documents, newspaper articles, private correspondence and personal writings hinted that producing natural fibers like henequen in Colombia would promote as much economic growth as this industry had developed in countries like Mexico. In fact, Mexico’s henequen industry had grown exponentially and had introduced cutting-edge machinery by 1880, offering useful experience to Colombia’s contemporary observers (Bulmer-Thomas, 2003).

The Colombian priest Federico Cornelio Aguilar, who dedicated several decades of study to the comparative analysis of Colombia against the rest of the Latin American countries, stated in 1884 that Colombia had great potential to develop the fique industry and that the quality of its fiber was better than the Mexican henequen. To him, the fique industry would contribute to developing Colombia’s export sector. He reported that the Mexican henequen industry was relatively new because “in 1877 it was newly established and only yielded \$ 242,586 for export”; and that in his

view “Colombia could also add that item to its exports, because its soil abounds in fique stalks” (Aguilar, 1884a, p. 233). He also argued that while in Mexico in 1882 this industry had grown exponentially, exporting \$3,907,585 of henequen, “Colombia does not export a single strand,” (Aguilar, 1884a, p. 210). Aguilar believed that his home country was able to export as much and more fiber than Mexico because, “Colombia abounds in aloe plants, and its fique is finer and silkier than the Mexican one,” (Aguilar, 1884a, p. 210). In an article Aguilar published in the Colombian *Anales de Instrucción Pública* in 1884, he invited Colombians to engage with this industry and stressed how Mexico was exporting great quantities of henequen to the United States, and in a provocative tone he asked, “Could we not do the same in our country, where the plant that produces it is so much more abundant?” (Aguilar, 1884b, p. 520). A year later in 1885, in a book Aguilar published narrating his “last year of residence in Mexico”—as he entitled it—he insisted that “in Colombia there is also abundance of fique or henequen and, in imitation of Mexico, their cultivation and exportation should be undertaken,” and affirmed that this industry augured a profitable future for Colombians because “our fique is finer and of better quality than the *ixtle* or Mexican henequen,” (Aguilar, 1885, p. 207). Although Aguilar’s cries seemed to have had no major practical effects, his pioneering considerations contributed to raising expectations of developing the fique industry in Colombia towards the end of the century, mainly after a pattern of steady growth in the Mexican henequen industry had developed.

Aguilar was not alone in this quest for following in Mexico’s footsteps. Towards the late 1880s, other Colombian intellectuals and statesmen began to perceive the Mexican economy and particularly its henequen industry as a model for establishing the Colombian domestic fique production. In 1889, two Colombian citizens sent a letter from Mexico to the president of Colombia, Rafael Núñez, and testified the advantages that the henequen industry had brought to the Mexican economy.³ In fact, henequen exports were equivalent to one third of Mexico’s merchandise exported yearly (not counting precious metals) from 1887 to 1890 (International Bureau of the American Republics, 1892, pp. 172–174). They reported that the Mexican henequen industry could be a model for stimulating the cultivation of fiber plants like fique and its industrial exploitation in Colombia (Zamosc, 1981). Likewise, in 1890, after finishing his period as a consul in San Francisco, and on his way back to his homeland, the Colombian statesman and intellectual Ernesto Restrepo Tirado lingered in Mexico, “where he studied the cultivation of henequen,” as he reported in a book he published examining Colombia’s aboriginal population. (Restrepo Tirado, 1892, p. iii).

Within Colombia, interest in this economic sector also grew. In 1890, interested in grasping the difference between fibers like fique, henequen, sisal, sisal-hemp and Manila fiber, and how the Colombian fique was known in the New York market, the anonymous writer “E” asked the Bogotá newspaper *El Correo Nacional* to clarify his

3 The source does not reveal the name of these Colombians, and the author of this article could not identify them in any other source (Zamosc, 1981).

questions regarding this jargon, and complained that a useful book the Mexican government had sent to Bogotá's "Agricultural Library" with this information was borrowed by someone who had neglected to return it. (E, 1890, p. 2) Two weeks later, the newspaper editors responded that "henequen, hemp, sisal, grass, cabuya, fique, etc. are the same thing—the product of the plant called maguey." ("Correspondencia. Respuesta a E," 1890, p. 2) They also indicated that "the Yucatán peninsula, formed by arid, dry and volcanic soils, is the place where this plant is most successfully cultivated, and whose product goes to the United States to serve for rigging, ties, sacks and various other uses," and that the annual harvest "produces six to ten million dollars," ("Correspondencia. Respuesta a E," 1890, p. 2). In January 1891, nom de plume A. G. V. also responded to E., and besides expounding on scientific explanations about differences among these plants and fibers—which helped the readership rectify some previous answers' imprecisions—the author offered further details. Regarding the fique's international market, A. G. V. explained: "So far our fiber is not well known in the New York market because large exports have not been made, only small shipments of samples which have been judged by their good quality, as better or equal to the fibers of henequen; and hopefully this will serve as a stimulus to establish among us, so scarce of export products, the henequen industry," (A. G. V., 1891, p. 3). Days later, this newspaper published a note promoting publications of "industrial application," and offered a review of Desplats & Gregoire's *Dictionnaire des Sciences, des Lettres et des Arts*—a relevant scientific dictionary. ("Obras de aplicación industrial (en francés)," 1891) In this review the newspaper editors delved into clarifying the term *Abacá*, which "is unknown, as we suspect, by the generality of our readers," and explained that *Abacá* "is a textile substance extracted from the leaves of a variety of plantain, also known as Manila hemp, or simply Manila, an article that must exist in abundance in our country and which we could export or make use of in large quantities. It makes fabrics that have the shine and softness of silk, and that would probably be more valuable than fique." ("Obras de aplicación industrial (en francés)," 1891, p. 1) Encyclopedic knowledge about these fibrous plants and their potential industrialization had come to circulate more widely in Colombia towards the end of the century.

