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QING LOCAL OFFICIALS AND THE CIRCULATION OF WILD SILKWORM REARING

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Introduction

In imperial China, agriculture was regarded as fundamental both to society and to the state. Accordingly, promoting agriculture (*quannong* 勸農) was a responsibility of the state. As is well known, the late imperial state relied on its officials not only for implementation of policy, but also for gathering the information on local production and conditions which served to develop this policy. These officials were the indispensable means for the construction of a body of knowledge that could be universally valid—in this case, that could be effectively implemented in different parts of the empire. This applied to textile production, and in particular to sericulture.¹

The production of silk, and in particular the rearing of silkworms, has been described by various authors.² In the relevant literature, the term “silk” generally refers to the yarn and fabric produced from the cocoons of *Bombyx mori* that are bred indoors and fed on the leaves of mulberry trees (*sang* 桑). However, there exist other species of insects of the order *Lepidoptera* whose cocoons have long been used to make yarn for fabric in China. These insects live outdoors, and most of them eat the leaves of trees other than the mulberry; the yarn they produce is called wild silk. Much less studied than the raising of domesticated silkworms (*Bombyx mori*), wild silk production was nonetheless of considerable interest to the late imperial state, especially under the Qing dynasty (1644-1911). The present study is devoted to assessing the extent to and ways in which the geographical mobility of officials and of other elements of the population contributed to the

¹ For a discussion of this policy regarding sericulture during the Yuan dynasty, see Mau Chuan-hui, “Les progrès de la sériciculture sous les Yuan (XIII^e-XIV^e siècles) d’après le *Nongsang jiyao* 農桑輯要,” *Revue de Synthèse* 131, no. 2 (2010), pp. 193-217.

² For an overview of the process of silk production in English see Joseph Needham and Dieter Kuhn, *Science and Civilisation in China*. Vol. 5, *Chemistry and Chemical Technology*. Part 9, *Textile Technology: Spinning and Reeling* (Cambridge: Cambridge University Press, 1988), pp. 285-417.

production of knowledge of wild silk production, and to its circulation in the Qing Empire.

Several species of caterpillars belonging to the families *Bombycidae* and *Antheraea* produce silk appropriate for commercial use. Like domesticated silkworms, wild silkworms produce cocoons to protect themselves during the metamorphosis into moths, but they must spend all, or most, of their life outdoors. In silkworm rearing (*fangyang* 放養), such caterpillars are placed on a tree and then, when they have eaten all its leaves, moved to another tree. The silk produced is glossier, heavier and more durable than that produced by *Bombyx mori*, partly owing to a high quantity of sericin around the fibroin (the insoluble protein present in silk).³ This raises difficulties both for unwinding silk from cocoons and for dyeing. On the other hand, the great durability of wild silk was regarded as an asset in imperial China, where its dull color was believed to represent virtuous moderation, as expressed in poems by Wang Yucheng 王禹偁 (954-1001) and Su Shi 蘇軾 (1031-1101), among others.

The use of wild silk for making cloth began in antiquity. For centuries, large harvests of wild silk cocoons were considered as good omens by officials who reported them to the throne in congratulatory memorials. By 1300, wild silk had been commercialized and gained the approval of ordinary people due to its low cost. The poet Ma Zuchang 馬祖常 (1279-1338) wrote that “from wild cocoons silk is reeled: delight in its low price.”⁴ In the early Ming period, the appearance of wild cocoons in the countryside became common and was no longer considered as a good omen for the empire.⁵ According to the *Gazetteer of Qingzhou* 青州 [Shandong] *Prefecture*, Linqiu 臨朐, Zhucheng 諸城, Mengyin 蒙陰 and Juzhou 莒州 produced silk goods made from mountain cocoons (*shanjian chou* 山繭紬), and those from Yishui 沂水 were the best.⁶

It is not clear if at the time Zhucheng producers obtained cocoons by rearing wild silkworms or simply by collecting cocoons in the wild. A poem by Wu Weiye 吳偉業 (1609-1671) described how Mengyin farmers “suc-

³ Sericin partly dissolves in hot water, which allows unwinding the cocoons and making silk; after drying, the residue coagulates again.

⁴ Su Tianjue 蘇天爵 (1294-1352), ed., *Yuan wenlei* 元文類, *juan 7*, “Ti Guangshanxian Kongzai Binfengting” 題光山縣孔宰幽風亭, in Wang Yunwu 王雲五, ed., *Guoxue jiben congshu* 國學基本叢書 (Taipei: Taiwan shangwu, 1968), p. 84.

⁵ Zhu Guozhen 朱國禎, *Dazheng ji* 大政記, *juan 8*, p. 13b, “Shibu” 史部 16 (Tainan: Zhuangyan wenhua shiye, 1996), p. 120. See also Wang Yuanting, *Yecanlu* 野蠶錄, in *Xuxiu Siku quanshu* 續修四庫全書 (hereafter *XXSK*) (Shanghai: Guji chubanshe, 1995-2002), vol. 978, p. 644.

⁶ [*Kangxi*] *Qingzhou fuzhi* [康熙]青州府志, Tao Jin 陶錦 and Wang Changxue 王昌學, comps., 1721, *juan 9*, p. 19b.

ceed in rearing wild silkworms, all of which formed cocoons.”⁷ We owe to Sun Tingquan 孫廷銓 (1613-1674)—an official and native of Yidu 益都 in Shandong—the first description of wild silk making, entitled “Shancan shuo” 山蠶說 (On mountain silkworms, 1651).⁸ Sun’s description predated the first campaign by local officials to promote wild silkworm rearing.

In the late seventeenth century, some local officials from Shandong took the initiative of introducing this practice elsewhere, in the districts under their jurisdiction. However, the real movement to promote it began in the first decades of the eighteenth century, when more officials and prominent local literati devoted themselves to popularizing these techniques, following the publication of a handbook on wild silkworm raising commissioned by the emperor. In 1744, at the suggestion of Jiang Shunlong 姜順龍,⁹ then Surveillance Commissioner (*anchashi* 按察使) of Sichuan, the Qianlong 乾隆 emperor (r. 1736-1795) ordered the Shandong Provincial Governor Kaer Jishan 喀爾吉善 (d. 1757)¹⁰ to compile a manual on wild silk production, entitled *Shandong yangcan chengfa* 山東養蠶成法 (The Shandong method for silkworm rearing).¹¹ This marked the beginning of a series of official campaigns for the local adoption of wild silkworm rearing that continued into the Republic of China.

The enthusiasm of local and provincial officials in promoting the wild silk industry¹² during the early and mid-Qing is striking. Since the late 1950s, historians have published articles on the history of wild silk produc-

⁷ Wu Weiye 吳偉業, *Wu Meicun shiji jianzhu* 吳梅村詩集箋注 (Baoyunlou 保蘊樓 ms., Shanghai: Guji chubanshe, 1983), *juan* 8, p. 554.

⁸ Sun Tingquan, *Yanshan zaji* 顏山雜記 (1651), “Tiyao” 提要, in *Yingyin Wenyuange Siku quanshu* 景印文淵閣四庫全書, “Shibu” 史部 350, “Dililei” 地理類 8, pp. 1a-2b (Taipei: Taiwan shangwu, 1986), vol. 592, p. 759.

⁹ On Jiang Shunlong, see [*Qianlong*] *Fuzhou fuzhi* [乾隆] 福州府志, Xu Jingxi 徐景熹 and Lu Zengyu 魯增煜, comps., *juan* 32, p. 4a, in *Zhongguo fangzhi congshu* 中國方志叢書 (hereafter ZGFZCS), Huanan difang 華南地方 72 (Taipei: Chengwen, 1967); see also Pan Yantong 潘衍桐, *Liang Zhe youxuan xulu* 兩浙輶軒續錄, Guangxu edition, *juan* 4, pp. 29b-30a, in *XXSK*, vols. 1685-1687, esp. vol. 1685, p. 125; and see Tao Liang 陶梁, *Guochao jifu shizhuan* 國朝畿輔詩傳, *juan* 30, p. 22a, Hongdou shuguan 紅豆樹館 edition, 1839, *XXSK*, vol. 1681, p. 381.

¹⁰ Kaer Jishan, *zi* Danyuan 澹園, was a descendant of Irgen Gioro from the Warga tribe and a Manchu of the Plain Yellow Banner. See Zhang Tingyu 張廷玉, *Qingshi gao* 清史稿, *juan* 309, Liezhuan 列傳 96, in *Ershiwu shi* 二十五史 (Shanghai: Guji chubanshe, 1984), vol. 12, pp. 10,596-10,600.

¹¹ Wang Xianqian 王先謙, *Donghua xulu* 東華續錄, *juan* 6, pp. 15b-16a, reprinted in *Shierchao Donghua lu* 十二朝東華錄, “Qianlong chao,” pp. 203b-204a (Yonghe: Wenhai, 1963).

¹² In this chapter, the term “industry” is used in its earlier sense of “activity,” “ability,” and “a trade or occupation.”

tion in China. Some of them have tried to understand the origin of *Bombyx mori* domestication through comparative studies with the history of wild silkworm raising.¹³ Numerous scholars have described the spread and development of the wild silk industry in various parts of China,¹⁴ while others have studied handbooks on wild silk production, trying to identify their authors and reconstruct the production process.¹⁵ However, there is as yet neither a systematic study of the history of the many local efforts to promote wild silkworm rearing nor an explanation of the reasons for the intense interest by the Qing government in the practice.

Three questions are considered in this chapter. First, what circumstances brought this hitherto neglected artisanal activity to the attention of various Chinese governments? Second, since wild silkworm rearing has the same objective as *Bombyx mori* rearing but produces lower quality silk,¹⁶ what were the advantages of wild silk making that led Qing officials to turn their attention to this practice? When the Qianlong emperor decided to promote the practice, he circulated a handbook, the first one on producing wild silk. More than ten works written before the end of the Qing documented the industry, helping to spread understanding and practical know-how. This brings us to our third question: what was the contribution of officials and local literati to the production and circulation of knowledge about wild silk production, and what role did human mobility play there? Relying on memorials, local gazetteers and handbooks, the present chapter aims to understand how practical know-how was transcribed in writing and how knowledge of wild silkworm rearing circulated during the early and mid-Qing period.

¹³ Jiang Youlong 蔣猷龍, “Zhongguo fei sangcan lei tusi kunchong de liyong lishi he chengjiu” 中國非桑蠶類吐絲昆蟲的利用歷史和成就, *Gujin nongye* 古今農業, 1988, no. 2, pp. 61-68; see also Hua Degong 華德公, “Jiacan de qi yuan, fazhan he jishu chengjiu” 家蠶的起源、發展和技術成就, in Zhu Xinyu 朱新予, ed., *Zhongguo sichoushi (zhuanlun)* 中國絲綢史(專論) (Beijing: Zhongguo fangzhi chubanshe, 1997), pp. 44-70.

