**Chapter 1**

**Foreign Cotton Craze: Upland Cotton and the Expansion of Cotton Science, 1900-1920**

In 1898, U.S. minister to Siam, John Barrett, wrote a piece in *The Washington Post* advocating for the American South to seize the opportunity to expand cotton trade with Asia. “Does the South appreciate her opportunity in the Far East? Does she realize that the mighty markets of Asia’s millions await her best efforts at exploitation? If not, she should.” While some Southerners might express skepticism, Barrett professed: “The Far East wants the South’s cotton: it wants a lot of it! It wants it now, and it will want it more next year—and in ten years it will want twenty times what it demands now!” The growing demand for cotton was in part driven by the establishment of cotton mills in Asia – mills that required the large quantities of American upland cotton grown throughout the South that had fueled the industrial revolution. China was a promising market as “cotton growing is not a science” there. “The time may come when China’s millions will learn how to grow all their cotton in China’s numberless acres, but that day is so far distant as not to discourage the planters and manufacturers of the South in exploiting these Asiatic markets.”[[1]](#footnote-1)

Barrett’s vision was never realized, in part due to transportation costs. But his piece nevertheless reflected a shifting global economy in the production and manufacturing of cotton and cotton goods. By the late nineteenth century, rising labor costs in the United States and Europe led manufacturers to look to the Global South for cheaper labor, including China where foreign and local companies established cotton mills. Early efforts to industrialize China’s cotton industry achieved mixed results, however. Cotton boosters discovered that importing and operating foreign machinery was relatively easy compared to the more difficult task of growing large supplies of American cotton. They found that the imported seeds either didn’t grow well or quickly mixed with local types – a process described as the loss of seed “purity.” The First World War further sparked a cotton mill building boom in China.[[2]](#footnote-2) The rapid expansion in the number of spindles and power looms drove demand for standardized American cotton, leading one observer to comment that “it would not be overstating the situation to say that China is having a ‘foreign cotton culture craze.’”[[3]](#footnote-3) While some suggested that previous failed attempts to introduce American cotton were evidence that it wasn’t suitable for China’s environment, others turned to the growing field of cotton science for answers.

This chapter explores early attempts to import American cotton seeds into China to demonstrate how these efforts, often classified as failure, solidified the centrality of science in establishing a modern industrial cotton sector. Efforts to fuel China’s growing textile factories through the influx of American cotton were sporadic and ultimately unsustainable as industrialists and government officials were unable to maintain control over the seed supply. A growing coalition of cotton industrialists and scientists began arguing that scientific intervention was necessary for agricultural change. The “common sense” of experienced farmers was insufficient. This coalition looked abroad for developmentalist models, sending Chinese students to the United States to receive advanced degree and inviting foreigners to survey local cotton production. In the process, they found was that, like other agricultural crops, cotton’s resistance to standardization required the development of a whole package of technologies that included experiment stations to acclimatize and breed new varieties of American cotton, extension facilities to carefully distribute the cotton in a systematic fashion, and reordering local society to prevent the different types of cotton in circulation from mixing – all of which was done in the struggle over seed “purity” and standardization.

*Early Growth of Cotton Science*

In October 1992, a conference was held in Hubei to commemorate the 100-year anniversary of American upland cotton in China. Primarily comprised of cotton scientists, the conference was an opportunity to reflect on how China’s cotton landscape was transformed over the past century. As the conference recognized, both the establishment of cotton mills and introduction of American cotton predated 1892. But 1892 represented China’s first “planned” and “large-scale” importation of American cotton seeds, thereby opening a new era of cotton improvement and industrialization in China.[[4]](#footnote-4) The key figure they celebrated was Zhang Zhidong張之洞 (1837-1909), a well-known reformer in the late Qing who advocated for a blend between Chinese and Western learning. In 1889, Zhang was appointed governor general of Hubei and Hunan where he embarked on industrialization projects that included cotton. Machinery for Zhang’s cotton mill was purchased and constructed by Mr. R. Morris of the British Platt Bros & Co., who had worked for the company for over four decades setting up mills in various parts of the world including India, Russia, and South America. In Hubei, Morris was dissatisfied with the local cotton supply and suggested Zhang try growing American cotton instead. In 1892, Zhang imported 34 dan (1,700 kg) of American cotton seed and distributed it to 15 counties and districts. The results from this first year were underwhelming as the seeds were planted too late in the year and weren’t spaced properly. But there was enough success to warrant continued importation and experimentation. In 1897 Zhang even hired Cornell graduate Gerow D. Brill (1864-1931) to help in this work.

Zhang’s overall results were mixed. If it weren’t for the fact that American cotton is now the dominant species of cotton grown in China, this episode would likely be remembered as an obscure and failed attempt to transform China’s cotton economy. But as the 1992 conference emphasized, through the efforts of multiple generations of individuals dating back to Zhang, China underwent a radical transformation that included the widespread adoption of American cotton and the expansion of scientific research that enabled China to breed its own varieties of American cotton rather than relying on foreign countries for seed. Zhang’s early efforts were therefore portrayed as a “prologue” to a new and modern era of cotton cultivation and manufacturing in the twentieth century.[[5]](#footnote-5)

Zhang Zhidong was part of a growing group of late Qing and Republican officials and industrialists who viewed cotton improvement as contributing to “national strengthening” as both an import-substituting and export-promoting industry.[[6]](#footnote-6) This was best expressed by the idea “cotton-and-iron-ism” (棉鐵主義) formally articulated in 1910 by official-industrialist Zhang Jian 張謇 (1853-1926). Cotton and iron were chosen for a couple of reasons. One was the centrality of cotton and iron in the development of light and heavy industry. But another reason was due to the significant volume of cotton and iron that was being imported into China around the turn of the twentieth century.[[7]](#footnote-7) Zhang wasn’t the first to point to this disparity. Foreign treaties signed as a part of the Second Opium War (1856-1860) greatly expanded foreign trade to inland China, including cotton goods which accounted for around one-third of China’s imports as early as 1871. Imported cotton goods increased rapidly in the subsequent decades. From 1880 to 1900, China was importing an average of nearly USD$47 million worth of cotton goods from around the world, accounting for as much as 40 percent of the value of all goods imported annually.[[8]](#footnote-8) Cotton yarn represented the most significant portion of these imports, growing on average from 97,451 piculs in the 1870s to 2.363 million piculs by the first decade of the twentieth century.[[9]](#footnote-9) China’s defeat in the Sino-Japanese War (1894-1895) sparked a greater sense of urgency to reverse this tide by modernizing China’s cotton industry. From 1890 to 1900, the number of spindles to produce yarn increased from 35,000 to nearly a half million while power looms to weave cloth increased more slowly from 530 to over two thousand.[[10]](#footnote-10)

Like Zhang Zhidong, other early promoters of cotton industrialization drew on the experiences of foreign countries to inform their work at home. In 1898, promoter of agricultural reform Zhu Zurong 朱祖榮 (n.d.) published an article arguing for the need to cultivate foreign cotton varieties. To Zhu, India served as an example of how to import and cultivate foreign cotton, but given that China’s environment was better suited for cotton production, he firmly believed that “China’s profits will surely surpass India” (其獲利必勝於印度). Moreover, Zhu emphasized that China didn’t need to rely solely on American upland cotton. With the outbreak of the U.S. Civil War, Zhu commented, British industrialists were forced to mix American and Indian cotton to produce different grades of cotton goods. China could learn from this experience to modernize its cotton industry in a similar way.[[11]](#footnote-11) Zhu’s comments reflected the direction that China’s cotton industry was heading. Traveling throughout China in 1915, one foreign observer noticed that cotton mills adopted this approach by mixing local cotton with higher-quality varieties to produce suitable yarn for manufacturing.[[12]](#footnote-12) More generally, the robustness of China’s handicraft industry prevented imported cotton cloth from consuming the market entirely. In fact, imports of foreign cloth didn’t rise significantly from the 1870s to 1910. Yarn imports did shape the handicraft economy, however. Foreign yarn, largely imported from India and Japan, was typically woven together with locally-spun yarn to produce cloth that incorporating the advantages of both types of fibers – foreign yarn tended to be less coarse while local yarn produced warmer and more durable cloth. Subsequently, the main push to industrialize in the late nineteenth and early twentieth century focused primarily on expanding production of machine-spun yarn.[[13]](#footnote-13)