The increasing interest in fiber plants and the henequen industry in general was also disseminated through specialized periodicals in Colombia. The renowned Colombian naturalist and agronomist Juan de Dios Carrasquilla Lema had also looked at Mexico for appropriate models to Colombia. Founder of the Colombian periodical *El Agricultor*, Carrasquilla dedicated a full issue in 1893 to promoting the henequen industry in Colombia, a crop he believed would bring to Colombia export prospects as wide as neighboring countries were enjoying (Carrasquilla Lema, 1893). Aiming to promote this industry in Colombia, *El Agricultor* continued to publish articles examining the henequen industry in countries like Mexico, El Salvador, and Cuba throughout the 1890s (Zamosc, 1981). During the third quarter of the nineteenth century, the industrialization of fiber plants was capturing the attention

of many Colombians, and the experience of Mexico became an essential reference due to its traditions and successful development.

As a matter of national interest, Colombian diplomats also contributed to raising awareness of the value of the natural fiber industry generally, exploring the appropriateness of different species that were being cultivated in some of Colombia's neighboring countries. Signed on September 30, 1900, an official memo reminded Colombian consuls that since 1866 (law 23) they were required to let Colombians know about "the most useful data on trade and industry, and on the advancement of science and arts in the consular district where performing consular functions," (Martínez Silva, 1900, p. 150). Colombian consuls in Latin American countries reported the benefits Colombia's economy could gain by cultivating crops like *sansevieria*, which yield a hard fiber—like fique and henequen, and could be used for the same purposes. In August 1901, the Colombian plenipotentiary minister in Caracas sent a report regarding the cultivation of *sansevieria* and the exploitation of its fiber, "with the purpose of recommending [its] cultivation in Colombia, which would give a magnificent article of export," ("Cultivo de la Sanseviera," 1901a; "Cultivo de la Sanseviera," 1901b; "Cultivo de la Sanseviera," 1901c; Ministerio de Relaciones Exteriores de Colombia, 1901, pp. 404-406; "Revista oficial y noticiosa. Agosto 2 de 1901," 1901, p. 1283). During the 1900s Colombian periodicals would disseminate some diplomat's reports, like the newspapers *El Nuevo Tiempo* and *Revista de Instrucción Pública* which published the Colombian consul in Lima Carlos Vallarino Miró's study "on the cultivation and commercial and industrial value of the plant called *sansevieria guineensis*," ("Cultivo de la sansevieria," 1905, p. 303). Based on his analyses and on Professor D. Augusto Dorco's experiments, Vallarino advocated introducing this crop in Colombia and developing its industry. "There are a dozen species of this plant, whose names I know," introduced the Colombian consul, "but as it is not my intention to make scholarly ostentation, but to transplant to my homeland a crop that can be extremely productive to get Colombia out of prostration, [...] I will speak only of the *sansevieria guineensis*," (Vallarino Miró, 1905, p. 306). His report drew the attention of several Colombian statesmen, who managed to send him 100 pesos towards the shipment from Peru to Colombia of "the quantity that you consider convenient of some seeds of the mentioned plant, with the necessary instructions on its cultivation," ("Cultivo de la sansevieria," 1905, p. 303). Vallarino argued that *sansevieria* was "far superior to fique or henequen due to the promptness with which it grows and the superiority of its beautiful fiber, which is suitable even for fine fabrics, and it replaces fique in all its applications and uses," (Vallarino Miró, 1905, p. 308). Based on these reports, the governor of Atlántico department decreed "to establish in each municipality an area for the cultivation of this fibrous plant," (López, 1906b, p. 95). Despite isolated efforts to foster it, the *sansevieria* industry did not develop in Colombia. Plantations for fique rather than any other similar plant would prevail. The circulation of printed materials detailing foreign and local crop experimentation was critical to this end.

Colombian entrepreneurs had also begun to regard fique as a potential agent for encouraging modern, domestic manufactures rather than an export commodity, as was generally advised by Colombian travelers and experts during the 1880s and 1890s. Beginning in the midst of the Thousand Days' War (1899-1902), Colombian coffee exporters looked to foster the growth of the domestic sacks industry and start replacing imported ones. The Bogotá newspaper *La Opinión* reported in 1901 that "due to the high price of the bills of exchange, some of the members of the guild of exporters have thought to take advantage of the fique fiber in the manufacture of sacks to pack coffee, instead of those that were previously brought from Europe. We know that soon a factory will be established with appropriate machinery to take advantage of the precious [fique] plant, which is produced with such abundance even in the driest places of our territory," ("Nueva industria," 1901, p. 672). The fique industry was already quite significant in regions such as Santander where, according to "fairly accurate data" gathered by the historian and geographer Francisco Javier Vergara y Velasco, by 1892 there were thousands of industrial plants, among which he calculated 5,800 spinning mills, 1,640 workshops of wool and cotton textiles, 5,000 of fique cloth, and 10 of *alpargates* [espadrilles] (Vergara y Velasco, 1901, p. 762). Despite Vergara y Velasco's hint of exaggeration, Santander and Norte de Santander had taken the lead in developing the Colombian fique industry since the late nineteenth century (Table 1). At the turn of the century, however, the production of fique twine and goods remained rudimentary in Colombia, with no significant technological change. Pre-Columbian tools and devices would continue to be used in this industry during the early twentieth century, when innovative machinery would begin to displace traditional devices, boosting production and standards of living for many Colombian smallholding and artisan families.