¹⁴ See, for example, Claudine Lombard-Salmon, *Un exemple d'acculturation chinoise: La province du Guizhou au XVIII^e siècle* (Paris: École française d'Extrême-Orient, 1972), pp. 177-181; Chen Dongsheng 陳冬生, “Qingdai Shandong de zuocan shengchan fazhan yu chuanbo tuiguang” 清代山東柞蠶生產與傳播推廣, *Gujin nongye* 古今農業, 1994, no. 1, pp. 10-17; and William T. Rowe, *Saving the World: Chen Hongmou and Elite Consciousness in Eighteenth-century China* (Stanford: Stanford University Press, 2001), esp. pp. 239-240.

¹⁵ See Yang Hongjiang, annotated by Hua Degong 華德公, “Cong ‘Yecanlu’ deng shu kan Qingdai zuocan siyu jishu” 從‘野蠶錄’等書看清代柞蠶飼育技術, *Canye kexue* 蠶業科學 10, no. 1 (1984), pp. 46-51.

¹⁶ Today's dyeing and finishing techniques allow the manufacture of colorful wild silk cloth, while modern fashion makes wild silk a luxury textile.

I. Economic, Agricultural and Demographic Circumstances

1.1. *Textile Production in Early Qing China*

Beginning in the Song and Yuan dynasties, the silk industry gradually became concentrated in four main regions: the lower Yangzi region, the Sichuan Basin, the Pearl River delta, and the lower Yellow River area.¹⁷ Of the many imperial silk manufactures previously established in various provinces, only three remained in the Qing period, all located in the lower Yangzi River region, a region known as the center of the silk industry.

The Ming period (1368-1644) was a crucial moment for Chinese textile production. At the very beginning of the dynasty, cotton cultivation was introduced into agricultural policy through the collection of cotton as a tax payment. The new tax policy also offered favorable terms for sericulture taxation. Over the following decades, government support and technical progress made cotton cultivation increasingly popular. However, until the early Qing, China seemed to produce enough silk to supply the needs of both the domestic and export markets despite the reduction of land available for mulberry tree plantations.¹⁸ In particular, the raw silk produced in the Lower Yangzi region was essential for making high-quality silk goods.¹⁹

Dressing in silk cloth seems to have been quite common among ordinary people in the late Ming, to the extent that the Chongzhen 崇禎 emperor (r. 1628-1644), concerned about signs of extravagant dress among his subjects, decided to wear wild silk cloth. His efforts only resulted in a rise of the price of this cloth.²⁰ At the time, Chinese silk producers began to have some difficulty supplying the demands from both a flourishing domestic market and a thriving maritime trade following the arrival of European fleets.²¹ The

¹⁷ Mau Chuan-hui, "A Preliminary Study of the Changes in Textile Production under the Influence of Eurasian Exchanges during the Song-Yuan Period," *Crossroads—Studies on the History of Exchange Relations in the East Asian World* 6 (2012), pp. 145-204.

¹⁸ See, for example, Zhang Han 張瀚, *Songchuang mengyu* 松窗夢語, *juan* 4, "Shanggu ji" 商賈記, p. 22a, in *Congshu jicheng* 叢書集成, Wulin wangzhe yizhu 武林往哲遺著 (Shanghai: Guji chubanshe, 1986).

¹⁹ The argument by Fu Yuanchu 傅元初, a late Ming Supervising Secretary (*jishizhong* 給事中), was reproduced by Gu Yanwu 顧炎武 in his *Tianxia junguo libing shu, yuanbian di ershiliu ce* 天下郡國利病書, 原編第二十六冊, Fujian, *Sibu congkan* 四部叢刊 (reprint, Taipei: Taiwan shangwu, 1966), p. 1263.

²⁰ Zhao Jishi 趙吉士, "Shiduji" 豕度寄: "Wuleiyu" 物類俚, *Jiyuan ji suoji* 寄園寄所寄, *juan* 8, in Xiaoyuanke 曉園客, comp., *Zhongguo biji xiaoshuo wenku* 中國筆記小說文庫: *Qingren bailu* 清人稗錄 (Shanghai: Wenyi, 1991), pp. 93-94.

²¹ Anonymous, "Sketch of Spanish Colonial Intercourse in Eastern Asia," *Chinese Repository* 中國叢報 VIII, no. 4 (Aug. 1839), pp. 169-179. See also Quan Hansheng 全漢昇,

mines in Mexico and in Japan supplied the inter-continental trade between China, South Asia, and Central America, flooding China with silver.²² Growing demand and inflationary pressures from imported silver caused prices to rise: they doubled between the beginning and the end of the Ming dynasty.²³ In the late seventeenth century, literati concerned about the stability of the empire called for the promotion of sericulture.²⁴

1.2. Agricultural Policy and Sericulture Promotion in the Early Qing

During the Ming-Qing transition, Northern China was devastated by war. The cultivated area recorded in 1651 represented less than thirty percent of that recorded in 1578.²⁵ The income from tax collection did not suffice to cover the costs of administration and the expenses of the ongoing war. The Qing, like earlier dynasties, took up the promotion of agriculture.²⁶ By 1667, the treasury had solved its financial difficulties, but thereafter wars remained a strain on resources.²⁷ It was crucial for the throne to find efficient means of financing the military; agricultural policy proved to be as effective a fiscal tool for the Qing as it had been for previous dynasties.

This policy also had social and cultural dimensions. Thus the fourth article of the *Shengxun shiliu tiao* 聖訓十六條 (Sacred edict in sixteen items) issued in 1670 by the Kangxi 康熙 emperor (r. 1662-1722) for the edification of all his subjects “emphasized agriculture and sericulture so as to meet the needs for clothing and food.” These instructions were circulated even more widely by his son, the Yongzheng 雍正 emperor (r. 1723-1735), who

“Ming Qing jian Meizhou baiyin de shuru Zhongguo” 明清間美洲白銀的輸入中國, in *Zhongguo jingji shi luncong* 中國經濟史論叢 (Hong Kong: Xinya shuyuan, 1972), vol. 2, pp. 435-450.

²² William Lytle Schurz, *The Manila Galleon* (New York: E. P. Dutton, 1939); see esp. pp. 63-98.

²³ Quan Hansheng, “Meizhou baiyin yu shiba shiji Zhongguo wujia geming de guanxi” 美洲白銀與十八世紀中國物價革命的關係, in *Zhongguo jingji shi luncong*, vol. 2, pp. 475-508.

²⁴ Tang Zhen 唐甄, *Qianshu* 潛書, “Jiaocan” 教蠶, *xiapian xia* 下篇下, pp. 1b-3a, *XXSK*, vol. 945, pp. 427-428.

²⁵ See Shi Zhihong 史志宏, “Qingdai qianqi de gengdi mianji ji liangshi chanliang guji” 清代前期的耕地面積及糧食產量估計, *Zhongguo jingjishi yanjiu* 中國經濟史研究 1989.2, pp. 47-62.

²⁶ Liu Yumo 劉餘謨, “Kenhuang xingtun shu” 墾荒興屯疏, in He Changling 賀長齡 and Wei Yuan 魏源, *Huangchao jingshi wenbian* 皇朝經世文編, *juan* 34, “Huzheng” 戶政, “Tunken” 屯墾, pp. 24a-25a (Yonghe: Wenhai, 1972), p. 877.

²⁷ See Jonathan Spence, “The K’ang-hsi Reign,” Chap. 3 in Willard J. Peterson, ed., *The Cambridge History of China*, Vol. 9, Part 1, *The Ch’ing Empire to 1800* (Cambridge: Cambridge University Press, 2002), pp. 120-182, esp. pp. 136-160.

provided annotations and additions under the title *Shengyu guangxun* 聖諭廣訓 (Amplified instructions on the sacred edict) in 1724; this was part of his continuation of his father's agricultural policy.²⁸ In 1696, Kangxi also commissioned a new version of the famous *Gengzhi tu* 耕織圖 (Pictures of tilling and weaving) to be printed with poems written by the emperor himself in praise of farmers and weavers to accompany pictures by the astronomer and painter Jiao Bingzhen 焦秉貞 (act. c. 1680-1720). Widely circulated, the prints became a symbol of imperial promotion of food and textile production that would be continued by his successors.²⁹ In 1724, Yongzheng ordered provincial officials to supervise local officials in developing agriculture and to award prizes to diligent and experienced farmers; local officials were also to survey the land and to identify the best local conditions for planting trees for silkworm rearing, carpentry and fuel. In short, the policy sought to combine the most economical use of land and the identification of the most beneficial economic activities.³⁰

Early in his reign, Qianlong ordered the compilation of the *Shoushi tongkao* 授時通考 (Comprehensive study of the farming year, 1741), which was based on agriculture manuals, including the *Gengzhi tu*. By distributing this work associated with the promotion of agriculture, Qianlong aimed to increase farmers' awareness of methods of food and textile production. Attaching great importance to silk production, he even tried to restore the cult of the divinity of sericulture, Qincan 親蠶, and had a temple built for this end. In 1746, after becoming the Governor of Shaanxi, the "model official" Chen Hongmou 陳宏謀 (1696-1771)³¹ reported: "I have ordered the widespread planting of mulberry trees and hired artisans skilled in silkworm rearing. In the province, the number of mulberry trees reaches several hundred thousands."³² This is perhaps the best-known example of the zeal shown by officials and literati for the promotion of agriculture, in which

²⁸ Wang Erh-min 王爾敏, "Qingting Shengyu guangxun zhi banxing yu minjian zhi xuanjiang shiyi" 清廷聖諭廣訓之頒行與民間之宣講拾遺, *Jindaishi yanjiu jikan* 近代史集刊 22, no. 2 (1993), pp. 255-280.

²⁹ Paul Pelliot, "À propos du *Keng Tche T'ou*," in *Mémoires concernant l'Asie Orientale (Inde, Asie centrale, Extrême-Orient)*, vol. 1, Paris: Gaston Leroux, 1913, pp. 65-122; see also Mau Chuan-hui, "Technical Painting, Decorative Painting or Political Advertisement: study on *Gengzhitu*," paper for the conference *Visual Representations in Pre-Modern and Non-Western Science and Technology*, National Tsing Hua University, 2009.

³⁰ Song Xixiang 宋希庠, *Zhongguo lidai quannong kao* 中國歷代勸農考 (Shanghai: Zhengzhong shuju, 1947), p. 76.

³¹ See Rowe, *Saving the World*.

³² *Qing Gaozong Chun huangdi shilu* 清高宗純皇帝實錄, *juan* 265, pp. 32b-33a, in *Qing shilu* 清實錄 (Beijing: Zhonghua shuju, 1986), vol. 12, pp. 444-445.

they dedicated particular efforts to silk production.³³ In order to raise productivity, they circulated knowledge about the best practices across the empire.