While the development of China’s cotton industry didn’t demand the abandonment of native cotton cultivation entirely, it still necessitated the cultivation of greater quantities of American cotton. And Zhang Zhidong’s hiring of Brill to help cultivate American cotton in Hubei demonstrated a growing recognition around the turn of the twentieth century that the future of China’s cotton industry required a certain kind of expertise. This included the establishment of agricultural experiment stations in the final decades of the Qing dynasty, which Peter Lavelle argues were “manifestations of a movement for agricultural reform and improvement (*nongshi gailiang*) which sought to leverage China’s potential for economic growth through the technical development of farming.” These included a central-level experiment station set up in Beijing, along with provincial level stations in Zhili, Shandong, and Henan.[[14]](#footnote-14) In the early years of the twentieth century, these stations began experimenting with American cotton and even distributed seed to the surrounding countryside in a similar fashion as Zhang Zhidong. In 1903, for example, the Shandong provincial government formed one of China’s earliest experiment stations in its capital of Jinan with the assistance of Japanese scientists. In addition to conducting cotton research at the station, the provincial government imported and distributed thousands of pounds of American cotton seed throughout the countryside as early as 1904. Continued importations in subsequent years led to an expansion of American cotton production in Shandong that boosted national exports. This caught the attention of German and British diplomats in China who reported around 1910 that cotton exports had doubled during the previous years due to the high-quality American cotton grown in Shandong.[[15]](#footnote-15) Such achievements were often unsustainable for reasons outlined below but are nevertheless noteworthy.[[16]](#footnote-16)

While much of these early efforts were led by provincial reformers, the Guangxu Emperor (r. 1875-1908) added his voice in favor of cotton industrialization in a 1908 mandate advocating for a more comprehensive study of cotton production and manufacturing. His comments reflected a growing consensus around the turn of the twentieth century that connected cotton industrialization to national progress. “China is spending an enormous amount of money yearly for the import of manufactured cotton goods.” (In 1908 China would import over USD $72 million in cotton goods.[[17]](#footnote-17)) “Unless this problem is taken in hand at once, there is no end to the amount of money China will have to spend on imports.” The mandate stressed that this was to be resolved through both expanding local manufacturing and overturning the “unscientific methods of [cotton] cultivation” within China. Connected to these efforts was the value of American cotton and the scientific study of cotton: “We learn that in America [美洲] there are grown the best varieties of cotton. The growth is vigorous, the bolls are large, the fiber produced is fine, elastic, tough, and long; and the goods manufactured from this fiber are smooth, lustrous, and soft – far superior to that produced in China. This is due entirely to the nation’s agriculturalists [農業家]. A careful study and classification of the varieties, and of the edaphic and ecological conditions results in a superior product.”[[18]](#footnote-18) The emperor further called on the recently formed Ministry of Agriculture, Labor, and Commerce (農工商部) to engage in a detailed study of global cotton that culminated in the publication of the multi-volume *Mianye tushuo* 棉業圖說 (Illustrations and descriptions of the cotton industry) in 1911. The volume outlined cotton production and manufacturing techniques as found in China, the United States, Germany, Japan, and Italy.[[19]](#footnote-19)

The emperor’s mandate and ensuing publication underscored the value of trained specialists in producing high-quality cotton. It also highlighted the need for a more organized and systematic approach to cotton research and reform. After traveling around China for six months in 1915, U.S. Commercial Agent Ralph M. Odell observed that efforts to grow American seed in China “have not been particularly successful” for several reasons. The first was that the plant grew well but the cotton wasn’t maturing, either due to the short season or failure to use early maturing varieties. But likely more important for Odell was that “no organized system prosecuted along intelligent, scientific lines has been adopted.” Instead, “Here and there men were met who had experimented with American seed, but each was working in a small area, and whatever good results each individual had attained was unknown to others who were working in the same direction. The enormous area of China and the isolation of certain districts make it imperative to undertake the improvement of the cotton on a large scale in order to make an impression on the native farmers.”[[20]](#footnote-20) Odell’s jab at the lack of “intelligent” approaches to cotton improvement wasn’t uncommon. An earlier report on Zhang Zhidong’s work had commented that “there is nothing whatever to hinder China from turning the tables and exporting cloth and yarn to foreign countries with much profit to herself—nothing, save the fact that all these ventures are under mandarin management, under which nothing thrives.”[[21]](#footnote-21) Negative assessments by foreigners of government-led initiatives continued to be common place in the subsequent decades.

Odell’s snide tone aside, his critique of the lack of organization between different projects seems valid (see more below). However, he did express some optimism due to the efforts of Zhang Jian, who he observed as being “one of the most progressive men in China” and “deeply interested in the agricultural and industrial progress of the country.”[[22]](#footnote-22) Zhang’s most enduring legacy was the implementation of his industrial model in Nantong and its surrounding counties where he established large-scale cotton farms, experiment stations and educational institutions, along with textile factories. Through his efforts, Nantong became a center of cotton cultivation and scientific research for the following decades.[[23]](#footnote-23) A lesser-appreciated role that Zhang played was as Minister of Agriculture and Commerce under Yuan Shikai’s Beiyang government. As part of his tenure, Zhang encouraged cotton improvement by allocating funds to establish several experiment stations. As a result, three central-level stations were set up in 1915 in Zhengding, Zhili (est. March 25, 1915); Nantong, Jiangsu (est. March 28, 1915); and Wuchang, Hubei (est. May 11, 1915). A fourth station was set up in in Beijing in 1918.

The expanding number of government agencies and experiment stations created a demand for trained experts. In the early twentieth century, young Chinese students pursued scientific studies at home and abroad where they graduated with degrees in a variety of subjects from chemistry and engineering to geology and agricultural science.[[24]](#footnote-24) These Chinese students were driven by a growing sense of “scientific nationalism,” or the belief that science and technology should be utilized “to create a strong, unified, and prosperous Chinese nation, free from foreign domination.”[[25]](#footnote-25) A burgeoning group of agricultural experts helped establish hundreds of agricultural experiment stations to fuel economic growth through scientific and technological advancements.[[26]](#footnote-26) This would include some of China’s most important cotton scientists and industrialists from the twentieth century who earned degrees from land-grant colleges in the United States. One of the earliest of these students was Hing Kwai Fung 馮慶桂 (b. 1882), who graduated in 1911 from Cornell with a Ph.D. in cotton science.[[27]](#footnote-27) His dissertation was a timely addition to a growing interest in American cotton within China: “An Ecological Study of the American Cotton Plant with Incidental Reference to its Possible Adaptability in China.” As immediately useful as Fung’s knowledge would have been for cotton improvement in China, he didn’t return upon graduation. Instead, he was hired by the USDA Bureau of Plant Industry to work with botanists Frederick Vernon Coville (1867-1937) and Walter Tennyson Swingle (1871-1952). While at the USDA, Fung spent part of his time assisting Swingle in creating a catalogue system for Chinese-language texts. Swingle and others had a growing interest in Chinese traditional knowledge about agriculture and had begun working with the Library of Congress to acquire texts from China.[[28]](#footnote-28) Fung spent roughly a year at the USDA after which he traveled throughout Europe, Egypt, and India surveying cotton conditions and collecting relevant books on the subject. By 1913, Fung returned to China where he initially worked at the Republic of China’s Department of Agriculture and Forestry 農林部 (later incorporated into the Ministry of Agriculture and Commerce) on cotton improvement projects and translating his doctoral research into Chinese, which was published as a series of articles across multiple issues in the Department’s *Agricultural Journal* (農林公報).[[29]](#footnote-29)