Aiming to provide Colombians appropriate models to Colombia's particular context from neighboring countries' experiences, specialized local publications began more often to circulate during the 1900s. Some of them sought to respond to specific objectives and industrial interests like the development of the textile industry in Colombia. Although entrepreneurs like Pedro Nel Ospina had already visited Mexico to draw models of cotton-based textile industries for Colombia, and a few industrial factories were already running in Colombia—mostly in cities like Barranquilla, Samacá, Medellín, and Bello—this sector was still incipient (Aguas, 1993; Montenegro, 2002; Ospina Vasquez, 1955). In 1906, the Colombian scientist Juan Bautista Londoño published a book seeking to promote the textile industry in Colombia, and along with some textile-plant samples, he presented it in the industrial exposition that was held in Medellín in 1906 (Pinillos, 1906). Aiming to offer appropriate information to Colombians looking to establish textile plantations and factories, this book embodied an effort to synthesize knowledge produced in these fields during the last decades. Regarding the industrialization of hard fiber textiles, Londoño stated that "I have taken the trouble to consult several writings on agaves from Mexico and Central America [...] with the sole purpose of knowing if it

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would be convenient to introduce any of them, and which ones I should recommend,” Londoño remarked (Londoño, 1906, p. 5). “If what is desired is to introduce henequen or sisal,” he concluded, “I consider unnecessary to make such an expense, given that our cabuya is at least equal, commercially, to the best henequen,” (Londoño, 1906, p. 5). Londoño also stated that experts in the field shared his concept, including the renowned naturalist and agronomist Juan de Dios Carrasquilla, who had been publishing his observations regarding the henequen industry in *El Agricultor* since the early 1890s (Zamosc, 1981). Given the promising future that Carrasquilla and Londoño had predicted for the Colombian fique industry, Londoño invited his fellow Colombian readers to “establish good cabuya plantations, to keep them clean, and to exploit them with all diligence for *domestic use*⁴ in the meantime, and to export it making good and inexpensive sacks for packing coffee,” (Londoño, 1906, p. 6). Based on these assessments, a newspaper article glossing the Industrial Exposition concluded that “the cultivation of sansevieria, henequen, pita, and corozo palm [...] would give a powerful increase in our progress,” (Pinillos, 1906, p. 2744).

The production of knowledge regarding fiber plants and their industrial exploitation in neighboring countries allowed people like Londoño to assert that the introduction of a new variety of fiber plant was unnecessary in Colombia, and that to make the fique industry succeed it was paramount to learn—seemingly from Mexicans—how “to manage well the cultivation and exploitation of the plant,” (*Guia para viajar por el departamento de Antioquia.*, 1927; Londoño, 1906, p. 6). Key to this learning process was, in Londoño’s view, the adoption of appropriate defibering machines “like the one Dr. Alejandro López [invented and] entrusted to the skillful *maquinista* [engineer] Mr. Pedro Velilla,” who was one of the owners of *Fundición Estrella* (later *Fundición y Talleres de Robledo*), a reputable foundry founded in Medellín in 1900 (*Guia para viajar por el departamento de Antioquia.*, 1927; Londoño, 1906, p. 6).

Rather than North Atlantic machinery factories, local ironworks were vital to the adaptation of technologies appropriate to Colombia’s particular context. The fin-de-siècle civil war, as well as topography difficulties, had incentivized Colombians to manufacture locally pieces of machinery that otherwise would have required importation at very high prices. A newspaper article illustrated the general situation of Colombia’s hardware-making industry in 1900, indicating that “despite the almost complete exhaustion of materials in the warehouses [...], because of the [civil] war, and despite the high price of the bills of exchange imposes on imported goods, there is no other way for those who need machinery than to build it in the country,” (“Industria,” 1900, p. 82). To this end, only in Medellín and its surroundings—where the Colombian fique industry would grow exponentially soon thereafter—was there a relatively large number of industrial plants like *Ferrería de Amagá*, the School of Arts and Crafts, and many ironworks owned by “Pedro Velilla, Estradas, Quinteros, Restrepos, Alonso Ángel, and José D. Sierra [...who] can satisfy any mechanical

4 Footnote in the original: “to manufacture tapestries, sacks, *guambías*, espadrilles, bundles, ropes, strings, etc.”

requirement of our large industries,” the newspaper article stated (“Industria,” 1900, p. 82). These workshops and foundries would support the Colombian fique industry process of technology transfer.

The process of technology transfer from Mexico to Colombia was led primarily by the Colombian civil engineer, entrepreneur, and diplomat Alejandro López (1876-1940). An analysis of López’s life would exceed the scope of this article. However, his name epitomizes the multifaceted trajectory of distinctive self-made Colombians (Mayor Mora, 2001). While conducting studies of the U.S. railway system, Alejandro López received a letter from the Colombian entrepreneur Manuel José Álvarez, encouraging him to examine the extant defibering machines to extract hard fibers like fique, which was abundant in his native Antioquia (López, 1906b). Álvarez was the leading figure in Medellín’s urban development and one of the founders of Antioquia’s pioneering textile company *Compañía Antioqueña de Tejidos* in 1902 (Gómez, 1990; Robledo, 1952; Vázquez, Corte, & Bertrand, 2005). Motivated to undertake this study, Alejandro López decided to analyze the Mexican henequen industry rather than U.S. machinery. He was convinced that the North Atlantic did not provide appropriate models to Colombia’s particular circumstances. While observing U.S. railway developments, López published several articles with his observations in Colombian newspapers, stressing the imperative of grasping technology according to local needs and settings. “I have always believed that the progress of our land has to come necessarily by degrees and naturally, that is, without leaps, by successive chains,” affirmed López in an article published in June 1905 (López, 1905a). By criticizing many Colombians who after witnessing firsthand the technological wonders of the North Atlantic returned to their homeland “dazed” and “mentally unbalanced,” he advocated for more people able not to copy blindly but to critically “reduce, translate and adapt” foreign technologies to Colombia’s particular circumstances (López, 1905b). To him, the appropriate way to reduce, translate and adapt technologies to Colombia’s context was by analyzing the least developed version among the countries using given techniques like defibering machines (López, 1905b). Hence, he believed that Mexico, although far more developed than Colombia regarding the henequen industry, was the closest step in Colombia’s technology-progress ladder. “As an ideal to which the material progress of our country should be directed,” López continued in his article of June 1905, “it is unquestionable that to make the most of [technological advances] more substance is extracted from studying and learning the works of one similar to ours,” (López, 1905a). He believed that rather than the “expression of amazement before marvels” common among Colombian travelers, the analysis of appropriate ideas leading to “the revelation that something is ready to be made in the country” was “one thousand times” more useful for Colombia’s material progress (López, 1905a). Seeking to draw appropriate methods and technologies for Colombia’s particular settings, and driven by his conviction to favor appropriateness over allurements, López examined Yucatán henequen’s history, plantation systems, and technology. “Having convinced myself that in the United States I would not find