1.3. *Foreign Trade*

In 1684, Kangxi lifted the ban on maritime trade. The resulting opening of commerce, especially with Europeans, brought wealth to the empire; it also led to an increase in raw silk prices. For example, in Wujiang 吳江 (Jiangsu), the price rose from two *fen* (0.02 tael) per ounce during the Jiajing 嘉靖 reign (1522-1566) to three to four *fen* per ounce during the Kangxi reign; by the Qianlong reign it had again doubled. During the same period, the price of silk goods rose by only one-third.³⁴ This difference reveals a much stronger demand for raw silk than for silk fabrics, possibly as a result of the activities of European merchants, who tended to purchase raw silk for use in the European silk industries.³⁵ They maintained regional trade in the Indian Ocean, where Chinese silk goods were very profitable merchandise. Trade with Europeans brought great quantities of silver into Chinese coastal regions, where “literati, women and, generally all of those who are even a little bit well-off wear silk cloth, and all dress in satin or in damask.”³⁶

This rise of raw silk prices created difficulties for the agents of the Imperial Silk Manufactory (Zhizaoju 織造局) when they purchased raw materials. Since the early Qing, they obtained their supplies at regulated costs for making the silk goods ordered by the Imperial Household Department (Neiwufu 內務府) and those necessary for administration use, as well

³³ Pierre-Étienne Will, “Développement quantitatif et développement qualitatif en Chine à la fin de l’époque impériale,” *Annales: Histoire, Sciences Sociales* 49, no. 4 (1994), pp. 863-902, see esp. pp. 891-899; see also Rowe, *Saving the World*, pp. 235-239.

³⁴ [Qianlong] *Wujiang xianzhi* [乾隆] 吳江縣志, Chen Xunxiang 陳夔纘, comp., *juan* 38, “Shengye” 生業, p. 8a, *ZGFZCS*, Huazhong difang 華中地方 (Taipei: Chengwen, 1975), p. 163.

³⁵ Thus, the Spanish crown forbade the importation of Chinese silk goods into the kingdom in order to promote the local silk industry, to no avail. See François Pyrard, *Voyage de François Pyrard* (Paris: chez Samuel Thiboust et veuve Remy Dallin, 3rd ed., 1619), p. 181. The same policy had been followed by other European kingdoms, such as France, which in 1700 granted the French East India Company the monopoly on importing silk goods from the Indian Ocean into France, in exchange for a sum of 150,000 pounds. See Louis Dermigny, *La Chine et l’Occident: le Commerce à Canton au XVIII^e siècle, 1719-1833* (Paris: S.E.V.P.E.N., 1964), vol. I, pp. 397-398.

³⁶ As reported by François-Xavier Dentrecolles (1664-1741) in Jean-Baptiste Du Halde, *Description géographique, historique, chronologique, politique, et physique de la Chine . . .*, 2nd ed. (La Haye: chez Henri Scheurleer, 1736), vol. II, p. 247.

as gifts for kings and nobles of tributary kingdoms.³⁷ The rise of raw silk prices weighed down the budget of the Imperial Silk Manufactory, and sometimes it was even difficult for them to obtain the top-quality silk needed to make clothes for the emperors.

Following the so-called “James Flint affair,” the exportation of silk was banned in 1757.³⁸ This ban, which was lifted under certain conditions five years later,³⁹ came just at the time when, after the conquest of Zungharia, Qianlong opened trade with the Kazakhs in Xinjiang, wishing to obtain from them horses and military supplies. At first, this trade did not yield the expected results, because the silk fabrics from the provincial warehouse of Shanxi did not match Kazakh tastes. Since the emperor attached great importance to these tributary exchanges, the three Imperial Silk Manufactory officials were commissioned to study local fashion so as to supply the proper silk. In 1760, silk products from the Imperial Silk Manufactory went on the market in Xinjiang.⁴⁰ Over the course of thirty-six years of trade with

³⁷ *Qinding Da Qing huidian* 欽定大清會典 listed the prices regulated by imperial authority for purchasing silk for different uses, such as for the imperial family, tributary nobles and for administration use. A margin rate was granted, in case market prices increased. See, for example, Tuojin 托津, [*Jiaqing*] *Qinding Da Qing huidian shili* [嘉慶] 欽定大清會典事例, *juan* 900, “Gongbu” 工部, “Neiwufu” 16, pp. 11b-12a (Taipei: Wenhai, 1987), pp. 7170-7171.

³⁸ “Hong Renhui shijian” 洪任輝事件: in 1755, as different European East India companies were active in the opening of ports for maritime trade, James Flint, an agent of the British East India Company, appealed directly to the Qianlong emperor, breaking Qing protocol. The event caught the attention of the Qing administration and left numerous documents. Some concerning the trade affairs with the British have been published in *Shiliao xunkan* 史料旬刊; and *Zhongguo di yi lishi dang'anguan* 中國第一歷史檔案館, *Qing Gong Yue Gang Ao shangmao dang'an quanji* 清宮粵港澳商貿檔案全集 (Beijing: Zhongguo shudian, 2002), esp. vols. 3-5. See, for example, “Qianlong ershisinian Yingjili tongshang an” 乾隆二十四年英咭喇通商案, *Shiliao xunkan*, nos. 3, 5 (Taipei: Guofeng, 1963). Many historians have contributed to reconstructing and analyzing the events. See, among others, Hosea Ballou Morse, *The Chronicles of the East India Company Trading to China 1635-1834* (Oxford: The Clarendon Press, 1926-1929, 5 vols.), vol. 1, p. 94; Liang Jiabin 梁嘉彬, *Guangdong shisanhang kao* 廣東十三行考 (Shaoguan: Guangdong renmin chubanshe, 1999), pp. 92-101.

³⁹ The decision was made on the solicitation of the Governor-general of Fujian and Zhejiang provinces, Yang Tingzhang 楊廷璋. At the time the Governor of Fujian province was Dingchang 定長 (1705-1768), the son of Kaer Jishan. See Yang Tingzhang, “Qing fu sijin chuyang jiuli shu” 請復絲勛出洋舊例疏, *Huang Qing zouyi* 皇清奏議, *zou* 55, pp. 5a-5b, *XXSK*, vol. 473; Tuojin, *Da Qing huidian shili*, pp. 8080-8081.

⁴⁰ On the Xinjiang silk trade, see Lin Yongkuang 林永匡 and Wang Xi 王熹, “Qianlong shiqi neidi yu Xinjiang Hasake de maoyi” 乾隆時期內地與新疆哈薩克的貿易, *Lishi dang'an* 歷史檔案, 1985, no. 4, pp. 83-88; and see Fan Jinmin 范金民 and Jin Wen 金文, *Jiangnan sichou shi yanjiu* 江南絲綢史研究 (Beijing: Nongye chubanshe, 1993), pp. 301-348.

the Kazakhs, which ended with the Qianlong reign, the three Imperial Silk Manufactory officials sent more than 400,000 pieces of silk cloth onto the Xinjiang market.⁴¹

Since the early eighteenth century, the court and officials had observed the price increase and taken measures to remedy this. Agricultural policy played an important role in these efforts. Building upon earlier initiatives, many provincial and local officials introduced sericulture into areas where the inhabitants knew nothing of the craft, or revived it in areas where the tradition of silk industry had been abandoned. For example, while he was Provincial Governor of Shaanxi (1743-1746 and 1747-1751), Chen Hongmou promoted domestic and wild silkworm rearing.⁴² While prefect of Fuzhou (1759-1762), Li Ba 李拔 introduced sericulture into Fujian;⁴³ he authored a famous text entitled “Cansang shuo” 蠶桑說 (On sericulture).⁴⁴ This promotion of sericulture was part of a wider agricultural policy.

1.4. Population Growth and Land Reclamation

During the 1680s, after decades of military trouble combined with natural disasters, peace finally came to the Qing Empire. The population, decimated during the Qing conquest, began to recover. In the 1720s, it reached the same size as at the height of the Ming dynasty; around 1740 it reached some two hundred million.⁴⁵ This population growth helped the Chinese economy recover: land abandoned during the disasters could be quickly reclaimed. The decisive land-clearing, agricultural and sericultural policies of the court led to significant results. The provinces most damaged by wars and natural disasters, including Shandong, Zhili 直隸 (which comprised present-day Beijing and Tianjin, most of Hebei province and a part of

⁴¹ Fan Jinmin and Jin Wen, *Jiangnan sichou shi yanji*, p. 311.

⁴² See Pierre-Étienne Will, “Développement quantitatif et développement qualitatif,” pp. 863-902.

⁴³ [*Qianlong*] *Funing fuzhi* [乾隆] 福甯府志, *juan shou*, Xiuzhi xingming 修志姓名, p. 7a; Lixu 例序, p. 8b; *juan 15*, Zhiguan 職官, p. 9b, in *Zhongguo difangzhi jicheng* 中國地方志集成 (hereafter *ZGDFZJC*), Fujian fu xian zhiji 福建府縣志輯 (Shanghai: Shanghai shudian, 2000).

⁴⁴ He Changling and Wei Yuan, *Huangchao jingshi wenbian*, *juan 37*, “Huzheng” 戶政 12: “Nongzheng zhong” 農政中, pp. 14a-16a, reprint pp. 952-953.

⁴⁵ Jiang Tao 姜濤, *Zhongguo jindai renkou shi* 中國近代人口史 (Taipei: Nantian shuju, 1998), pp. 28-31. For demographic statistics in ancient China, we have to consider the historical background; see, for example, Ho Ping-ti, *Studies on the Population of China, 1368-1953* (Cambridge, Mass.: Harvard University Press, 1959); and Cao Shuji 曹樹基, *Qing shiqi* 清時期, in Ge Jianxiong 葛劍雄, comp., *Zhongguo renkou shi* 中國人口史, vol. 5 (Shanghai: Fudan daxue chubanshe, 2001).

Henan and Shandong provinces), Yunnan, Sichuan and Guangxi were quickly straightened out. Shandong seems to have been one of the provinces that suffered the most serious blow to its population in these years,⁴⁶ partly due to massive migration out of the province.

After the boom years from 1680 to 1720, demographic growth seemed to slow down, but the empire's massive population still put strains on available arable lands. By 1712, as it became evident that it was not possible to further enlarge the available land area, the emperor decided that taxes should no longer be collected according to the actual population size, ordering a quota to be drawn up for every province according to the recorded number of taxable persons.⁴⁷ In order to raise funds for the treasury, his successor Yongzheng had to incorporate the poll tax into land taxes (*tan ding ru di* 攤丁入地).⁴⁸

Under Qianlong, various means to increase agricultural production were sought. Tax exemptions were offered during the first years of harvest on newly cleared land, improved techniques were spread by introducing New World food and economic plants, hydraulic works were systematically carried out and a new tax reform was implemented.⁴⁹ The maritime trade with East and Southeast Asia enabled the Chinese to import necessary raw materials (for example, copper, dye, timber, spices) and foodstuffs (especially rice). This favored the development of more profitable activities, such as sericulture, porcelain manufacture and the production of tea and silk products.⁵⁰ The arrival of European merchants led to a flourishing of maritime trade and to a gradual change in its nature in Southern China. As silk weaving developed in Europe, these merchants purchased more raw silk, which led to an increase in price on the Chinese market. This hindered the purchase of raw silk by the Imperial Household Department.

⁴⁶ Jiang Tao, *Zhongguo jindai renkou shi*, pp. 164-167.

⁴⁷ *Qing Shengzu Ren huangdi shilu* 聖祖仁皇帝實錄, *juan* 249, p. 15b, in *Qing shilu* 清實錄 (Beijing: Zhonghua shuju, 1986), vol. 6, p. 3328.

⁴⁸ Bai Shouyi 白壽彝, *Zhongguo tongshi* 中國通史, vol. 10, *Zhongguo shidai-Qing shiqi* 中古時代—清時期, (Shanghai: Renmin chubanshe, 1996), pp. 763-776.