In addition to hiring Chinese scientists such as Fung, China also recruited foreign experts. In 1916, the Ministry of Agriculture and Commerce organized the Bureau of Cotton Investigation and hired U.S. agronomist Hicks Horatis Jobson (1886-1967) to be “in charge of the organization of the cotton work” with Fung as his associate.[[30]](#footnote-30) The rational for establishing the Bureau, according to Fung, was that “very little progress can be made” without “a special department through which information about cotton may be secured by experts who have special knowledge of or practical experience in the subject of cotton.” The newly founded Bureau hoped to fill this void by focusing on the problems of raw cotton production and textile manufacturing, the former work including “introduc[ing] foreign varieties if possible that will give better yields, and furnish a longer and stronger staple.”[[31]](#footnote-31) Following Jobson’s 1916 tour of China, which included visits to Shanghai, Nantong, and Hankou, he described some concern over the future of American cotton in China, specifically regarding the pink boll worm which tended to attack American cotton more aggressively than native cotton. However, Jobson still believed that “it will not be many years before American cotton will be grown on a large scale, provided the Government continues the work as it has been started.”[[32]](#footnote-32) Jobson’s reserved optimism was shared by others at the Ministry of Agriculture and Commerce who had accompanied him during this tour, including technical expert Hsieh En-lung (謝恩隆) who had earned a Ph.D. in agricultural science from Cornell in 1910.[[33]](#footnote-33) While the central cotton experiment stations had done important work on cultivation methods of American cotton, Hsieh emphasized that future work needed to first prioritize selection (選種), domestication (馴種), and breeding (育種). According to Hsieh, the future of China’s cotton industry wasn’t in annually importing tons of yarn and raw cotton but expanding local production of American cotton through scientific experimentation.[[34]](#footnote-34)

Not all graduates from foreign universities went on to work in government institutions such as Fung and Hsieh. The boundaries between government and industry were porous as seen in the example of Zhang Jian, but in the 1910s there emerged a strong push within the industrial community to improve cotton production – efforts that often paralleled those conducted by the government. This is best exemplified by industrial-scientist H. Y. Moh (Mu Ouchu 穆藕初; 1876-1943). Moh came from a family of cotton merchants in Shanghai and at a young age began working at the Shanghai customs where he paid particular attention to the import-export economy. It was while on an assignment for Zhang Jian in 1907 that Moh came to believe that the future strength of the nation relied on the improvement of agriculture.[[35]](#footnote-35) Being “determined to learn something more about cotton than the mere buying and selling of it,” Moh went to the United States in 1909 at the age of 33 to gain an agricultural education.[[36]](#footnote-36) He split his undergraduate studies between the University of Wisconsin at Madison and the University of Illinois at Urbana-Champaign before pursuing post-graduate education at Texas Agricultural and Mechanical College where he graduated in 1914. As a part of his training in Texas, Moh visited the university experiment station for three weeks where he observed the scale and comprehensiveness of improvement work. As he described, the station had over 10,000 mu of cotton fields, a cotton gin, and plans to establish a textile mill and a printing and dyeing mill. This experience solidified for Moh the interconnectedness of agriculture, science, and industry. Upon returning to China, family friends helped him establish the Teh-dah Cotton Spinning Co. (德大紗廠). He would later go on to establish several other cotton mills, with each adopting a comprehensive approach to cotton improvement modeled after the Texas experiment station (and likely Zhang Jian’s work in Nantong). This included the establishment of experiment stations to develop improved cottons that could be distributed in the surrounding region, along with a centralized cotton gin that would directly feed his factories.[[37]](#footnote-37)

Moh’s combined industrial and scientific backgrounds helped establish stronger connections between these two worlds. In 1917, Moh helped organize the Cotton Improvement Association of China (中華植棉改良社) alongside other industrialists and scientists.[[38]](#footnote-38) Although China was one of the top four producers of cotton in the world, they lamented that it only grew five percent of global cotton as compared to the United States’ 65 percent. China’s cotton problem wasn’t only one of quantity but also of quality. The purpose of the society was therefore to connect those engaged in cotton work throughout China to exchange knowledge and improve the production of cotton.[[39]](#footnote-39) Members could join the society for free and receive discounted seeds and instruction manuals. Within two years, membership had reached 800 individuals, including many of the most important industrialists and foreign-trained agronomists.[[40]](#footnote-40) Shortly thereafter, the association was folded into the much larger and more comprehensive Chinese Cotton Millowners’ Association (CCMA; 華商紗廠聯合會).

It is worth noting that foreign mill owners in China had tried establishing a joint association with Chinese mill owners for a number of years. James Kerfoot, a British industrialists who first arrived in China in 1896, expressed his frustration to a crowd of Chinese mill owners upon retirement in 1919: “You know, gentlemen, how anxiously I have worked towards this end [cotton improvement work], but you prefer to work alone instead of co-operating with the foreign millowners, who are anxious to assist financially and otherwise in this vital matter which affects all the mills equally.” Kerfoot’s address, selections of which would be published in the *North China Daily News*, ran with the even more frank subtitle of: “CHINESE MILLOWNERS EXHORTED TO ABANDON THEIR SHORTSIGHTED POLICY AND COOPERATE WITH FOREIGN MILLOWNERS.”[[41]](#footnote-41)

Chinese millowners weren’t entirely opposed to working with foreign millowners and experts, but there was a clear sense amongst prominent industrialists such as Moh that China needed to take control of its own destiny. In fact, the formation of the CCMA was the direct result of foreign threats to local industrialization efforts. In 1917, Japan attempted to eliminate customs duty on cotton exports from China to reduce its cost of acquiring cotton. A group of Chinese millowners gathered in Shanghai to discuss the proposal and sent three delegates to Beijing to meet with prime minister Duan Qirui. Included within these three delegates was Yang Shoumei who had close ties to the early Republican military elite and Mu Xiangyao穆湘瑶 (1874-1937) the brother of H.Y. Moh. To the delight of the Chinese millowners, the proposal was shelved. On the heels of this success, they decided to organize the CCMA as a formal association in March 1918. The CCMA was both a local and national organization. The majority of millowners were in the Shanghai region, but mills in other parts of China such as Hankou, Tianjin, and Qingdao joined as well. Membership grew from 13 mills in 1918 to 38 by 1922. Zhang Jian was chosen as the president of the CCMA, but most of the work was led by the vice-president C.C. Nieh 聶其杰 (1880-1953; he also went by the name Nie Yuntai 聶雲台) who was a founding member of the 1917 Cotton Improvement Association of China with Moh and a member of the prominent industrialist Nieh family.[[42]](#footnote-42)

The CCMA adopted a broad approach to cotton improvement that not only included leveraging political influence to shape public policy, but also included experimentation work and detailed cotton surveys. Building on his experience managing the Cotton Improvement Association of China, Moh served as the Chairman of Cotton Improvement and Extension Committee at the CCMA. Part of this work included overseeing the establishment of experiment stations throughout the country. The CCMA, “with the view of improving and increasing the cotton crop and fostering the development of cotton industry” established seven stations in 1919 and ten more in 1920. Nine of these were in Jiangsu, reflecting the heavy Shanghai presence. But other stations were set up in Zhili, Hunan, Hubei, Henan, Zhejiang, and Anhui.[[43]](#footnote-43)

The CCMA generally prioritized the education and employment of Chinese scientists and in supporting Chinese-led efforts to improve cotton rather than relying on foreign experts, but they occasionally invited foreigners to aid in their work. In 1919, for example, they helped sponsor the visit of Orator Fuller Cook, a leading cotton scientist at the United States Department of Agriculture. Many of Cook’s observations tended to confirm existing trends within China. He further stressed the viability of American cotton production in China, along with the importance of experimentation and acclimatization in this process. But his visit also represented a turning point in how cotton improvement was to be conducted moving forward. Cook’s recommendations provided a blueprint for larger-scale reform in China based on the centrality of “pure seed” cotton. The collective efforts of Chinese scientists and industrialists over the previous two decades to establish a scientific basis for industrial cotton production provided the necessary framework for Cook’s visit.