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a field to make that study,” López stated, “and with the aim of contributing something to the knowledge of an industry that has long been presented in Colombia with flattering perspectives, I resolved to move to Yucatán, which is undoubtedly the most important center of fiber production that is extracted there from henequen, a species quite similar to our maguey.” (López, 1906b, p. 377) His notes were published in a booklet called *El henequén y otras plantas fibrosas* in 1906. (López, 1906a).

Due to the relevance of this one of a kind study, beginning in June 1906 the Colombian government disseminated its content gradually through a number of issues of the Ministry of Public Works and Development’s official organ. (López, 1906b) Throughout his study, Alejandro López couples Mexicans’ industriousness and the country’s railways to the success of the Mexican henequen industry, reflecting on Colombia’s implicit need to continue working on developing the railroad system. “Without the network of more than a thousand kilometers of railroad tracks that cross the State of Yucatán in several directions,” López stated, “the fiber industry would not be what it is today,” (López, 1906b, p. 379). López was at the time the manager of one division of the Antioquia railroad, which was one of the few rail lines that was under construction (and partially working) during the 1900s in Colombia. From the perspective of López’s biographer, the Antioquia railroad became one of López’s passions (Mayor Mora, 2001, p. 96). However, his visit to Mexico was primarily focused on grasping what was unique to Yucatán henequen history, and what could appropriately be adapted to Colombia.

Alejandro López believed that to promote the Colombian fique industry, it was necessary to start by reducing, translating and adapting Mexico’s techniques, methods, and technologies. Once he explained particularities of the terrain, sowing, cultivation, and harvest, he delved into examination of the defibering processes and machines used in the Yucatán henequen industry. Most of his attention was given to the Solís wheel, the Mexican invention that revolutionized the henequen industry in Mexico decades prior. “Many thousands of the Solís machine were used in the childhood of this industry in Yucatán,” stated López, “and they are still used among the small growers, who are very few,” (López, 1906b, pp. 31–32). He then noted that because fique was primarily produced by scattered small growers in Colombia, and “since the maguey and the henequen are so similar, it is natural to hope that if we want to leave [pre-Columbian] *carrizo* in Colombia we begin by using the simple Solís wheel,” (López, 1906b, pp. 31–32). Based on Mexico’s experience, Alejandro López, like other intellectuals regarding economic and political systems, stressed the necessity to acknowledge historical processes and local particularities before devising projects of national improvement. To him, the Colombian fique industry was an infant that needed to learn from mature industries—like that of Mexico—to grow well.

Looking to providing appropriate machinery to generally poor fique growers in Colombia, some Colombian travelers and diplomats would report the benefits of similar industries in neighboring countries. Analyses of neighboring countries’ know-how stimulated local invention and contributed to the technological change

that would bolster the Colombian fique industry in rural areas. In Colombia, a primitive tool called the *carrizo* had fulfilled for centuries the necessary function of extracting the inner fiber from fique leaves (López, 1906a). The *carrizo* was a sturdy wooden stick with a Y-shaped slot at the top through which fique leaves were forced to pass, removing the pulp and yielding the fiber (Zamosc, 1981). Fique laborers usually made and modified their *carrizos* at will, manufacturing them in advance or right before harvesting mature and ready-to-shred fique leaves (López, 1932b). Artisans also manufactured *carrizos* that were sold at local markets. However, and despite minor modifications, the *carrizo* continued to resemble an archaic tool with modest productive margins. To establish a small or medium scale industry, however, the incorporation of a more efficient device was deemed necessary.

Since the late nineteenth century, many Colombians had devoted themselves to the study of the fundamental principles of defibering and the tools that could be adopted in Colombia. Their primary purpose was to create a machine able to fulfill the particular needs of local fique producers. The first Colombian invention in this field was the *Desfibradora para Agave* that Alejandro Gómez patented in Bucaramanga in 1894. However, little is unknown about this pioneering machine, and no evidence suggests that it was adopted and marketed successfully (Mayor Mora, 2005). In 1905, having traveled to Mexico and carefully studied henequen crops as well as the processes and machines used for defibering it, Alejandro López designed an original prototype of a defibering machine that he named *Desfibradora Antioqueña*. This defibering mechanism was the first one of its type patented in Antioquia, and its first unit was manufactured in Medellín by Pedro Velilla in 1906 (Londoño, 1906). Local newspapers publicized this revolutionary creation by stating that “a single laborer would easily scrape from 2500 to 3000 stalks, with a minimum product of 100 pounds of cabuya [per day]. It weighs 20 fractionable arrobas, outside the bank or wooden frame that can be made in the locality,” (Mayor Mora, 2001, p. 101). By then, the Colombian coffee industry had depended heavily on jute sacks that were imported from England. Thus, one of the virtues attributed to the *Desfibradora Antioqueña* was the contribution it would make to this industry. One of the witnesses of the public presentation of López’s invention, the Colombian engineer Roberto Botero Saldarriaga, acknowledged that “Dr. López’s defibering machine worked with precision, speed and cleanliness; it was a complete success, proclaimed by the assistants, who very effusively congratulated the indefatigable fighter,” (Mayor Mora, 2001, pp. 102–103). By indicating the economic contribution to the coffee industry, Botero stressed that there was no longer a need to spend the “40,000 dollars that the sacks for coffee packaging cost annually, [...] which can now be replaced by those made here due to the cheapness of the raw material obtained with Dr. López’s defibering machine,” (Mayor Mora, 2001, pp. 102–103). For this and portability reasons, this machine was well received by Colombian farmers.