⁴⁹ See Pierre-Étienne Will, "Of Silk and Potatoes: Efforts at Improving Agriculture in Eighteenth-century China," presentation at Cornell University, East Asia Program on 8 October 1991; see also Rowe, *Saving the World*, pp. 231-245.

⁵⁰ Since the Song dynasty (960-1279), the importation of Champa rice as well as the introduction of its cultivation supplied the dense population of southeastern China. See Deng Gang, "The Foreign Staple Trade of China in the Pre-Modern Era," *The International History Review* vol. 19, no. 2 (1997), pp. 253-285. See also Robert B. Marks, *Tigers, Rice, Silk & Silt: Environment and Economy in the Late Imperial South China* (Cambridge, England, and New York: Cambridge University Press, 1998), pp. 118-133.

By the mid-eighteenth century, the policies of the Qing emperors had effectively led to the clearing of the land in the most easily exploited and accessible regions. Qianlong then called on people to clear barren land and other less accessible areas, such as by rivers or situated on “hilltops and promontories” (*shantou dijiao* 山頭地角).⁵¹ Wild silkworm rearing, which involved the use of existing wild forests, fitted in with this policy. During the Daoguang 道光 reign (1821-1850), the population reached four hundred million,⁵² while the area of arable land stayed almost the same as recorded during the Jiaqing 嘉慶 reign (1796-1820). Meanwhile, since the second half of the eighteenth century, British East India Company merchants traded Chinese products for opium produced in India. As a result, significant quantities of silver metal that had been imported from America and Japan now left China. As natural disasters and social unrest had recurred at the end of the eighteenth century, it became urgent for Daoguang’s court to find efficient means to increase the wealth of the empire. This entailed a new wave of government promotion of wild silkworm rearing.

II. The Spread of Wild Silkworm Rearing

Cha Shenxing 查慎行 (1650-1727) mentioned that in the late seventeenth century wild silkworm rearing was spreading into every valley of Shandong, becoming as common as *Bombyx mori* rearing, while it had been unknown in the early fifteenth century.⁵³ Its spread might have been due to migrants who settled in the province during the late sixteenth and early seventeenth centuries. Thus, in 1681, emigrants from Zhucheng taught the people of Qixia 棲霞 how to plant the *zuo* 柞 trees used to feed mountain silkworms; cocoons were soon successfully harvested there. But “the scale did not reach one-tenth of that at Zhucheng and Yishui.”⁵⁴ Despite this evidence, historians have been largely silent on the spread of wild silk production by emigrants (**Table 2.1**).

⁵¹ Cf. Bai Shouyi, *Zhongguo tongshi*, p. 207; see also Sun Wenliang 孫文良, Zhang Jie 張杰, and Zheng Chuanshui 鄭川水, *Qianlong di* 乾隆帝 (Nanjing: Jiangsu jiaoyu chubanshe, 2005), p. 77-82.

⁵² Cao Shuji, (*Di wu juan*) *Qing shiqi*, p. 704.

⁵³ Cha Shenxing, *Renhai ji* 人海記, *Biji xiaoshuo daguan* 筆記小說大觀 40.7 (Taipei: Xinxing, 1985), pp. 544-545.

⁵⁴ [*Qianlong*] *Qixia xianzhi* [乾隆]棲霞縣志, Wei Chang 衛萇, comp., *juan* 1, “Wuchan” 物產, p. 14a, *ZGDFZJC*, Shandong fu xian zhiji 山東府縣志輯 (Nanjing: Fenghuang, 2004), vol. 51, p. 41.

Table 2.1 Introduction of Wild Silkworm Rearing by Emigrants.

| Year | Pioneer | Region of origin | Region of introduction | Method |
|-------------|-----------|--------------------|--|----------------------------------|
| 1681 | Emigrants | Zhucheng, Shandong | Qixia, Shandong | Plantation of <i>zuo</i> 柞 trees |
| Before 1744 | Emigrants | Shandong | Districts of Kaifeng, Zhangde, Huaigeng, Shanzhou, Nanyang, Runing and Guangzhou in Henan province | Emigrants carried eggs with them |
| Before 1771 | Emigrants | Shandong | Tazigou, Liaoning province | |

It is vital to see the link between the expansion of this activity and the efforts made by officials and local literati. Many accounts of the introduction of the activity or of its promotion by officials were reproduced in gazetteers or epitaphs (**Table 2.2**). These documents are written in a very similar style, reflecting the model of good Qing-era officials.

Table 2.2 Introduction of Wild Silkworm Rearing by Officials.

| Year | Pioneer (place of origin) | Region of introduction | Method |
|------------|--|-------------------------|---|
| 1667 | Wu Guan 吳琯 (1622-1678, Changshan, Shandong) | Pingshun, Shanxi | Located <i>hu</i> 榭 forests, brought silkworm eggs to Pingshun |
| 1698 | Liu Qi 劉棨 (c. 1656-1718, Zhucheng, Shandong) | Ningqiangzhou (Shaanxi) | Located <i>hu</i> forests and brought in skilled artisans from home town |
| After 1736 | An Hongde 安洪德 (Liaocheng, Shandong) | Mianzhu, Sichuan | Tried to promote wild silkworm rearing at the same time as that of <i>Bombyx mori</i> sericulture |
| 1738 | Chen Derong 陳惠榮 (1689-1747, Anzhou, Zhili) | Guizhou province | Requested financial support from Qianlong |
| 1738 | Chen Yudian 陳玉壘 (Licheng, Shandong) | Zunyi, Guizhou | Identified <i>chu</i> 樗 or <i>chouchun</i> 臭椿, and brought in both artisans and eggs |
| 1739 | Wang Jun 王禱 (Jiaozhou, Shandong) | Dayi, Sichuan | Identified <i>zuo</i> tree, and brought in both artisans and eggs |

| Year | Pioneer (place of origin) | Region of introduction | Method |
|-----------|--|--|--|
| 1744 | Jiang Pu 蔣溥 (1708-1761, Changshu, Jiangsu) | Hunan province | |
| 1744 | Chen Hongmou (1696-1771, Lingui [modern-day Guilin], Guangxi) | Shaanxi province | |
| 1744 | Shuose 碩色 (1687-1759, Manchu of the Plain White Banner) | Kaifeng, Zhangde, Huaigeng, Shanzhou, Nanyang, Runing and Guangzhou (all in Henan) | Reported trees like <i>zuo</i> and <i>hu</i> trees growing in these regions |
| 1748 | Xu Jieping 徐階平 (Jiaxing, Zhejiang) | District of Zheng'an in the prefecture of Zunyi, Guizhou | Observed forests of <i>xiang</i> 橡 trees (oak); asked his wife to teach weaving |
| 1749 | Li Yingyu 李應虞 (Shouzhang 壽張, Shandong) | Lincheng, Hebei | Hired craftsmen from Mengyin, Shandong |
| 1757-1763 | A'ertai 阿爾泰 (d. 1773, Manchu of the Plain Yellow Banner) | Shandong province | Tried to develop the wild silk industry by promoting plantation of <i>boluo</i> 柶樺 trees |
| 1766 | Han Mengzhou 韓孟周 (c. 1729-1798, Weixian, Shandong) | Lai'an, Anhui | Used <i>chun</i> and <i>hu</i> trees that the locals used as fuel |
| 1771 | Hao Jingxiu 郝敬修 (Gaomi, Shandong) | Hanyin, Shaanxi | Distributed illustrated manual |
| 1824 | Cheng Guoren 程國仁 (1764-1824, Shangqiu, Henan) | Guizhou province | |
| 1824 | Liu Zuxian 劉祖憲 (Meixi, Fujian) | Anping, Guizhou | <i>Xiang</i> trees |
| 1849 | Song Rulin 宋如林 (Military Han Chinese of the Bordered Red Banner) | Liping, Guizhou | Introduced knowledge from Zunyi |
| 1849 | Tao Lücheng 陶履誠 | Kaitai 開泰, Guizhou | |

Based on the methods adopted, one can divide campaigns for promoting wild silkworm raising before the middle of nineteenth century into three periods. Before 1743, some local officials took the initiative of introducing wild silk production into the regions they administered. From 1744 to the end of the Qianlong reign, the campaigns were supported by the throne through the circulation of handbooks compiled under imperial orders. During the first half of the nineteenth century, the campaigns aimed both at reviving the activity in regions where wild silk had previously been produced, as in some areas of Shandong and Guizhou, and at introducing it into new areas. In the latter case, knowledge was often transferred from newly

developed wild silk centers, as in the case of Zunyi 遵義 prefecture in Guizhou province, which is discussed below.

2.1. *Elite Activism before 1743*

At the end of the seventeenth century, some local officials took the initiative of introducing wild silk production into their jurisdictions. Before that, emigrants from Shandong had contributed to spreading the activity into neighboring provinces, such as Zhili. In the early eighteenth century, however, local officials took the lead and promoted this activity. It is worth noting that almost all of these officials were Shandong natives. Their arrival in post thus triggered the transfer of what had previously been a local technology.

The earliest attempt to spread wild silkworm rearing that I have been able to identify is the introduction of the practice into Pingshun 平順, Shanxi, by Wu Guan 吳琯 (1622-1678), a magistrate (*zhixian* 知縣) born in Changshan 長山, Shandong. Before his appointment to the post, the natives of Pingshun had not engaged in textile production. As reported by Wang Shizhen 王士禎 (1634-1711), when Wu Guan inspected fields under his jurisdiction in 1667, he observed that the mountains were covered in *hu* 榭 trees. He brought wild silkworm eggs from his hometown and taught the locals how to make a profit from the making of this kind of silk. The following year, they started to produce wild silk.⁵⁵

One of the most famous examples of the successful spread of wild silk production by local officials might be its introduction into Ningqiangzhou 甯羗州 (present-day Ningqiang 甯羗 in Shaanxi) by Liu Qi 劉燾 (c. 1656-1718), a native of Zhucheng. In 1698, when he was appointed as the magistrate of Ningqiangzhou, the Guanzhong 關中 plain suffered a severe famine, worsening conditions in an already very poor region. Liu soon observed stretches of *hu* forests in mountain areas that local people used only for fuel—they were apparently unaware of their use for feeding wild silkworms. He thus conceived the idea of enriching commoners through wild silkworm raising. The same was true of Wu Guan, who sent people back to his hometown to purchase wild silkworm eggs. Furthermore, Liu Qi hired skilled artisans to teach Ningqiangzhou's residents how to produce wild

⁵⁵ Wu Guan was appointed as the magistrate of Pingshun in 1667. See Wang Shizhen, *Yuyang shanren wenlüe* 漁洋山人文略, *juan* 9, “Wenlinlang Neiqiu zhixian Wujun muzhiming” 文林郎內丘知縣吳君墓誌銘, pp. 23a-25a, in *Siku quanshu cunmu congshu* 四庫全書存目叢書 (Jinan: Qi Lu shushe, 1997); and see [*Jiaqing*] *Changshan xianzhi* [嘉慶] 長山縣志, Ni Qiwang 倪企望, Zhong Tingying 鍾庭英 et al., comps., *juan* 7, p. 17b (Taipei: Chengwen, 1976).

silk. According to the local gazetteer, the people could thus obtain benefits from wild silk production and thus named the cloth woven with the silk produced “Mr. Liu’s silk cloth” (*Liugong chou* 劉公綢).⁵⁶

The campaign carried out by Liu Qi took place soon after the publication of the *Gengzhi tu* in 1696. Through the distribution of these woodblock prints, Kangxi called on his subjects to apply his policies in agriculture and sericulture. The results of the campaign became an essential element for assessing officials. Thus, wild silkworm rearing was adopted as a parallel method of sericulture by officials who administered regions that were not suitable for *Bombyx mori* rearing or for cotton plantation. Liu Qi’s success in introducing a wild silk craft industry attracted the attention of his contemporaries. In the early eighteenth century, several local and provincial officials tried to introduce the activity into the regions under their jurisdiction, proceeding as Liu Qi had done.