*Orator Fuller Cook and the One-Variety Movement*

Cook’s ideas about cotton improvement were deeply shaped by his understanding of the U.S. cotton economy. As an agent in the USDA Bureau of Plant Industry, much of Cook’s time and energy focused on cotton. Looking at the relative decline of U.S. cotton since the Civil War, Cook suggested that the breakup of large plantations into smaller farms had contributed to a marked decline in cotton quality. The problem was essentially two-fold. First, high-quality cotton was no longer grown in relative isolation, with cross-pollination from neighboring farms leading to a decline in the overall quality of cotton after several generations. And second, smaller farms were unable to afford their own gin, making them reliant on large public gins that mixed high- and low-quality seeds.[[44]](#footnote-44) Alan L. Olmstead and Paul W. Rhode have further pointed out that this problem of mixing at the public gin was exacerbated around the turn of the twentieth century with technological advancements that dramatically increased the amount of cotton that could be processed in a single day.[[45]](#footnote-45) The tendency for varieties to “run out” (i.e. lose uniformity), Cook emphasized, was not inevitable. If done properly, “the same variety of cotton can be maintained and utilized in the same community for many years with no deterioration.”[[46]](#footnote-46) The solution, he argued, was to restore the advantages of the old plantation system by uniting communities of farmers to grow only one variety of “pure seed” cotton (seed “purity” referring to a standard set of characteristics that should be maintained across generations), an idea that would become known as the one-variety community movement. According to Cook, there were simply “too many cotton varieties.” Community action and a “cooperative spirit” were essential to improving the cotton industry and the farm economy.[[47]](#footnote-47) By growing one variety of cotton, carefully selecting and weeding out irregular plants, and collectively ginning to prevent mixing, farmers could produce large supplies of uniform pure-seed cotton that would help the United States compete on the global market.[[48]](#footnote-48)

Determining the best variety of cotton for a given community was key to the success of this program. As Cook emphasized, “To increase the number of varieties in a community is not desirable. On the contrary, there would be a distinct advantage if the whole community would grow one variety, if the best variety could be determined.” Cook made clear that the process of testing and breeding cannot be combined. “A mistake made frequently by farmers, and sometimes by professional breeders,” Cook pointed out, was to save the seed from trial experiments where multiple varieties are grown next to one another to determine the best variety for a given region. “This plan is open to the serious danger that the seed of the new variety when gathered in the fall will not be pure, but will be contaminated by crossing with the local variety, so that its special value will be lost.” Instead, after conducting comparative tests and once the farmer is convinced of the superiority of a new variety, they should obtain a “fresh stock of the seed.”[[49]](#footnote-49)

To determine the most suitable varieties of cotton for each region, Cook made packets of cotton seeds for regional distribution and testing in the United States. These included varieties such as “Trice,” a variety acquired by the Western Tennessee Experiment Station from the farm of Luke Trice in 1904. It also included the variety known as “Acala,” which Cook helped locate during a trip to Chiapas, Mexico in 1906.[[50]](#footnote-50) The purpose of this program was to make available a series of promising varieties of cotton so that the USDA could collect relevant information and farmers could compare them with local varieties. From an early stage, the program cautioned against seed mixing: “it is a well-known fact that varieties of cotton become mixed and impure unless special care is taken to prevent crossing with other varieties.” As such, cotton farmers needed to take special care of the seeds if they hoped to grow the same variety for multiple years. This involved: planting the seed in an isolated patch a quarter of a mile away from other cotton fields and surrounded by forest if possible; weeding out plants whose characteristics are not true to the original variety; carefully selecting the best plants for future production; and ginning the selected cotton seed separately to avoid mixing.[[51]](#footnote-51)

Community production also promised to increase profits for local farmers by allowing them to collectively market high-quality cotton at a higher price. As Olmstead and Rhode describe, individual attempts to improve cotton quality at this time were frequently discouraged by the “hog-round” or “on-point” system of marketing. Under this system, middlemen at the local level would grade a sample of bales and pay one average price for all the cotton sold. It was only after being shipped to regional markets that trained specialists would divide the cotton by quality. This system encouraged “free riding” as “farmers who sold shorter-staple cotton were vastly overpaid, and those who marketed longer staples were shortchanged.”[[52]](#footnote-52) As Cook observed, under this system “the only object in choosing varieties is to get large yields. Some of the most inferior varieties, with short, weak, and irregular lint, yields well and are grown in large quantities simply because the commercial system fails to apply any adequate discrimination of quality in buying the cotton from the farmers.”[[53]](#footnote-53) These marketing problems were reason enough to convince communities to grow one variety, as “better prices can be secured for large quantities of one kind of fiber than for small quantities of different kinds.”[[54]](#footnote-54) Large-quantities of uniform cotton would not only increase its collective value when being sampled at the local market, but also opened up the possibility of bypassing middlemen entirely to sell directly to manufacturers. The one-variety community movement aimed at placing farmers in “responsible, constructive relations with the industrial world.”[[55]](#footnote-55)

The first cotton communities were formed in 1912 in the Salt River Valley of Arizona and the Imperial Valley of California. Growth was relatively slow until 1925 when California designated eight counties as one-variety communities, with a law stipulating “that only Acala could be planted, harvested, or ginned in a district of well over four million acres. Even the possession of non-Acala seeds was illegal.”[[56]](#footnote-56) Community production in the traditional American South moved slower as farmers in one-variety communities continued to complain about market conditions. Aided by the Smith-Doxey Cotton Classing Act in 1937 which standardized grading, one-variety communities expanded in the 1930s and 1940s, where by 1946, they produced around half of U.S. cotton output.[[57]](#footnote-57) Olmstead and Rhode point to the one-variety movement and the Smith Doxey Act as representing a biological and structural revolution that “led to a fundamental change in the source of seed supply, in the varieties of cotton grown, and in how cotton was classed and marketed.” Rather than mechanization, they argue, these biological and structural innovations “counted for the roughly tripling of American cotton yields and the significant increases in average staple length between 1930 and 1960.”[[58]](#footnote-58) Community production went into decline in the 1950s and 1960s in part due to increased mechanization that favored purchased seed that were delinted. Except for parts of California, “one-variety communities simply faded away, having served their purpose in helping promote the transition to better cottons and improved cultural and marketing practices.”[[59]](#footnote-59)

Despite these later successes, Cook’s visit to China occurred before the one-variety movement had really taken off in the United States. Yet what Cook and his associates found in China shared many similarities with the US, including small farms, an overabundance of different cotton varieties, and seed mixing that occurred when collectively ginning different qualities of cotton. This led them to similarly prescribe the one-variety movement as a solution to China’s cotton problem.