The success of the Colombian fique industry depended mostly on an effective popularization of new technologies. To promote both his invention and investigations

in the field, Alejandro López continued to examine fique crops and feasible methods to perfect his defibering machine during the following decades. *Desfibradora Antioqueña* was awarded a prize in the National Exhibition that was held in Bogotá in 1910 to celebrate the first century of Colombian independence (Mayor Mora, 2001). Later, for his dedication and contributions to the fique industry in Colombia, and especially for his study called *El fique. Su cultivo y beneficio industrial*, Lopez was awarded the first prize in the Agricultural and Livestock Exhibition held in Medellín in 1918 (López, 1918a). By 1918, López had also improved the defibering machine of his invention, offering a safer as well as a more durable, precise and productive model (López, 1918b). He affirmed that although his machine produced some fiber waste, “due to the practice I acquired in Mexico, I can assure you that every single defibering machine wastes some fiber, but not as much as the fiber wasted by defibering in the manual apparatus that is commonly used in our fields,” (López, 1918b, p. 610).

Striving to establish large-scale fique plantations and to mechanize fique extraction during the late 1910s, some Colombians sought to adapt North Atlantic technologies like steam and hydraulic machines that were used to exploit fiber crops in East Africa, the Philippines, and Mexico (M. T., 1918; Zamosc, 1981). However, although these machines were highly productive, they would exceed both the cost and dimensions suitable in Colombia, where fique production provided a livelihood to low-income, rural families. Moreover, transportation costs were often prohibitive in Colombia due to its inadequate internal transport system (Safford, 2010; Zamosc, 1981). In fact, Alejandro López stated in 1918 that owners of large-scale plantations of 100,000 fique plants—which was uncommon in Colombia—“should think about getting one of the [large] Mexican machines, although I doubt very much that our bad means of transport work to transport those machines and to distribute their products economically,” (López, 1918b, p. 611). Thus, to expand the fique industry in Colombia, growers required equally revolutionary and highly productive machinery, but affordable and lightweight (Zamosc, 1981). Mexican expertise was critical to this development because it provided models appropriate to Colombia’s particular circumstances. Alejandro López once acknowledged that “between the manual apparatus of the aborigines [*carrizo*] and the large automatic machines used in Mexico, there is a middle ground, which is the one that suits our nascent industry, that is for plantations of 20 to 50,000 plants,” (López, 1918a, p. 17). He was referring to the Solís wheel that was invented in Mexico in the 1850s and that had gradually been improved towards the end of the nineteenth century.

The defibering machine’s affordability, size, and weight were crucial to expanding the fique industry in Colombia. Alejandro López, aware of this, published announcements indicating that the device of his invention was suitable for small- and medium-sized plantations. He also advertised his invention as follows: “I am selling the *Desfibradora Antioqueña*, model of 1918,

for \$300 in legal gold, placed in La Virginia for Valle, in Manizales for Caldas, and in any port of Bajo Magdalena from La Dorada to Barranquilla, duly packed for transportation on the back of mules, in 6 or 7 packages, which together weigh approximately 400 kilos,” (López, 1918b, p. 610). Openly acknowledging that he had drawn from Mexican expertise, López stated that “my *Desfibradora* is an adaptation of Mexican models, [making it] transportable on the back of mules and suitable for medium-size industry,” (López, 1918b, p. 610). López’s studies and developments became widely known in Colombia, stimulating inventive activity, mostly during the 1930s. Mostly based on his analyses and comparisons between Mexico’s henequen and Colombia’s fique, Alejandro López published some of the most relevant studies in this field from 1906 to 1932. (López, 1906a, 1918a, 1932b, 1932a).