The promotion of agriculture and sericulture in the early Qing seemed to have a wide influence on local officials and literati. Yang Shen 楊岫 (1699-1794), a native of Shaanxi, provides an interesting example of how a literatus who was not an official involved himself in the study of wild silk production. In 1725, Yang identified *hu* forests during his trip in the Nan Mountains (Nanshan 南山), situated in the neighboring region of Xi’an. He then purchased wild silkworm eggs from Yishui, Shandong (about 1,000 kilometers away), and brought in masters to teach the methods at the school he had founded, where he taught agriculture in the context of traditional academic learning.⁵⁷ It is worth noting that these efforts coincided with Yang’s attempts at rearing *Bombyx mori* in his private school. After years of efforts, he finally succeeded. He documented his findings in a handbook, *Binfeng guangyi* 邇風廣義 (Extensive explication of ancient Shaanxi customs, preface 1742). The handbook deals essentially with *Bombyx mori* silk production; Yang included two essays describing the processes of rearing wild silkworms in *hu* forests and the production of silk from their cocoons.⁵⁸ The following year, Yang’s manuscript was published with the support of Shuai Nianzu 帥念祖, the Provincial Administration Commissioner (*buzhengshi* 布政使) of Shaanxi, and with prefaces by his disciples Wang Gang 王綱 and Liu Fang 劉芳. The same year (1743), Chen Hongmou came to Shaanxi as Provincial Governor. He relied on Yang’s ability for

⁵⁶ Zhao Erxun, *Qingshi, juan* 476, *Liezhuang*, p. 12,995. See also Gao Shumei 高樹枚, *Lidai quannong shilüe* 歷代勸農事略, *xia pian* 下篇, p. 32b (1915).

⁵⁷ Yang Shen, *Binfeng guangyi*, pp. 15b-16a, *XXSK*, vol. 978, pp. 81-82.

⁵⁸ *Ibid.*, pp. 15b-19b (pp. 81-83).

improving agricultural technologies and achieved substantial results during his occupation of the post.⁵⁹

In the late 1730s, several officials worked to promote silkworm rearing in the Southwest provinces, especially Sichuan and Guizhou. In 1738, while Chen Derong 陳惠榮 (1689-1747, a native of Anzhou 安州, Zhili), was the Provincial Administration Commissioner of Guizhou, he requested financial support from Qianlong for developing textile production in the province. By 1742, he had set up more than a hundred wild silkworm rearing sites.⁶⁰

The beginning of Chen Derong's campaign in 1738 coincided with Chen Yudian's 陳玉壑 appointment as magistrate of Zunyi. Chen Yudian was responsible for another successful development of wild silkworm rearing, and he too was a native of Shandong, coming from Licheng 歷城; he was appointed following the recommendation of Chen Derong, who knew of his mastery of sericulture.⁶¹ As Liu Qi had done in Ningqiangzhou, in Zunyi he identified *chu* 樗 forests used only for fuel.⁶² The following year, he tried to introduce wild silkworm rearing by employing skilled masters from his hometown to teach the technique to the inhabitants of his jurisdiction. The first attempts failed because the eggs brought from Shandong hatched during the trip. But after three years of attempts, Chen Yudian finally succeeded, and in 1743 around eight million cocoons were harvested.⁶³ From then on, "the habitants of Zunyi mastered wild silkworm rearing. The reputation and the price of Zunyi silk cloth [*zunchou* 遵紬] were comparable with those of figured silk of Wu [equivalent to the plain of Lake Tai 太湖] and figured silk of Shu 蜀 [Sichuan]."⁶⁴

⁵⁹ Rowe, *Saving the World*, pp. 236-237.

⁶⁰ Zhao Erxun, *Qingshi, Liezhuan*, *juan* 477, pp. 13,003-13,005.

⁶¹ *Dading fuzhi* 大定府志, Daoguang era. Huang Zhaizhong 黃宅中 and Zou Hanxun 鄒漢勛, comps., 1849, *juan* 30, *neipian* 內篇 20; *Guiyang fuzhi* 貴陽府志, Xiao Guan 蕭琯, comp., Xianfeng edition, *juan* 66.

⁶² Also called *chouchun* 臭椿, a kind of *ailanthus*, this tree was widely spread into Europe and America during the nineteenth century. See Denis Cachon, *L'arbre du ciel: Ailanthus altissima: histoire et biologie* (Nogent-sur-Marne: D. Cachon, 2006); and Mau Chuan-hui, "Marché et nouvelle matière textile: la recherche de vers séricigènes sauvages en Chine et en France," in Pilar Gonzalez-Bernaldo and Liliane Perez, eds., *Les Savoirs-mondes: Mobilités et circulation des savoirs depuis le Moyen Âge* (Rennes: Presses Universitaires de Rennes), pp. 239-253.

⁶³ Zheng Zhen 鄭珍, *Chujian pu* 樗繭譜, "Zhihui" 誌惠, *XXSK*, vol. 978, p. 623.

⁶⁴ Li Yuandu 李元度 (1821-1887), "Chen Sheng'an taishou shilüe" 陳省菴太守事略, reproduced in Wang Yuanting, *Yecanlu*, p. 659.

In 1739, another attempt to introduce wild silkworm raising took place in Sichuan province. The magistrate of Dayi 大邑, Wang Jun 王寯,⁶⁵ also a Shandong native, born in Jiaozhou 膠州, saw that “there were numerous *zuo* trees in the village, but local people did not know that could be used to feed wild silkworms. Jun taught them how to feed [wild] silkworms to enrich the district.”⁶⁶ Wang Jun again bought tens of thousands of wild silkworm cocoons from his hometown to distribute them to the locals in order to teach them how to produce wild silk. After two years, the experiment produced results, leading the Surveillance Commissioner of Sichuan, Jiang Shunlong, to promote the activity and to suggest that the throne should order the Governor of Shandong—at that time Kaer Jishan—to compile a work describing the methods for feeding the two kinds of wild silkworms found in Shandong, the *chuncan* 椿蠶 (which eat the leaves of *chun* 椿) and the *shancan* 山蠶 (mountain silkworms). It was said that the former produced silk of better quality than the others.⁶⁷ This work, Jiang suggested to the emperor, should be distributed in all provinces so that local officials could promote cultivation when they noticed *hu* or *qinggang* 青桐 trees growing in their jurisdictions.

The local gazetteer of the Mianzhu 綿竹 district in Sichuan recounts a similar campaign carried out at almost the same time as that of Wang Jun, by its magistrate An Hongde 安洪德,⁶⁸ another native of Shandong (Liaocheng 聊城). He tried promoting wild silk production and at the same time *Bombyx mori* sericulture. In order to obtain effective results, An Hongde wrote and printed a handbook describing suitable techniques. It is interesting to note that Jiang Shunlong did not refer to this case in his memorandum. Does this mean that the campaign by An Hongde did not produce the expected results, or was it simple negligence on Jiang’s part? Perhaps after observing the different results of campaigns carried out by local officials, he

⁶⁵ On Wang Jun, see [*Daoguang*] *Jiaozhou zhi* [道光] 膠州志, Li Tu 李圖, comp., *juan* 27, “Liezhuan” 列傳 7, “Renwu” 人物, p. 33a, *ZGDFZJC*, Shandong fu xian zhiji 山東府縣志輯 39 (Nanjing: Fenghuang, 2004) p. 261.

⁶⁶ “Gonglu Gaozong Chun huangdi shengyu” 恭錄高宗純皇帝聖諭, reproduced in Wang Yuanting, *Yecanlu*, *XXSK*, vol. 978, p. 641, quoting a Qianlong edict.

⁶⁷ [*Qianlong*] *Zhucheng xianzhi* 諸城縣志, Li Wenzao 李文藻, comp., “Zhi” 志 12, *Fangwukao di jiu* 方物考第九, p. 4a, in *ZGFZCS*, Huabei difang 華北地方 384 (Taipei: Chengwen, 1976), p. 88.

⁶⁸ An Hongde (zi Shuobo 碩伯) received his first appointment in 1736. He had been transferred from his post at Qijiang 綦江 to Mianzhu and gained a reputation for ensuring local administration, such as promoting agriculture and sericulture, and hydraulic works. See *Mianzhu xianzhi* 綿竹縣志, Huang Shangyi 黃尚毅, comp., *juan* 25 and *juan* 28, in *Xinxiu fangzhi congkan* 新修方志叢刊, Sichuan fangzhi 四川方志 115, 1920 edition (Taipei: Xuesheng shuju, 1968).

perceived the necessity to circulate “efficient methods” for silkworm rearing—that is, Shandong methods—in the hope of obtaining more substantial benefits. In any case, it is evident that at that moment, the promotion of wild silkworm rearing found powerful support among officials.

2.2. *The Expansion of Wild Silkworm Rearing under Qianlong*

In 1744, as soon as the handbook entitled *Shandong yangcan chengfa* was compiled, a great number of copies were given out to relevant officials. Many provincial officials, such as Jiang Pu 蔣溥 (1708-1761), Governor of Hunan, and Chen Hongmou, Governor of Shaanxi, acknowledged receipt of the handbook. They then distributed copies to their subordinate local officials to promote experimental cultivation.

The development of wild silkworm raising undertaken by imperial edict seems to have had an immediate impact. Many officials paid more attention to wild forests growing in the areas under their jurisdiction and reported on the practice of wild silkworm raising in their memorials. These kinds of observations paved the way for the campaign. In 1744, Shuose 碩色 (1687-1759), Governor of Henan, reported that in the districts of Kaifeng 開封, Zhangde 彰德, Huaigeng 懷庚, Shanzhou 陝州, Nanyang 南陽, Runing 汝寧 and Guangzhou 光州 there grew “trees similar to *zuo* and *hu* trees which can be used for feeding mountain silkworms.” The Governor observed: “Recently migrants from Shandong brought with them [wild silkworm] cocoons into Henan and cooperated [with the local people] in wild silkworm raising. Today inhabitants of these districts have succeeded both in [reproducing] the eggs and in assimilating the technique.”⁶⁹ In 1771, Hadaqingge 哈達清格 was appointed as the local chief of Tazigou 塔子溝 in Liaoning province, where some offices were established in 1740.⁷⁰ Two years later, after collecting information and carrying out field research, he wrote a twelve-chapter work that included one chapter on wild silkworm rearing. He presented evidence that the mountains in the territory of Tazigou were covered mostly in *boluo* 椴 trees, which grew leaves of the size of one’s palm. In the early 1770s, the wild silk industry spread in the region, following the arrival of Shandong natives; this did not happen, however, without conflicts over land ownership.⁷¹

⁶⁹ *Gaozong Chun huangdi shilu*, *juan* 225, 9th month of the 9th year of the Qianlong reign *xia* (p. 916).