*Cook in China*

It is unlikely that Cook would have ever ventured to China were it not for his close friend and colleague Walter T. Swingle. Swingle was an early agricultural explorer alongside David Fairchild who had broad interests in global agricultural exchange and a budding interest in China’s rich agricultural knowledge. This latter interest had led him to work with the Library of Congress to catalogue and acquire large volumes of agronomic texts with the help of others such as then recent Cornell graduate Hing Kwai Fung (see above). This work, along with his long-standing interest in citrus, first brought Swingle to China in 1915 in search of seeds and old books. In Beijing, Swingle met Zhao Erxun (1844-1927) who was overseeing the compilation of the *Draft History of the Qing*. While cotton wasn’t the central focus of Swingle’s work, he had recently worked with Cook to grow Egyptian cotton in Arizona. Zhao, likely inspired by Zhang Jian’s cotton work in Nantong, attempted to hire Swingle and Cook “to test American cotton varieties… on his large estate in North China.”[[60]](#footnote-60) Swingle declined as he didn’t want to give up his position at the USDA. But such encounters likely fueled his interest in the growth of American cotton in China. His 1918 visit to China subsequently included visits with cotton improvement agencies. In Beijing, he met up with Fung and Hsieh En-lung at the Ministry of Agriculture and Commerce. In Nanjing, he observed the experimental work on cotton culture conducted by John H. Reisner at the University of Nanking. In Nantong, he met with Zhang Jian and discussed the issue of cotton cultivation in alkali soil. And in Shanghai, he met with H.Y. Moh and other prominent industrialists at the CCMA such as C.C. Nieh, Huang Shoumin 黃首民, and Chen Guangfu 陳光甫.[[61]](#footnote-61)

Swingle’s visit convinced him that cotton experts such as Cook could help China’s struggling cotton industry. Fortunately, the CCMA was willing to sponsor the trip with the help of Reisner at Nanking. After convincing Cook to make the trip, Reisner organized a regional test of eight varieties of American cotton sent to twenty-five locations throughout China. Most of these sites were missionary stations, but they also included other individuals and institutions such as the Ministry of Agriculture and Commerce and Zhao Erxun in Beijing, Zhang Jian in Nantong, and industrialist Zhou Xuexi in Tianjin.[[62]](#footnote-62) The plan was to have these different locations plant the seeds prior to Cook’s arrival so that that he could then observe the different varieties and determine which were best suited for each region. “After [the best variety] has been determined” by Cook and his associates, Reisner emphasized in a letter sent out to these stations, “all other varieties will be discarded.…This is in keeping with the latest and probably the most important cotton cultural practice ever discovered, namely, that crossing of different varieties, no matter how excellent the varieties to begin with, leads to deterioration” (emphasis in original). Building on Cook’s research, Reisner further emphasized that the challenge was not only to determine the best variety, “but see to it that in the meantime seed of several different kinds is not allowed to be distributed in the region for which you are working.”[[63]](#footnote-63)

On August 10, 1919, Cook arrived in China with his colleague and assistant Harold F. Loomis. They were later joined by a young cotton specialist John B. Griffing who had worked with some of Cook’s associates in Arizona on pure-seed production of Egyptian cotton. Through Swingle’s recommendation, Griffing had also been hired by Reisner to head cotton improvement work at Nanking (see chapter 2). They were also joined by a handful of other specialists, including Xie Jiasheng 謝家聲 of the University of Nanking and C.C. Nieh of the CCMA. A young Ye Yuanding 葉元鼎, who had recently graduated from the University of Nanking and was now working at the CCMA, also accompanied Cook. From early August to late October, Cook was touted as “the first authority on cotton in the world”[[64]](#footnote-64) as the group traveled to an exhausting 23 different locations across Jiangsu, Zhejiang, Anhui, Shandong, Zhili, Henan, Hubei, Hunan, and Jiangxi.[[65]](#footnote-65) In addition to observing the results of the regional variety tests, they also documented different types of cotton, methods of cultivation, regional soil and climatic conditions, and the most pervasive pests limiting cotton production. Although there doesn’t appear to have been much quantitative data collected, their general observations from the regional test showed that “Trice” was most suitable to China followed by “Acala” and another variety known as “Lone Star.”[[66]](#footnote-66)

One particularly troubling discovery from their travels was that varieties of American cotton had already mixed with local seeds. According to Ye Yuanding’s account, local farmers claimed that American cotton had been grown for many years and spread rapidly due to its quality and yield. But because nobody carefully selected the cotton, it deteriorated and mixed with local types.[[67]](#footnote-67) Griffing went so far as to say that “degenerate American cotton are now widely distributed and can be found in nearly every field of Chinese cotton.”[[68]](#footnote-68) This was a crucial finding. One of the major advantages of American cotton was that it was a different species of cotton from native varieties grown in China, meaning that it could be introduced into new regions without fear of hybridization.[[69]](#footnote-69) This fact led Reisner to feel “sanguine about the future of foreign cotton culture in China.”[[70]](#footnote-70) Yet as Griffing highlighted from their tour of China, “a degenerate and further degenerating cotton is being scattered broadcast throughout the country. These mongrel plants will be the most serious obstacle to the maintaining of the high standard of an acclimatized cotton, when such a type is ready for distribution, for it will be practically impossible to prevent their crossing with and thus destroying the uniformity and quality of the pure type. This situation is the greater cause for regret when we realize that American cotton cannot hybridize with Chinese native cotton and pure seed could easily be established and maintained in a community if there were no other American type in the locality, even though native Chinese varieties were present.”[[71]](#footnote-71)

Equally troubling was that this problem of mixing different varieties was apparent at many of the experiment stations that they visited, including the central-government cotton stations in Beijing, Baoding, and Wuchang.[[72]](#footnote-72) Particularly egregious was a station in Anhui where plots labeled as American cotton contained a mixture of both native and American varieties and even one field of native cotton that was incorrectly labeled as American cotton.[[73]](#footnote-73) This experience left a particularly negative impression of state-sponsored experiment work on Griffing who, after beginning work at Nanking University, dismissed many of these stations as merely “rediscover[ing] common facts already known to experienced cotton growers.”[[74]](#footnote-74) But Cook recognized that many of these problems weren’t unique to China. During his meeting with the CCMA in Shanghai, Cook emphasized that experts in the United States have struggled with these issues for many years. Establishing pure seed production continued to be a problem in the US where cotton varieties were widely mixed. He explained that this was why he and his colleagues at the USDA were developing sets of pure seed cotton (the same used for the variety test in China) that could be distributed throughout the country for trials to determine which varieties were most suitable to each region.[[75]](#footnote-75)

On November 1, 1919, Cook boarded the Empress of Russia on his way back to the United States after two exhausting months of travel throughout China. Once aboard, Cook found himself in a “sad state of oriental collapse.”[[76]](#footnote-76) In a letter to his son, he expressed his aversion to China and within a month after departure noted that his time there already felt like a “distant memory.”[[77]](#footnote-77) Cook appears to have only published two articles related to China during his long and productive career, one on pests and another on Jiangxi millipeds.[[78]](#footnote-78) His two-month trip represented a short and apparently forgettable moment in his life. But Cook’s visit left a lasting footprint on cotton improvement work in China. Cook is mostly remembered today for determining that American cotton could thrive in China and that the varieties of Trice and Acala were most suitable if properly acclimatized.[[79]](#footnote-79) Interestingly, both of these ideas were already more or less established in China by this time of Cook’s visit.[[80]](#footnote-80) The more important and overlooked contribution that Cook had on cotton improvement was the importance of establishing pure seed cotton production within the one-variety community framework. Reisner’s report of the trip emphasized this aspect: “Before Mr. Cook’s arrival, it is safe to say, no one in China truly realized the important relation between successful cotton culture and pure seed…. From the standpoint of pure seed production, it is safe to say, that not a single individual or experiment station to date so far has been successful in developing fine strands of uniform character of any foreign staple.”[[81]](#footnote-81) Cook’s reinforcement of the adaptability of varieties such as Trice and Acala was important for cotton production for the next decade as these varieties spread throughout China. But Cook’s ideas about pure seed and community production shaped cotton improvement work for the next half century. Individuals such as Zhang Jian and H.Y. Moh were moving in this direction with the close integration of experimentation, cultivation, and factory production. However as we will see in the following chapters, what Cook provided was a blueprint for scaling up these relationships to transform national cotton production.