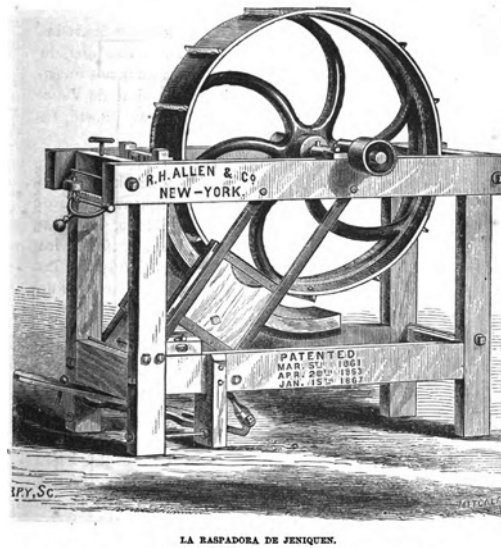
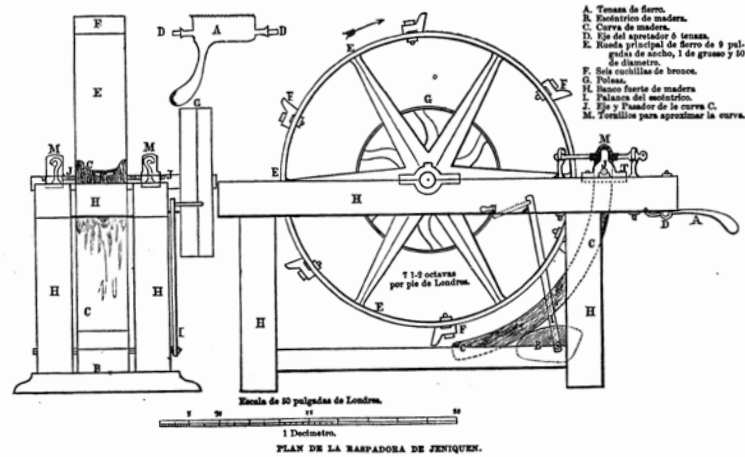
Based on the same Mexican defibering principle that Alejandro López had improved and adapted to Colombia’s circumstances, some Colombian inventors developed defibering machines that varied mostly in safety, durability, power, weight and productivity. Some of them were Antonio J. Alvarez R. and Gabriel Escovar Álvarez, who created the *Desfibradora Delta* and *Desfibradora Escovar*, respectively (Álvarez Uribe, 1938; López T., 1937). Inventors like López even admired the latter. In 1936, López wrote to Escovar acknowledging that “of the machines of this class that until now I have had the opportunity to know and study, yours is the one that meets the best construction conditions for the simplicity of its manufacture and the quality of the materials; and from the knowledge that I have of this industry, not only in the country but [also] abroad, I believe that you make a valuable contribution with the ‘*Desfibradora Escovar*,’ since the conditions noted and its low price make it available to all of our fique growers,” (López, 1932b, pp. 1513–1515). Local ironworks also manufactured their own defibering machines, mainly in Antioquia’s Talleres Delta, Ferrería de Amagá, Talleres Robledo, and Talleres Nacionales de Escobar Londoño y Compañía, which produced the defibering machine *Londobar* (Álvarez Uribe, 1938; Industria Nacional Colombiana, 1931; López T., 1937; *Medellín en 1932*, 1932; Palau, 1918). During the 1930s, inventive activity grew in Colombia, and several patents to fulfill the Colombian fique industry’s needs were requested. Even the National Federation of Coffee Growers patented in Bogotá a “*Máquina desfibradora de fique*” in 1934.⁵ The buoyant coffee economy and its continually growing demand for sacks stimulated inventive activity in Colombia. The Colombian fique industry’s technological change would contribute directly to the expansion of the Colombian coffee industry, providing economic alternatives for many smallholding and artisan families.

5 For more technical details about these defibering machines, see (Campuzano-Hoyos, 2017)

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Figure 1. Raspadora mexicana or rueda de solís



Source: Ramón Páez, *Ambas Américas. Contrastes*, New York, Appleton, 1872, pp. 264-265.

Figure 2. Desfibradora lombar #2 talleres nacionales de escobar londoño & CÍA.



Source: Eduardo López, *Almanaque de los Hechos Colombianos*, Bogotá, Arboleda & Valencia, 1919, 61.

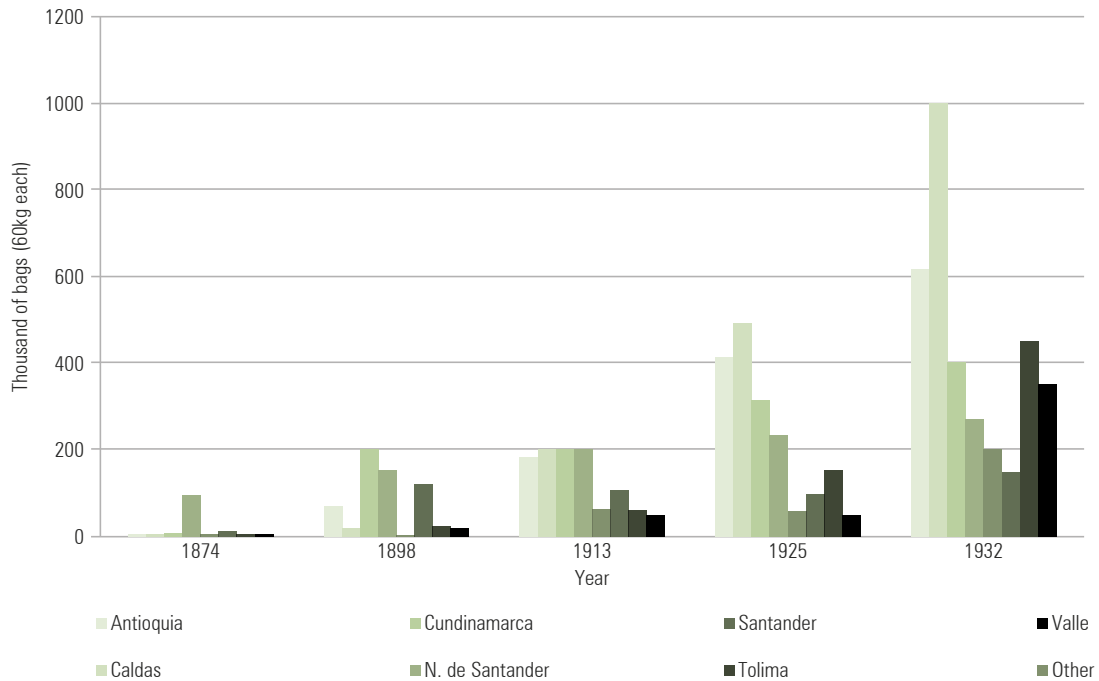
THE CONFIGURATION OF THE COLOMBIAN FIQUE INDUSTRY