⁷⁰ Hadaqingge 哈達清格, *Tazigou jilüe* 塔子溝紀略, 1773?, in *Congshu jicheng xubian* 叢書集成續編 15 (Banqiao: Yiwen yinshuguan, 1970), *juan* 1, p. 1a.

⁷¹ *Ibid.*, *juan* 9, p. 3a.

In his “Memorial on Attempts to [Rear] Mountain Silkworms” (*Shixing shancan shu* 試行山蠶疏), Jiang Pu reported that “in the southern areas of Hunan, there are many trees like *qinggang* and *li* 櫟 in the forests that cover mountains and swamps; these are suitable for feeding wild silkworms. Moreover, mulberry silkworms [*Bombyx mori*] can give only one harvest every year, in the spring, while mountain silkworms give a second harvest in the autumn.”⁷² A few years later in Hunan, the magistrates of Daozhou 道州 (modern Daoxian 道縣, south of Yongzhou 永州 city) and Chenzhou 辰州 (the drainage basin of the Yuan 沅 River, located south of Hongjiang city 洪江) reported that “in the fourth lunar month of the year, silkworms had formed cocoons with which [the people] made silk. All the inhabitants of the district were elated and encouraged by the event. They then wrote down the integrated process from silkworm rearing, egg production to silk making it into a booklet of instructions.”⁷³ In turn, Jiang Pu ordered a prospectus carved as woodblocks and published for distribution to his subordinates to stimulate local experiments.

Meanwhile, in Shaanxi, Chen Hongmou described in detail his campaigns for spreading wild silk cultivation in the province, providing information on the efforts made by officials to apply the imperial agricultural policy and analyzing the factors that led to success or failure of their campaigns.⁷⁴ In a statement published in 1757 and dedicated to the spread of mountain silkworm rearing, Chen mentioned that: “In the third [lunar] month of the ninth year of Qianlong [April-May 1744], according to the imperial edict, [the provincial office of] Shandong sent to my office of Governor of Shaanxi [a copy of] the *Shandong yangcan chengfa* that they had compiled and published. As soon as it arrived in Shaanxi, it was submitted to the office in charge of reproduction so as to distribute it in the province for study.”⁷⁵

Though many authors and officials pointed out that *hu* trees grew easily in Shaanxi, the introduction of wild silkworm rearing encountered enormous

⁷² Jiang Pu, “Shixing shancan shu,” in Wang Yuanting, *Yecanlu*, p. 647. In reality, farmers in the Jiangnan region reared two generations of silkworms in a year. In Canton polyvoltin silkworms (those that produce several generations in a year) had been reared. Nevertheless the cocoons harvested in spring provide the best quality for Jiangnan farmers; while in the Pearl River delta, only two harvests in a year were worthwhile.

⁷³ Ibid.

⁷⁴ Chen Hongmou, “Guangxing shancan xi” 廣行山蠶檄, in [*Daoguang*] *Qijiang xianzhi* [道光] 綦江縣志, Song Hao 宋顥 and Luo Xing 羅星, comps., *juan* 10, *ZGDFZJC*, Sichuan fu xian zhiji (Chengdu: Bashu, 1992); also reproduced in He Changling and Wei Yuan, *Huangchao jingshi wenbian*, *juan* 37, pp. 24a-25b; and Wang Yuanting, *Yecanlu*, “Zalu” 雜錄, p. 647.

⁷⁵ The text is reproduced in the three works cited immediately above.

difficulties. Besides birds or natural disasters, as seen in Xianning 咸甯 and Tongguan 同官 (present-day Tongchuan 銅川), and the fact that local people abandoned the activity after the officials who had initiated it left, as in Nanqiangzhou 南羌州 and Lüeyang 略陽, there were more obvious obstacles.⁷⁶ Chen Hongmou examined how some districts, such as Meixian 郿縣 and Lantian 藍田, obtained promising results from the wild silkworm rearing campaign:

The magistrate of Meixian, Ji Xuzhong 紀虛中, hired a skilled artisan [from Shandong], named Wei Zhendong 魏振東, as the chief of [wild silkworm] cultivation for training local people how to feed wild silkworms. The spring harvest produced about 400,000 cocoons. Combined with the autumn harvest, the total will be between 800,000 and 900,000.⁷⁷

Meanwhile, the experiment carried at Tongguan failed due to a cold winter. Chen ordered the officials who administered the regions in the south of Tongguan covered by *hu* trees to set up groves and to cut down other trees (*kānfā zāshù* 砍伐雜樹). He insisted that:

Silkworm eggs have to be purchased by officials and tools also have to be provided by officials. While the climate conditions are specified in the *Shandong yangcan chengfa*, it is possible to hire masters from Ningqiang, Meixian or Shangnan 商南 in our province, or to enlist artisans skilled in mountain silkworm rearing from Shandong or Henan to come and teach.⁷⁸

Similar practices are recorded in local gazetteers and provide a rough idea about how local officials succeeded in introducing the wild silk industry. In 1748, Xu Jieping 徐階平, a native of Jiashan 嘉善 district (a part of Jiaxing 嘉興 prefecture, Zhejiang province), was appointed as a Circulating Officer (*liuguan* 流官) for the Zheng'an 正安 district in Zunyi prefecture. Observing cocoons formed by wild silkworms in a forest of *xiang* 橡 trees (*quercus serrata*, a kind of oak tree), he collected them to weave their silk into cloth on the loom he had brought with him from Jiaxing. He then ordered the locals to make looms and asked his wife to train the women in weaving. He also taught locals to rear silkworms, using eggs that he had

⁷⁶ Chen Hongmou pointed out that the work of wild silk making and weaving that had been introduced in Nanqiangzhou by Liu Qi was neglected in his own time. Wang Yuanting, *Yecanlu*, pp. 652-653.

⁷⁷ Chen Hongmou, "Guangxing shancan xi," in He Changling and Wei Yuan, *Huangchao jingshi wenbian*, *juan* 37, pp. 12a-b (p. 951).

⁷⁸ Chen Hongmou, "Xunsu yigui bu" 訓俗遺規補, in Wang Yuanting, *Yecanlu*, pp. 652-653.

brought with him. Since there were no mulberry trees, he had them fed with leaves of *zhe* 柘 tree (*Maclura tricuspidata*).⁷⁹ Zheng'an thus became a central market of wild silk products, increasing the income of the region. In the late Qing, silk products from Guizhou were of sufficient quality to be sold as "Sichuan silk cloth" (*Chuan chou* 川綢). The locals called this fabric "Mrs Xu's silk cloth" *Xupo chou* 徐婆綢, after Xu Jieping's wife.⁸⁰ Xu Jieping's promotion of wild silk production made it a longstanding local economic activity.

The interest shown by Qing emperors in wild silk production also prompted officials in the "cradle" of wild silkworm raising—Shandong province—to take measures to promote the activity. When A'ertai 阿爾泰 (d. 1773),⁸¹ a Manchu of the Plain Yellow Banner, was Governor of Shandong from 1757 to 1763, he promoted wild silk production and promoted the planting of *boluo* trees on fallow lands and hillsides.⁸² He proposed to "exempt those who planted *boluo* trees on fallow land or hill lands from paying the tax on cleared land."⁸³ Thus Manchu officials also took part in this empire-wide effort.

Up to the 1760s, there were two main ways for officials to spread the knowledge of wild silkworm raising to their jurisdictions: bringing in skilled artisans and circulating copies of the handbook published by imperial order. Some officials rephrased its content and published it in the form of instructions; others reproduced the full or abridged text. In 1766, Han Mengzhou 韓孟周 (c. 1729-1798),⁸⁴ native of Weixian 濰縣 in Shandong, compiled a reorganized version of the *Shandong yangcan chengfa* entitled simply *Yangcan chengfa* 養蠶成法 (Method for silkworm rearing). When he became magistrate in Lai'an 萊安, Anhui, Han observed that the locals used the wood of *chun* and *hu* trees as fuel. He stopped this practice and hired arti-

⁷⁹ [*Guangxu*] *Liping fuzhi* [光緒] 黎平府志, Yu Wei 俞渭 and Chen Yu 陳瑜, comps., *juan 3 xia*, pp. 49 a-b (*Liping fuzhiju*, 1893 edition), *ZGDFZJC*, Guizhou fu xian zhiji, vols. 17-18 (Chengdu: Bashu, 2006). In the various narratives of local gazetteers, it is unclear what kind of silkworms had been introduced by Xu Jieping. It is quite possible that he brought eggs of *Bombyx mori* from Zhejiang and then adapted silkworm rearing in view of local conditions.

⁸⁰ Liu Ruliao 劉汝璆, "Zhongsangyi" 種桑議, in Ge Shijun 葛士澹, *Qing jingshi wen xubian* 皇朝經世文續編, *juan 35*, "Huzheng" 戶政 12, pp. 7b-8a (Taipei: Wenhai, 1972), pp. 938-939.

⁸¹ For more detail on Aertai, see Zhao Erxun, *Qingshi*, *juan 326*, "Liezhuàn" 列傳 113, pp. 10,875-10,878.

⁸² [*Daoguang*] *Jinan fuzhi* [道光] 濟南府志, Cheng Guan 成瓘, comp., *juan 37*, *ZGDFZJC*, Shandong fu xian zhiji 山東府縣志輯 1-3 (Nanjing: Fenghuang, 2004), p. 1152.

⁸³ Zhao Erxun, *Qingshi*, *juan 326*, "Liezhuàn" 列傳 113, p. 10,875.

⁸⁴ Li Yuandu 李元度, "Han Gongfu xiansheng shilüe" 韓公復先生事略, in Wang Yuanting, *Yecanlu*, p. 659.

sans from the southern region of Shandong to introduce the technique of wild silk production into his region; his *Yangcan chengfa* was printed as part of this campaign.⁸⁵ In 1771, the newly arrived magistrate of Hanyin 漢陰 in Shaanxi, Hao Jingxiu 郝敬修, a native of Gaomi 高密 in Shandong, tried to introduce wild silk production there. Two years later, after having obtained sufficient results, he published an illustrated and popularized version of the *Shandong yangcan chengfa* in order to ensure a wider circulation of its contents.⁸⁶ Unfortunately, for the moment we do not have access to this booklet, but only to a reproduction of the text in the local gazetteer of Hanyin, edited by Hao Jingxiu.

2.3. *The High Point of Wild Silkworm Rearing in the Daoguang era (1821-1850)*

During the Daoguang reign, a new wave of promotion of wild silkworm raising coincided with growing raw silk exports. After almost one century of promotion by the central government, new centers of wild silk industry emerged. The best known is Zunyi, Guizhou. On the other hand, promotion efforts failed in many areas where locals soon gave up the craft.