*Conclusion*

It is easy to view cotton improvement efforts prior to Cook’s visit through the lens of failure. Cook and others brought to light many fundamental problems with existing approaches to cotton experimentation, including the mixing of native and American cotton varieties or the failure to acclimate American cotton prior to dissemination. The growing craze for foreign cotton in the early twentieth century at times led individuals to promote the expansion of American cotton without considering the potential negative consequences of their approach. At the same time, the convergence of political, industrialist, and scientific interests in the late Qing and early Republican era laid an important foundation for cotton work moving forward. These converging interests increasingly recognized that cotton was a complex biological organism and that industrialization therefore required extensive scientific and social change, from the expansion of the cotton science community and the establishment of regional experiment stations to standardizing cotton varieties in circulation and reforming how cotton was grown and processed. Cotton improvement work in the 1920s and 1930s attempted to put these ideas into practice, including an emphasis on pure seed and community production. As discussed in the following chapter, there remained questions about scale and who should lead these efforts. And the end results were mixed. But the 1920s and 1930s saw the further solidification of science as a central actor in shaping industrialization and an increasingly central force in driving rural reform.

1. John Barrett, “Dixie and the Orient,” *The Washington Post* (15 May 1898): 11. Barrett was not alone in his enthusiasm. A 1902 piece in the *Los Angeles Times* similarly declared that “the American trade boom in the British Empire has about reached its climax.” Instead of trying to compete with the British colonies also growing cotton, there was an increased recognition that the Chinese-American trade “offers possibilities greater than can be found anywhere else in our foreign trade.” See “Development of Trade with China” *Los Angeles Times* (27 Aug 1902): 6. [↑](#footnote-ref-1)
2. H.D. Fong, “Cotton Industry and Trade in China,” *Chinese Social and Political Science Review* 16, no. 1 (1932): 347–48; Beckert, *Empire of Cotton*, 414–15. [↑](#footnote-ref-2)
3. John H. Reisner, “Report of the College of Agriculture and Forestry for the Year Ending August, 1919,” *University of Nanking Bulletin* 4, no. 6 (1919): 9. [↑](#footnote-ref-3)
4. *Jinian Zhang Zhidong yinzhong ludimian yibai zhounian: xueshu yanjiuhua lunwen ji* 纪念张之洞引种陆地棉一百周年: 学术研讨会论文集 (Hubei: Hubei renmin chubanshe, 1994), 1. [↑](#footnote-ref-4)
5. *Jinian Zhang Zhidong* (1994); Wang Ruhai 王若海, “Zhang Zhidong yinzhong ludimian bainian ji pingxi” 张之洞引种陆地棉百年及评析, *Zhongguo nongshi*, no. 2 (1992): 81-83; Stross, *The Stubborn Earth*,ch. 2; “H.E. Chang Chih-Tung’s Wuchang Cotton Mills,” *The North-China Herald* (17 Mar 1893): 393. [↑](#footnote-ref-5)
6. Pomeranz, *The Making of a Hinterland*, 73-74. [↑](#footnote-ref-6)
7. Ma Wanming, Wang Siming, and Li Qun, “Lun Zhang Jian ke jiao xing nong ji changdao ‘mian tie zhuyi’ de shijian” 论张謇科教兴农及倡导“棉铁主义”的实践, *Nanjing Nongye Daxue xuebao* 2, no. 1 (2001): 42-47. [↑](#footnote-ref-7)
8. Odell, *Cotton Goods in China*, 26. [↑](#footnote-ref-8)
9. Albert Feuerwerker, “Handicraft and Manufactured Cotton Textiles in China, 1871-1910,” *The Journal of Economic History* 30, no. 2 (1970): 342-348. [↑](#footnote-ref-9)
10. Yan Zhongping 严中平, *Zhongguo mian fangzhi shigao* 中国棉纺织史稿 (Beijing: Shangwu yinshuguan, 2017), 459. [↑](#footnote-ref-10)
11. Zhu Zurong 朱祖榮, *Quan zhong yang mian shuo* 勸種洋棉說 [On urging the cultivation of foreign cotton] *Nongxuebao* no. 18 (1898): 50-53; see Peter Lavelle, “Agricultural Improvement and China’s First Agricultural Experiment Stations,” in Denise Phillips and Sharon Kingslandeds., *New Perspectives on the History of Life Sciences and Agriculture* (New York: Springer, 2015), 331. [↑](#footnote-ref-11)
12. Odell, *Cotton Goods in China,* 199. [↑](#footnote-ref-12)
13. Feuerwerker, “Handicraft and Manufactured Cotton Textiles in China, 1871-1910,” 342-348. [↑](#footnote-ref-13)
14. Lavelle, “Agricultural Improvement and China’s First Agricultural Experiment Stations,” 324. [↑](#footnote-ref-14)
15. “Zhongguo mianhuaye buke zaizi fangqi” 中國棉花業不可再自放棄, *Shen bao,* no. 13849, August 28, 1911. [↑](#footnote-ref-15)
16. On achievements of American cotton production in Shandong, see Yuan Pengxin 苑朋欣, “Qingmo Shandong Meimian de yinzhong he tuiguang” 清末山东美棉的引种和推广, *Nongye kaogu*, no. 6 (2009): 22–24. [↑](#footnote-ref-16)
17. Odell, *Cotton Goods in China*, 30. [↑](#footnote-ref-17)
18. Based on translation found in Hing Kwai Fung, “Cotton Culture,” *The Chinese Social and Political Science Review,* no. 97 (1916): 106. Mandate from Guangxu year 34, month 1, day 11 (11 February 1908), reprinted in Zhongguo di’yi lishi dang’anguan, ed., *Guangxu Xuantong liang chao shang yu dang* 光绪宣统两朝上谕档, no. 34 (Guilin: Guangxi shifan daxue chubanshe, 1996), 9-10. [↑](#footnote-ref-18)
19. Fung, “Cotton Culture,” 108; *Mianye tushuo* 棉業圖說 (Beijing: Nong gong shang bu, 1911). India and Great Britain are noticeably missing from this list. [↑](#footnote-ref-19)
20. Odell, *Cotton Goods in China*, 204-205. [↑](#footnote-ref-20)
21. “H.E. Chang Chih-Tung’s Wuchang Cotton Mills” *The North-China Herald* (17 Mar 1893): 393. [↑](#footnote-ref-21)
22. Odell, *Cotton Goods in China*, 206. [↑](#footnote-ref-22)
23. Elisabeth Köll, *From Cotton Mill to Business Empire: The Emergence of Regional Enterprises in Modern China* (Cambridge, MA: Harvard University Press, 2003); Qiang Jian 羌建, *Jindai Nantong mianye biange yu diqu shehui bianqian yanjiu* 近代南通棉业改革与地区社会变迁研究 (Beijing: ZHongguo nongye kexue jishu chubanshe, 2013). [↑](#footnote-ref-23)
24. According to one scholar’s count, from 1901 to 1949, a total of 2,048 Chinese students studied agricultural-related topics abroad, including cotton science. See Shen Zhizhong 沈志忠, “Nongke liuxuesheng yu Zhongguo jindai nongye keji tizhihua jianshe” 农科留学生与中国近代农业科技体制化建设, *Anhui shixue* 5 (2009): 6 [↑](#footnote-ref-24)
25. Zuoyue Wang, “Saving China through Science: The Science Society of China, Scientific Nationalism, and Civil Society in Republican China,” *Osiris* 17 (2002): 299. [↑](#footnote-ref-25)
26. Peter Lavelle, “Agricultural Improvement and China’s First Agricultural Experiment Stations,” 324. By the mid-1930s, there were around five hundred experiment stations established at the central, provincial, and county levels. “Quanguo nongshi shiyan changsuo gaikuang” 全國農事試驗場所概況, n.d. [c. 1936], 422(2)-810, Second Historical Archives of China, Nanjing. [↑](#footnote-ref-26)