Since the late nineteenth century, the fique industry had drawn the attention of several Colombian politicians, intellectuals, and businesspeople who assumed that the higher the production and exports of coffee, the higher the demand for sacks for its packaging. Unlike Colombia's production of export commodities like coffee, tobacco, and bananas, Colombian fique industry expanded unrelated to the global market for natural fibers and binder twine, which had been increasing since the late 1880s (Lyster H. Dewey, 1931). In fact, mechanized cereal farming demanded high quantities of twine, and in "the United States the gigantic International Harvester Corporation played a dominant role as the major purchaser of henequen from Mexico," (Bulmer-Thomas, 2003, p. 59). The Colombian fique industry was particularly responsive to domestic demand, mainly from coffee producers and traders. The sacks used for both coffee production and trading were made with natural fibers like the Bengal's jute and tropical America's fique. Hence procuring them in a predominantly rural country such as Colombia would stimulate smallholding and domestic manufacturing. By the early 1930s, the Colombian coffee industry had expanded dramatically, creating an unprecedented demand for sacks (Figure 3).

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Figure 3. Coffee production by colombian departments*



*As a unitary republic, Colombia is divided in thirty-two administrative divisions called departamentos (departments)

Source: This chart was prepared based on "El despegue cafetero," Jesús Antonio Bejarano, in: Historia económica de Colombia, José Antonio Ocampo, Bogotá, 1997, p. 238.

In 1930, foreseeing the importance of this industry, the Secretary of Agriculture and Development of Antioquia stated that "the day that the harvest of Colombian coffee is exported in national sacks, which would give the coffee an unequivocal stamp of its origin, the cabuya industry will have a demand of more than three million sacks for export only, a number that would gradually increase with the production of coffee," (Secretaria de Agricultura y Fomento de Antioquia, 1931, p. 3). Cabuya sacks were also demanded by several different agricultural and mining industries to pack articles like panela (brown sugar loaf), grains, tubers, coal, and salt (Secretaria de Agricultura y Fomento de Antioquia, 1931). To supply the growing demand for cabuya goods in Colombia, expanding the fique cultivated area and introducing new technologies for processing it was paramount. Some trade associations and individual efforts were critical to these ends. Along with coffee exports, fique

plantations and manufactures of cabuya goods grew during the first decades of the twentieth century.

The National Federation of Coffee Growers of Colombia, which was established in 1927, played a crucial role in the expansion of the Colombian fique industry. In 1930, after holding the Fourth National Congress of Coffee Growers, the Federation declared that it would facilitate the means to develop the fique industry in Colombia and that its confederates would refrain from “importing jute or any other fibers of foreign production that can compete with the packaging manufactured in the country,” (Federación Nacional de Cafeteros de Colombia, 1931, p. 736). Since then, fique and coffee production interlocked as never before—so much so that traditional coffee producing regions also became the leading producers of fique and cabuya sacks in Colombia.

The Federation’s official declaration of supporting Colombian fique industry stimulated inventive activity in Colombia. Seeking to foster the industrial exploitation of fique and its derivatives, some influential Colombians had encouraged practical adaptations and assimilation of foreign technology since the 1890s. (Campuzano-Hoyos, 2017) This interest led to a process of technological change through which devices like mechanical scrapers and modern defibering machines displaced indigenous tools like the *carrizo*. Colombia had low levels of invention and patent registration during the nineteenth and early twentieth centuries (Mayor Mora, 2005). However, both the Federation’s official declaration of support and the passing of new tariffs protecting the Colombian fique industry in 1931 stimulated inventive (or imitative) and patenting activities in Colombia. In fact, an unprecedented number of patents was requested to fulfill the Colombian fique industry’s needs between 1931 and 1939. At least five defibering machines, as well as three spinning devices and processes, were patented in Colombia during the 1930s (Mayor Mora, 2005). These creations would seek to improve devices the Colombian pioneer Alejandro López had conceived decades earlier. By 1916 López had already invented, patented, and commercialized both the defibering machine known as *Desfibradora Antioqueña* and the cabuya loom named *Hiladora Colombia* (Londoño, 1906; Mayor Mora, 2001). Mexican technologies and know-how mostly inspired his developments after years of fieldwork in both Colombian and foreign fique and henequen plantations. While examining foreign techniques, López realized that to develop the fique industry in Colombia, the introduction of suitable technologies was necessary, fitting not only local needs but also geographical settings. His developments would power the Colombian fique industry’s first technological change.

The Colombian fique industry’s first large-scale technological change took place once the expansion of the Colombian coffee industry led to demand for unprecedented amounts of cabuya sacks. This change unfolded as a process of technology transfer during the early decades of the twentieth century. While some Colombian and foreign inventors successfully adopted, created and commercialized new technologies, local engineers assimilated the necessary expertise to build, repair and improve technical hardware in regional workshops beginning in the 1900s. This

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process, then, stimulated local creativity, invention, and innovation towards the expansion of the Colombian fique industry. In fact, if local inventors like Alejandro López analyzed foreign creations and designed their own original devices, local foundries and ironworks like *Ferrería de Amagá* and *Talleres de Robledo* supplied domestic expertise to build the machinery needed to expand the fique industry to other emerging factories during the first decades of the twentieth century. In fact, by 1931 modern national technology was available to expand the fique industry in Colombia. A variety of defibering machines were locally made, as José Julián Echeverri reported in an article about the industrial exploitation of fique (Echeverri, 1931). Although the expansion of technological change was slow in Colombia during the first decades of the twentieth century, a growing pattern of inventions and improvements of specialized hardware unfolded during the 1930s. As Table 1 shows, Colombian fique industry expansion was concentrated in the departments of Santander, Antioquia, and Boyacá, contributing 74% of fique and 83% of cabuya sacks in 1934. Santander, however, was by far the most productive department. Most of this production was used to provide fique sacks to the Colombian coffee industry. During the 1920s and 1930s cabuya sacks displaced jute packaging, which was usually imported to Colombia from South Asia via the U.K. In fact, long before the famous Juan Valdez emblem was created in 1959, fique sacks had become an exclusive trademark of Colombian coffee (Campuzano-Hoyos, 2017).