These campaigns again targeted both new areas and areas where the industry had faltered. They entailed promoting the planting of trees in the hope of further extending silkworm raising. It was no longer led by Shandong natives, but increasingly by officials from Southern China, who authored many of the most important handbooks on the subject. They succeeded in spreading the knowledge of wild silk among the elite. In 1824, Cheng Guoren 程國仁 (1764-1824),⁸⁷ Governor of Guizhou, followed the suggestion of Wu Rongguang 吳榮光 (1773-1843),⁸⁸ Provincial Administration Commissioner of the same province, to spread the methods used in Zunyi for producing silk from *xiang* 橡 silkworms.⁸⁹ The same year, Liu

⁸⁵ Li Yuandu, “Han Gongfu xiansheng shilüe”, in Wang Yuanting, *Yecanlu*, p. 659.

⁸⁶ [*Qianlong*] *Hanyin xianzhi* [乾隆]漢陰縣志, Hao Jingxiu 郝敬修, comp., *juan* 8, “Jiaoyang shancan shuo xu” 教養山蠶說序, 27a-28b (1775 edition).

⁸⁷ [*Daoguang*] *Guiyang fuzhi* 貴陽府志, Zhou Zuoji 周作楫 and Xiao Guan 蕭瑄, comps., *juan* 3, p. 16a; *juan* 9, p. 27a; *juan* 68, p. 9a, “Zongbu zhengji lu” 15, in *ZGDFZJC*, Guizhou fu xian zhiji 12-14 (Chengdu: Bashu shushe, 2006), vol. 12, p. 63, 162; vol. 13, p. 298.

⁸⁸ *Qingshi Liezhuan* 清史列傳, *juan* 38 (Beijing: Zhonghua shuju, 1987), p. 33; see also Zhou Zuoji et al., *Guiyang fuzhi*, *juan* 9, “Biao” 表 6: “Zhiguan” 職官 27, and *juan* 68, “Zongbu zhengji lu” 15.

⁸⁹ Liu Zuxian 劉祖憲, *Xiangjian tushuo* 橡繭圖說, *XXSK*, vol. 978, p. 551; see also [*Daoguang*] *Anping xianzhi* [道光]安平縣志, Liu Zuxian and He Sigui 何思貴, comps., *juan* 4, “Tuchan” 土產, p. 1b (Guiyang: Guizhou tushuguan, 1964).

Zuxian 劉祖憲⁹⁰ forbade the people under his jurisdiction in Anping 安平 (Guizhou) to chop down trees and instead taught them how to plant *xiang* trees and rear silkworms. The next year,

[Having observed that] the poor suffered from a shortage of eggs, he contributed 460 taels for loans to them. Since his arrival in Guizhou, he continuously bought tens of piculs of oak [*xiang*] seeds and gave them out to the people to plant. He also bred oak saplings next to his official residence to distribute to villagers.⁹¹

In 1827, Liu published a manual entitled *Xiangjian tushuo* 橡繭圖說 (Illustrated explanation of oak cocoons), an illustrated book in which very simple texts accompany each illustration to explain the procedure from egg hatching to silk reeling. In order to promote wild silk production, he lent money to farmers to establish weaving workshops and hired about thirty artisans to teach locals how to make wild silk goods.⁹²

In 1849, wild silkworm rearing was finally introduced into Liping 黎平 in Guizhou. An earlier attempt had been made by an incoming Surveillance Commissioner (*anchashi* 按察使), Song Rulin 宋如林,⁹³ during the campaign in the early Daoguang era. Song took inspiration from Chen Yudian's success bringing wild silk production into Zunyi, which had made it the richest prefecture in Guizhou province. Song Rulin suggested to local officials that they should finance the purchase of seeds for planting trees from which wild silkworms could be fed in regions too barren for growing other crops. He published instructions on planting oak trees, entitled “Zhong xiang” 種橡 (Planting oak trees), as well as an “invitation to plant oak trees and to feed [wild] silkworms” (*qing zhongxiang yucan zhuang* 請種橡育蠶狀).⁹⁴ He does not seem to have been very successful: the magistrate and prefect continued to provide financial support for the campaign into the Xianfeng 咸豐 reign (1850-1861), but the campaign was abruptly stopped

⁹⁰ Zi Zhongju 仲矩, a native of Meixi 梅溪, a town in Minqing 閩清 district of Fujian province.

⁹¹ Liu Zuxian, *Xiangjian tushuo*, *xu* 叙, p. 1a (p. 554).

⁹² *Ibid.*, preface by He Sigui (1827).

⁹³ *Guiyang fuzhi*, Zhou Zuoji et al., comps., *juan* 9, “Biao” 6: “Zhiguan” 27; *juan* 68, “Zongbu zhengji lu” 15, pp. 17b-19a; see also [*Guangxu*] *Jiangxian zhi* [光緒] 絳縣志, Hu Yan 胡延, comp., *juan* 16, “Guji zhi di ba” 古籍志第八, in *Xinxiu fangzhi congkan* 新修方志叢刊, *Shanxi fangzhi* 山西方志 100 (Taipei: Taiwan xuesheng shuju, 1968); and see *Qingpu xianzhi* 青浦縣志, Wang Zushou 汪祖綬, comp., *juan* 19, “Renwu” 人物 3, in *ZGDFZJC*, *Shanghai fu xian shi ji* 6 (Jiangsu: Guji, 1996).

⁹⁴ *Anshun fuzhi* 安順府志, Zou Hanxun 鄒漢勛, comp., *juan* 53, “Yiwen zhi” 藝文志 10, in *ZGDFZJC*, *Guizhou fu xian zhiji* 42; and see *Xifeng xianzhi* 息烽縣志, Gu Cong 顧縱, comp., *juan* 33, “Xianzheng zhi” 縣政志, pp. 11a-b, in *ZGDFZJC*, *Guizhou fu xian zhiji* 43.

by the Miao rebellion in 1855. In 1870, Yuan Kaidi 袁開第 took up the project by establishing a public forest plantation. He ordered townsmen to purchase eggs in Henan and began rearing wild silkworms at Heidongtou 黑洞頭.⁹⁵

During the second half of the Qianlong reign wild silkworm rearing had been practiced in Hunan, Shaanxi, Anhui, and Zhili. The new campaigns since the Daoguang changed this geography: up to the early twentieth century, the practice remained widespread in Shandong, Guizhou, Henan and Shaanxi.⁹⁶

III. The Creation of Artisanal Knowledge of Wild Silkworm Rearing

Systematic writing on wild silkworm rearing as a “parallel” industry began to take shape in the seventeenth century. It provides a very interesting body of knowledge for understanding how a craft industry aroused the curiosity of officials and literati and how practical knowledge was transcribed into writing.

The *Erya* 爾雅 (the earliest extant Chinese dictionary, third century BCE for the first major portion of the text) lists various types of wild silkworms named according to the trees that feed their caterpillars, specifying which of them produce raw materials suitable for silk making. In a much more recent text, Zhou Qufei 周去非 (1135-1189) gives a short description of how natives of Hengzhou 衡州 in Guangxi obtained wild silk from the caterpillars living off the leaves of maple trees.⁹⁷ The earliest writing summarizing the entire process of wild silk making available to us, Sun Tingquan’s “Shancan shuo” (1651), is based on observations made in Shimen 石門. Technical descriptions of wild silkworm rearing only appear with Yang Shen’s *Binfeng guangyi* (1740), based on his personal observations and experience. All the handbooks published before 1800 except the *Binfeng guangyi* were written or compiled by officials from Shandong and refer to methods developed there. Since the early nineteenth century, handbooks by literati native to Southern China emerge; most of them declare they are inspired by Chen

⁹⁵ *Liping fuzhi*, Yu Wei and Chen Yu, comps., *juan 3 xia*, pp. 49a-b. Wang Yuanting reproduced the passage in his *Yecanlu* with the heading of “Shancan shuolüe” 山蠶說略, pp. 651-652.

⁹⁶ Yang Gong 楊鞏, *Zhong Wai nongxue hebian* 中外農學合編, *juan 11*, p. 57a, in *Siku weishoushu jikan*, series 4 四庫未收書輯刊, 四輯, vol. 23, p. 315 (Beijing: Siku weishoushu jikan bianji weiyuanhui, 2000).

⁹⁷ Zhou Qufei, *Lingwai daida* 嶺外代答, *juan 6*, p. 13b, “Fuyong men” 服用門, “Chongsi” 蟲絲, in *Baibu congshu jicheng* 百部叢書集成 29, *Zhibuzhu zhai congshu* 知不足齋叢書 16 (Banqiao: Yiwen, 1966).

Yudian's experiences in Zunyi. Only in these later works can one find detailed information both on the identification of suitable trees and information on how to plant these trees. During the same period, some literati attached more and more importance to the appearance of silkworms, as in Liu Zuxian's *Xiangjian tushuo* and Wang Yuanting's 王元綎 *Yecanlu* 野蠶錄 (Records on wild silkworms, 1903). The evolution of the content of handbooks parallels the spread of wild silkworm rearing.

So far I have been unable to locate the original of *Shandong yangcan chengfa*. However, a few years after the distribution of the first edition by Qianlong, several local gazetteers included extracts or reproductions of the text, such as the whole text reproduced in *Lianzhou fuzhi* 廉州府志 (Gazetteer of Lianzhou prefecture, Guangxi, 1755) and the extracts reproduced in *Xu Shangzhou zhi* 續商州志 (Sequel to the Gazetteer of Shangzhou, Shaanxi, 1758).⁹⁸ The *Shandong yangcan chengfa*, also referred to as the *Yang shancan chengfa* 養山蠶成法 or *Dongsheng yangcan chengfa* 東省養蠶成法, seems to have had a wide influence. Without citing the previous work, Han Mengzhou's text (1762) and Hadaqingge's writings (1773) are quite similar to what was reproduced in the *Gazetteer of Lianzhou Prefecture* (1755).⁹⁹ The text here and Han Mengzhou's version are both divided into several sections, but with some obvious modifications. It is noteworthy that in 1743 the Jesuit missionary Pierre Le Chéron d'Incarville (1706-1757)¹⁰⁰ sent ash tree seeds to France, where they were identified as *Ailanthus glandulosa* Desf.¹⁰¹ The shipment included a note in which d'Incarville mentioned three species of wild silkworms: "those of *fagara* or Chinese pepper plant, those of the ash tree [*fraxinus*] and those of oak."¹⁰² D'Incarville probably had access both to Sun Tingquan's text and the *Shan-*

⁹⁸ Zhou Shuoxun 周碩勳, *Lianzhou fuzhi*, juan 9, Nongshang, pp. 15a-24a (Meicang shuwu, 1755 edition), in *Gugong zhenben congkan di 204 ce*, Guangxi fu zhou xian zhi 10 (Changsha: Hainan chubanshe, 2001) and in the Daoguang era edition in the *Xu Shangzhou zhi*. The extracts were reproduced by Luo Wensi 羅文思, *Xu Shangzhou zhi*, juan 4, in *ZGDFZJC*, Shaanxi fu xian zhiji 30 (Nanjing: Fenghuang, 2007).

⁹⁹ Hadaqingge, *Tazigou jilüe*, juan 10, "Canshi" 蠶事.