27. Fung’s 1908 bio in *The Cornell Class Book* states: “Hing Kwai Fung, Canton, China. Prep school: Queen’s College. Age, 24. Univ. course, Agr. Years in Cornell, 4. Since Mr. Fung, ‘the glass of fashion and mould of form,’ arrived from China, he has been smashing hearts of fair dames on all sides. One glance from his twinkling black orbs conquers the heart completely. We hope his search for A.M. and Ph.D. will keep him here several years longer. Cosmopolitan Club, National Representative of Cosmopolitan Club, Member of Jugatæ Club.” See *The Cornell Class Book* (Ithaca, NY: Cornell University, 1908), 88. [↑](#footnote-ref-27)
28. On Swingle, see Spencer Stewart, “Xiang Zhongguo xuexie: Shi Yonggao, Zhong Mei nongye jiaoliu ji lishi jiazhi” 向中国学习: 施永高, 中美农业交流及历史价值, *Zhongguo lishi*, 38, no. 6 (2019): 29-39. [↑](#footnote-ref-28)
29. The first of these articles was published in Feng Qinggui 馮慶桂, “Zhongwai mian di qihou kao” 中外棉地氣候考, Nonglin gongbao 2, no 9 (1913): 67-84. For a brief note on Fung’s work at the Department, see Fung to Fredrick V. Coville (June 21, 1913), box 1, folder “China”, Division of Botany, RG54 - Records of the Bureau of Plant Industry, Soils, and Agricultural Engineering, National Archives at College Park. [↑](#footnote-ref-29)
30. “Agricultural Education and Research in China,” *Science* 46, no. 1177 (20 July 1917): 54-55. Not much is known about Jobson or how he found employment in China, but he had previously graduated with a bachelor’s degree in 1908 from Texas Agricultural and Mechanical College where his training included research on cotton. [↑](#footnote-ref-30)
31. Fung, “Cotton Culture,” 108-112; “Zhangcheng: Mianyechu guize” 章程: 棉業處規則, *Nongshang gongbao* 2, no. 9 (1916): 52-53; “Benbu jishi” 本部記事, *Nongshang gongbao* 2, no. 8 (1916): 220. [↑](#footnote-ref-31)
32. Similar to Odell, Jobson implied that part of the problem with American cotton production in China was the approach that the Chinese government took to cotton improvement: “If it were possible to conduct the work on a more modern and systematic basis much more progress could be made, but since it is being fostered by the Chinese Government it must be promoted according to the methods and system it prescribes.” See H. H. Jobson, “American Cotton Types in China,” *Millard’s Review* (29 Dec 1917): 136-137. [↑](#footnote-ref-32)
33. Hsieh’s background shared many similarities with his colleague Fung. Both were born in Canton and attended Queen’s College in Hong Kong before traveling to the United States for advanced education in agriculture. Hsieh first attended Massachusetts Agricultural College and Boston University before doing post-graduate work at Cornell beginning in 1910 where Fung was finishing up his Ph.D. Upon returning to China in 1912, Hsieh was also hired by the Ministry of Agriculture and Commerce, but his education and work at the Ministry didn’t focus exclusively on cotton. His Cornell thesis was on the impact of liming on soil fertility and his early reports in China looked at the tobacco and tea industries. But his more general work at the Ministry included occasionally inspecting the cotton improvement work at the four central-level cotton stations, including accompanying Jobson on his tour of China. See Hsieh En-Lung, “A Study of the Relation of Liming to Soil Fertility” (PhD dissertation, Cornell University, 1911). [↑](#footnote-ref-33)
34. Xie Enlong 謝恩隆 and Qian Suisun 錢穟孫, “Zhenxing mianye zhi guanjian” 振興棉業之管見, *Nongshang gongbao* 4, no. 8 (1918): 1-4. [↑](#footnote-ref-34)
35. “我国以农立国, 必须首先改良农作, 跻国家于富庶地位, 然后可以图强.” As quoted in Xia Rubing 夏如兵 and You Yi 由毅, “Kexue yu qiye de ouhe: Mu Ouchu yu Zhongguo jindai zhimianye gailiang” 科学与企业的耦合: 穆藕初与中国近代植棉业改良, *Zhongguo nongshi* 40, no. 3 (2021): 37-43. [↑](#footnote-ref-35)
36. *Cotton Cultivation in China and Something about the Spinning and Weaving Mills* (Shanghai: Offices of the “North-China Daily News & Herald” Ltd., 1917), 26-27. [↑](#footnote-ref-36)
37. *Cotton Cultivation in China and Something about the Spinning and Weaving Mills,* 26-27. For an overview of Moh’s early education and contributions to China’s cotton industry, see Xia and You, “Kexue yu qiye de ouhe.” [↑](#footnote-ref-37)
38. These included Wu Shanqing 吳善慶, Yu Pinghan 郁屏翰, Nie Yuntai 聶雲台 (C.C. Nieh), You Xiyin 尤惜陰, and Huang Shoumin 黃首民. [↑](#footnote-ref-38)
39. “Zhonghua zhimian gailiang she” 中華植棉改良社, *Dongfang zazhi* 14, no. 21 (1917): 192-193. [↑](#footnote-ref-39)
40. Xia and You, “Kexue yu qiye de ouhe.” [↑](#footnote-ref-40)
41. “Future of China’s Cotton Industry,” *North China Daily News* (3 June 1919). A copy of this address was sent to the U.S. Department of State intended for the US Chamber of Commerce. See “Future of China’s Cotton Industry” (6 June 1919), National Archives and Records Administration (NARA), RG84: Records of Foreign Service Posts, Diplomatic Posts, China, Volume 0994, National Archives at College Park. [↑](#footnote-ref-41)
42. “1917 nian huashang quanguo shachang lianhehui changli shiliao” 1917年华商全国纱厂联合会创立史料 *Dang’an yu lishi*,no. 3 (1988): 4-11; Richard Clarence Bush, “Industry and Politics in Kuomintang China: The Nationalist Regime and Lower Yangtze Chinese Cotton Mill Owners 1927-1937” (PhD dissertation, Columbia University, 1978), 66-68; [↑](#footnote-ref-42)
43. T.S. Kuo “The Report of The Cotton Experiment Stations of The Chinese Cotton Millowners’ Association,” in *Huashang shachang lianhehui zhimianchang baogao* 華商紗廠聯合會植棉場報告 (Shanghai: ?, 1921): 1. [↑](#footnote-ref-43)
44. O.F. Cook, “Cotton Improvement on a Community Basis,” in *Yearbook, 1911* (Washington, DC: United States Department of Agriculture, 1912): 397; Orator F. Cook, “One-Variety Cotton Communities,” *United States Department of Agriculture Bulletin*, no. 1111 (November 25, 1922): 12; “Cotton Improvement: Essentials of a Program” (no date), Papers Prepared for Publication 1932-35, Box 2, Division of Cotton, Rubber, and other Tropical Plants, RG54, Records of the Bureau of Plant Industry, Soils, and Agricultural Engineering, National Archives at College Park. [NOTE: there is no author listed for the “Cotton Improvement” paper, but the ideas and writing style, combined with the fact that it was found within a folder of Cook’s other publications, strongly suggests that this was also authored by Cook.] [↑](#footnote-ref-44)
45. Alan L. Olmstead and Paul W. Rhode, “Hog-Round Marketing, Seed Quality, and Government Policy: Institutional Change in U.S. Cotton Production, 1920-1960” *Journal of Economic History* 63, no. 2 (2003): 451. [↑](#footnote-ref-45)