Table 1. National production of fique and cabuya sacks by colombian departments in 1934

Department	Fique (tons)	Sacks (thousands)
Antioquia	1,410	1,658
Boyacá	1,250	7
Caldas	408	437
Cauca	619	75
Cundinamarca	700	N/A
Huila	52	1
Magdalena	226	5
Meta	4	N/A
Nariño	250	571
Norte de Santander	346	198
Santander	4,750	5,000
Tolima	34	N/A
Valle	14	1
Total	10,063	7,953

Source: El fique y los empaques en Colombia, Bogotá, León Zamosc, 1981, p. 50.

Drawing mostly from neighboring countries, the Colombian fique industry experienced a significant technological change before the creation of the *Compañía de Empaques S.A.* in 1938, the first large-scale, urban factory of cabuya products in Colombia⁶ (Compañía de Empaques S. A., 2004; Paola Andrea, 2003). Before establishing this company, its founders visited Mexican henequen plantations and factories to analyze the machinery used there (Compañía de Empaques S. A., 2004). Displacing artisanal livelihoods with mechanization (mostly the cabuya-sack making processes), the foundation of this and similar companies throughout the country would change the Colombian fique industry dramatically (Campuzano-Hoyos, 2017).

CONCLUSIONS

During the last quarter of the nineteenth century, many Colombians sought to establish in Colombia large-scale fiber plant plantations to develop Colombia's export activity. However, although Mexico had its henequen industry and some other countries like Cuba and El Salvador were developing similar plantation systems, in Colombia it was only after the coffee industry took off that the fique industry became firmly established, but on a small and medium scale, responding to Colombia's particular economic, social, and infrastructural circumstances.

Directly linked to the expansion of the Colombian coffee industry because of its demand for sacks, the Colombian fique industry boomed during the first decades of the twentieth century. It developed because rather than importing expensive and inappropriate machinery from the countries of the North Atlantic, some Colombian intellectuals, entrepreneurs, and scientists examined global developments and adapted more suitable crops and technologies to Colombia's context. They sought to develop the Colombian textile industry—in which fique had become an essential raw material—by analyzing and attempting to adapt know-how from Latin American countries chiefly.

During the first third of the twentieth century, analyses of the Mexican henequen industry's history, plantation systems, and technology became crucial to the success of the Colombian fique industry and its first technological innovation. While large defibering machines were installed in Mexico towards the end of the nineteenth century, former Mexican inventions like the *Raspadora Mexicana* or *Rueda de Solís* became useful for developing local devices that would foster smaller productive units in Colombia. Aided by talented people who adapted affordable, mid-sized and productive technologies, the fique industry developed in Colombia as "heritage of the poor" (*patrimonio de los pobres*). Local ironworks were also crucial for easing the technology transfer process, providing locally-made hardware and specialized assistance. By adopting and assimilating Mexican expertise and mechanical hardware, Colombian inventors developed devices affordable and appropriate for Colombia's peoples, economy, and topography.

6 The official document of incorporation of this Company is held in the Antioquia Historical Archive, notarial records, notary 3, Medellín, public deed 1704 of 7 September 1938.

The Colombian fique industry developed because of the contributions of Colombian intellectuals, entrepreneurs, and scientists, rather than drawing from North Atlantic models, drew from Mexico appropriate models for Colombia's particular context. This history challenges the traditional assumption that Latin American countries generally developed a technological dependence on the North Atlantic nations. Countries like Mexico developed original inventions that Colombians like Alejandro López believed would be more appropriate for Colombia's circumstances than technologies devised for societies with radically different social, economic, and historical conditions. Alejandro López believed that in terms of technology and industrial development Colombia was still an infant at the beginning of the twentieth century, which would require fostering a process of learning from more mature counterparts, mainly Mexico, which was much more developed than Colombia but was at the same time the closest on the assumed ladder of material progress. Like the association between the Mexican henequen and the Colombian fique industry, other kinds of specific models of material progress—including technologies—were drawn from Latin American countries. This article signals the need to conduct further studies on intertwined processes of technological change and economic growth within Latin America, which would be critical towards a better understanding of the business and economic history of Colombia and Latin America in a more global perspective.

Business schools worldwide have been incorporating literature on business and economic history because historical analyses contribute to academic debates and managerial practices. In fact, recent scholarly works have built on "recent efforts to incorporate historical perspective into management and organization studies," (Bucheli & Wadhvani, 2015, p. 3). Highlighting the notion of "appropriateness," this article aims to contribute to critical approaches regarding geographical, historical, social, and cultural contexts in academic research, as well as in theory and managerial practices, from a historical perspective. This would help us better understand why, for instance, while the historiography on Latin American business and economic history has chiefly underlined the "technological gap" between Latin American countries and the North Atlantic, and therefore the technological dependence upon the latter (Beatty, 2015; Bértola & Ocampo, 2013; Weaver, 2000; Haber, 1997), in practice some Latin American developments had contributed greatly to developing Colombia's economy and industrial sectors. This article, then, aims to open new paths for historical reasoning and research about intra-American interactions and mutual learnings.

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