46. Cook, “One-Variety Cotton Communities,” 17; Cook, “Cotton Improvement on a Community Basis,” 404. [↑](#footnote-ref-46)
47. Cook, “One-Variety Cotton Communities,” 15, 39. [↑](#footnote-ref-47)
48. Cook, “One-Variety Cotton Communities,” 1-2; Cook, “Cotton Improvement on a Community Basis,” 397-398. [↑](#footnote-ref-48)
49. O.F. Cook, “The Improvement of the Cotton Crop by Selection,” *Distribution of Cotton Seed in 1911* (Washington D.C.: USDA Bureau of Plant Industry, 1911): 3-4. [↑](#footnote-ref-49)
50. O.F. Cook and C.B. Doyle, “Acala Cotton, A Superior Upland Variety from Southern Mexico”, *United States Department of Agriculture Circular*, no. 2 (November 1927): 7-10. See also *Distribution of Cotton Seed in 1909* (Washington, DC: Bureau of Plant Industry, USDA, January 15, 1909). [↑](#footnote-ref-50)
51. *Distribution of Cotton Seed in 1903* (Washington D.C.: USDA Bureau of Plant Industry, 1903), 11-12. [↑](#footnote-ref-51)
52. Olmstead and Rhode, “Hog-Round Marketing, Seed Quality and Government Policy,” 454. [↑](#footnote-ref-52)
53. Cook, “One-Variety Cotton Communities,” 23. [↑](#footnote-ref-53)
54. Cook, “One-Variety Cotton Communities,” 22. [↑](#footnote-ref-54)
55. Cook, “One-Variety Cotton Communities,” 29. [↑](#footnote-ref-55)
56. Olmstead and Rhode, “Hog-Round Marketing, Seed Quality and Government Policy,” 458. [↑](#footnote-ref-56)
57. Olmstead and Rhode, “Hog-Round Marketing, Seed Quality and Government Policy,” 460. [↑](#footnote-ref-57)
58. Olmstead and Rhode, “Hog-Round Marketing, Seed Quality and Government Policy,” 480. [↑](#footnote-ref-58)
59. Olmstead and Rhode, “Hog-Round Marketing, Seed Quality and Government Policy,” 479. [↑](#footnote-ref-59)
60. “Educational Experience of Walter T. Swingle,” no date, Box 13, Folder 2, Walter Tennyson Swingle Collection, Special Collections, University of Miami Libraries, Coral Gables, Florida. [↑](#footnote-ref-60)
61. Walter T. Swingle Diary (1918), Box 14, Walter Tennyson Swingle Collection, University of Miami Special Collections; Ye Yuanding葉元鼎, “Ge sheng zhimian qingxing diaocha ji” 各省植棉情形調查記, *Huashang shachang lianhehui jikan* 1, no. 2 (1920): 233.  [↑](#footnote-ref-61)
62. “Mr. J.H. Reisner, Dean of the College of Agriculture of the University of Nanking, has taken several bags of this seed and distributed them among those with whom he is working in connection with the improvement of cotton in China…. The remaining six bags were distributed as follows: Two to Chang Ch’ien, Nan Tung Chow; one to Chao Erh Sun, Peking; one to Chou Hsueh His, Tientsin; and two to the Ministry of Agriculture and Commerce.” Letter from Dorsett likely to Julean Arnold, May 15, 1919, 649-2519, Second Historical Archives of China. [↑](#footnote-ref-62)
63. Letter reproduced in “Report on Cotton Experiment 1919,” 1920, 649-2699,. Report can also be found in RG011-199-3416, Yale Divinity Library. [↑](#footnote-ref-63)
64. “Report on Cotton Experiment 1919,” Feb. 18, 1920, 649-2699, Second Historical Archives of China. [↑](#footnote-ref-64)
65. Locations visited included: Nanjing, Changzhou, Wuxi, Shanghai, Baoshan, Nantong, Hangzhou, Chuxian, Nansu, Anqing, Tianjin, Tangshan, Junliangcheng, Beijing, Baoding, Zhangde, Zhengzhou, Hankou, Wuchang, Yuezhou, Changsha, Jiujiang, and Nanchang. [↑](#footnote-ref-65)
66. John H. Reisner, “Report of the College of Agriculture and Forestry, 1919-1920,” *University of Nanking Bulletin* 5, no. 5 (1920): 12. [↑](#footnote-ref-66)
67. Ye, “Ge sheng zhimian qingxing diaocha ji,” 236. [↑](#footnote-ref-67)
68. John B. Griffing, “Report of Three Years’ Cotton Improvement Work,” *University of Nanking Agriculture and Forestry Series* 1, no. 6 (Nanjing: University of Nanking, Sept. 1923), 3. [↑](#footnote-ref-68)
69. Cook, “Arrangement of Parts in the Cotton Plant,” 10; John B. Griffing, “Possibilities in American Cotton Introduction in China,” *Millard’s Review of the Far East* (June 12, 1920): 98; Feng Zefang further confirmed this finding while conducting doctoral research at Cornell. See C. F. Feng, “Genetical and Cytological Study of Species Hybrids of Asiatic and American Cottons,” *Botanical Gazette* 96, no. 3 (1935): 485-504. [↑](#footnote-ref-69)
70. Letter from Reisner to Rev. Bishop W.C. White, April 25, 1919, 649-2699, Second Historical Archives of China. [↑](#footnote-ref-70)
71. Griffing, “Possibilities in American Cotton Introduction in China,” 98. [↑](#footnote-ref-71)
72. Other experiment stations that they visited included: 上海穆氏植棉試驗場, 上海張華浜植棉試驗場, 南通私立農校棉場, 杭州善源公司植棉場, 天津唐山植棉試驗場, 北京中央農事試驗場, 北京第四植棉試驗場, 直隸農業專門學校棉場, 武昌第三植棉試驗場, 安慶農業學校棉場, 南京胡氏棉場, 金陵大學植棉試驗場 and some of its regional stations. [↑](#footnote-ref-72)
73. Ye Yuanding, “Ge sheng zhimian qingxing diaocha ji (xu)” 各省植棉情形調查記(續), *Huashang shachang lianhehui jikan* 1, no. 3 (1920): 231. [↑](#footnote-ref-73)
74. Griffing, “Report of Three Years’ Cotton Improvement Work,” 4; Stross, *The Stubborn Earth*, 123. [↑](#footnote-ref-74)
75. Ye, “Ge sheng zhimian qingxing diaocha ji (xu),” 233-235. [↑](#footnote-ref-75)
76. Letter from Cook to Reisner, November 12, 1919, 649-2723, Second Historical Archives of China. [↑](#footnote-ref-76)
77. Cook to Robert Cook, November 17, 1919, Folder 3, Box 3, Robert C. Cook Papers, Library of Congress; Cook to Robert, December 8, 1919, Folder 3, Box 3, Robert C. Cook Papers, Library of Congress. [↑](#footnote-ref-77)
78. O.F. Cook, “A Disorder of Cotton Plants in China: Club-Leaf or Cyrtosis,” *Journal of Heredity* 11, no. 3 (1920): 99-110; O.F. Cook and H.F. Loomis, “A New Family of Spined Millipeds from Central China,” *Journal of the Washington Academy of Sciences* 14, no. 5 (1924): 103-108. [↑](#footnote-ref-78)
79. See, for example, Wang Ruohai 汪若海, Cheng Hongliang 承泓良, and Song Xiaoxuan 宋晓轩, *Zhongguo mianshi gaikuang* 中国棉史概述(Beijing: Zhongguo nongye kexue jishu chubanshe, 2017): 176. [↑](#footnote-ref-79)
80. On suitability of American cotton, see discussions of Jobson, Hsieh, and Mu Ouchu above. It was reported in 1918 that the four central-level experiment stations had been conducting tests on different American varieties in the previous years, determining that Trice was “the best early variety of American cotton for extensive cultivation in China.” See Hollington K. Tong, “China Officially Adopts American Cotton Seed as Standard,” *Millard’s Review of the Far East* (30 Nov 1918): 514. Additionally, regional experiment stations continued to test out other varieties – including the CCMA and other stations. See subsequent chapters for details. [↑](#footnote-ref-80)
81. Reisner, “Report on Cotton Experiment 1919,” 56-57. [↑](#footnote-ref-81)