¹⁰⁰ On d'Incarville, see Joseph Dehergne, *Répertoire des Jésuites de Chine, de 1552 à 1800* (Roma: Institutum Historicum S.I.; Paris: Letouzey & Ané, 1973), pp. 128-129.

¹⁰¹ Marie-Pierre Dumoulin-Genest, "L'introduction et l'acclimatation des plantes chinoises en France au XVIII^e siècle," Ph.D. diss., École des Hautes Études en Sciences Sociales, 1994, vol. 3, pp. 267-268. (Dumoulin cites the eighteenth-century term *Ailanthus galantulosa*.)

¹⁰² Quoted by Stanislas Julien, *Résumé des principaux traités chinois sur la culture des mûriers et l'éducation des vers à soie* (Paris: Imprimerie Royale, 1837), p. 195.

dong yangcan chengfa, or perhaps manuscripts or other information necessary for drafting his latter.¹⁰³

In what follows, I discuss the content of five works on the subject and their authors in order to show how artisanal practical knowledge was “translated” into scholarly knowledge, but also how the knowledge of wild silk circulated as this practice was successfully implemented.

3.1. *The Earliest Description of Wild Silk Production*

Sun Tingquan’s “Shancan shuo” is included in his book entitled *Nanzheng jiliue* 南征記略 (Account of a journey to the South), compiled in 1651 after the Shunzhi emperor sent him to Mount Tai (Taishan 泰山) for a sacrifice to Yu the Great.¹⁰⁴ During the journey, Sun observed wild silkworm raising using *hu* trees in Shimen and described the practice. He recorded that, at that time, almost every family in mountain areas of eastern Shandong province practiced wild silkworm raising, which had the same importance locally as rearing domesticated *Bombyx mori*.

Sun Tingquan mentioned three kinds of wild silkworms, named according to the leaves they eat: *hu* 榭 silkworms, *chun* 椿 silkworms and *jiao* 椒 silkworms. The cocoons and silk goods produced from them were named according the same principle. Sun gave a general idea of the whole process from feeding the wild silkworms to reeling the silk by boiling cocoons in an alkali solution, noting that after the young caterpillars were hatched, farmers placed them on *hu* trees and built huts in the forest in order to watch over them, protecting them from both harmful animals and bad weather. According to him, wild silkworm raising at Shimen produced three crops every year, in spring, summer and autumn. The cocoons could be more than three inches (*cun* 寸) long and their color resembled that of the earth, ranging from yellow earth to red clay.

Sun was one of the few who provided information about the actual unwinding of wild silk. He described the reeling process: the townsmen placed

¹⁰³ In the late seventeenth century, Ye Mengzhu 葉夢珠 (c. 1623-after 1693), a Songjiang 松江 literatus, reported that the best wild silk fabric was made with the cocoons collected from Chinese pepper plants (*jiaoshu* 椒樹). But in the early Qing, the prices fell and this fabric ceased to be produced, so that this kind of wild silkworms are mentioned in very few texts; see Ye Mengzhu, *Yueshi bian* 閱世編 (Beijing: Zhonghua shuju, 2007), p. 184.

¹⁰⁴ Zhao Erxun, *Qingshi*, juan 250, *Liezhuan* 37, pp. 9,686-9,687; see also Academia Sinica and National Palace Museum, *Ming Qing yu Minguo dang'an kua ziliaoku jiansuo pingtai* 明清與民國檔案跨資料庫檢索平台 (<http://archive.ihp.sinica.edu.tw/mctkm2c/archive/archivekm?@@409732184>). The *Shancan shuo* was reproduced by Wang Yuanting, *Yecanlu*, p. 655.

the cocoons in ceramic containers, the bottoms of which had been covered in bamboo leaves and branches. They then poured a solution of grass or wood ash (an alkaline solution) to cover the cocoons. They boiled this for a whole day, until the silk slipped away easily, frequently adding in water so as to maintain the level of the liquid. About ten cocoons were then strung on a stick and the silk was unwound on a reel. Sun reported that a skillful artisan could obtain more than three hundred feet (around 90 m) of silk thread in a day; at the very least several tens of feet could be unwound per day. On the other hand, Liu Zuxian cited a production of 5,000 cocoons per day, which gave silk weighing about 25 to 30 taels (c. 900-1,200 g).¹⁰⁵ Apparently, the production of wild silk reeling was lower than that of silk made from *Bombyx mori* cocoons.¹⁰⁶

3.2. A Detailed Description within a Manual of Silk Production

Yang Shen included a 1,000-character essay entitled “Yang hucan fa” 養柵蠶法 (Method for rearing *hu* silkworms) and a 500-character essay entitled “Fang hujian fa” 紡柵繭法 (Method for spinning *hu* cocoons) in his *Binfeng guangyi* (1740, author’s preface 1741). Yang claimed he learned these methods from artisans of Shandong where he bought wild silkworm eggs in 1725 and that the silkworms he introduced into his hometown in Shaanxi fed on *hu* leaves; but he provided no description of these silkworms.¹⁰⁷

Yang’s descriptions are more complete and more detailed than those of Sun Tingquan. Neither of them described the observable traits of silkworms, but Yang noted that “even though the silkworms are born on a *hu* tree, they also eat *qinggang* and *xiang* leaves and give cocoons of the same quality [whatever leaves they eat].”¹⁰⁸ Indeed, wild silkworms can eat several kinds of leaves, which makes precise identification difficult. Yang neither explained how to recognize trees suitable for feeding wild silkworms nor showed how to recognize the silkworms. He gave a detailed description of the silkworm rearing process, noting the precautions that farmers had to take:

On the day of Establishment of Spring (*lichun* 立春, around 4-5 February), in a sealed room at the foot of the mountain, spread the cocoons on large trays.

¹⁰⁵ Liu Zuxian, *Xiangjian tushuo*, xia juan, p. 17b.

¹⁰⁶ Yang Fuli 羊復禮, *Cansang zhaiyao* 蠶桑摘要, “Tushuo” 圖說 10 (1890); see also Wei Jie 衛杰, *Can sang cuibian* 蠶桑萃編, in *SKWSSJK*, series 4, vol. 23, juan 4, pp. 2a-b.

¹⁰⁷ Yang Shen, *Binfeng guangyi*, juan 3, p. 16a, *XXSK*, vol. 978, p. 82.

¹⁰⁸ *Ibid.*, juan 3, p. 15b (p. 81).

Close all doors and windows in order to prevent any draft. Burn dry hardwood to keep the temperature of the room as warm as in the third month. Continue this without stopping day or night until five days before the Spring Equinox (20-21 March), altogether for forty days [...]. If the room is too hot, the hatched moths will be dry and dark; if warm air is not sufficient, moths will not come out [of their cocoons] in time. Generally after forty days, moths leave their cocoons between seven and eleven in the morning. Let female and male moths mate and separate them at four in the afternoon. Using wheat straw, weave several baskets three feet in diameter and one foot high; also weave lids. Put more than one hundred moths in each basket. Cover with the lid and let the moths lay eggs inside.¹⁰⁹

Then he gave very precise explanations about wild silkworm raising, beginning by showing how to move young caterpillars on branches from the basket where they were hatched:

After young caterpillars have been hatched in the basket, between seven and eleven o'clock in the morning, put down baskets (seven, eight to some ten or more) at the entrance of the valley. Choose a flat and extended place for placing baskets upon a stream (place stones under the baskets in order to avoid them getting wet). Pick branches of *hu* tree in the water around the baskets (if you don't push the branches into the water, the leaves will dry very soon). As soon as the silkworms smell *hu* leaves, they leave the baskets in order to get onto the leaves.¹¹⁰

Yang Shen also explained how to move caterpillars from one tree to another in order to ensure a sufficient supply of leaves during their development. This was a technique specific to wild silkworms rearing. He strongly recommended hiring watchmen to continuously guard the silkworms, and throwing pebbles or lighting fires from time to time in order to prevent attacks by birds, bats or other harmful animals. Yang mentions the three phases of molting undergone by silkworms before they are ready to make their cocoons. The spring harvest is gathered after the summer solstice, and the cocoons kept for reproduction are then laid out in a cold room. After a few days, moths naturally break free of these cocoons. The procedure for producing eggs in the autumn is somewhat different from that for the spring: females are made to mate with males from outside, so as to fortify the breed.¹¹¹ Yang devoted half of the text of his “Fang hujian fa” to the meth-

¹⁰⁹ Yang Shen, *Binfeng guangyi*, *juan* 3, pp. 15a-b (p. 82). The traditional Chinese hours of *chen* 辰 and *si* 巳 correspond to 7:00-11:00 AM; *shen* 申 corresponds to 3:00-5:00 PM.

¹¹⁰ *Ibid.*, p. 16b (p. 82).

¹¹¹ *Ibid.*, pp. 17b-18a (pp. 82-83).

ods for spinning and to the description of the preparation of warp threads for weaving silk goods. This was useful for artisans who did not yet have any experience in preparing a loom, although it was not really explicit enough to train a beginner.

In 1741, Yang Shen wrote to the governor of Shaanxi, Shuai Nianzu, suggesting a sericultural policy for the province, with the letter he included his *Binfeng guangyi*.¹¹² Shuai then ordered the reproduction of this manual and its distribution to every district in the province. Nevertheless, this text did not seem to attract the attention of Jiang Shunlong, who suggested that the emperor should order Shandong officials to compile a handbook on wild silkworm rearing. It is not clear whether Jiang Shunlong was unaware of Yang Shen's work or whether he found it unsatisfactory and only had confidence in Shandong methods.

3.3. *The Earliest Extant Manual Devoted to Wild Silk Production (1744)*

The 1755 edition of the *Gazetteer of Lianzhou Prefecture* contains a copy of the 1744 *Shandong yangcan chengfa*. Containing annotations referring to local conditions and perhaps other modifications, this copy provided important information about the first official manual of wild silk production. It contains five sections: 1) the process for feeding mountain silkworms in the spring, 2) the process for feeding mountain silkworms in the autumn, 3) things to scoop out and to avoid while rearing mountain silkworms, 4) the process for feeding *chun* silkworm, with an annex on silkworms on *jiao* 椒 trees, and 5) details on wild silk production and weaving. There are also five other independent sections which describe in detail the tray for holding eggs, the species of silkworms, the species of *boluo* trees and the planting of *boluo* and *chun* trees.

The text is clear and was easy to understand for those who had received basic training in classical Chinese. Every section contains headings followed by short descriptions, either of the stages of an operation or of the tools necessary for the operation. In the description section, the author gives details on optimal timing for each operation, precautions to take in order to obtain better results, and the physical movements required for each operation. He explains each practice and possible occurrence. Thus, Kaer Jishan¹¹³ divides egg production into five steps: collecting the cocoons,¹¹⁴

¹¹² Yang Shen, *Binfeng guangyi*, *juan 1*, Jingchen 敬陳, pp. 1a-17b (pp. 11-18).

¹¹³ As mentioned above, Qianlong ordered Kaer Jishan, who was the Provincial Governor of Shandong at that time, to prepare a draft text. Pending further, more detailed identification, I consider him and other officials as the authors of the work.

heating up the cocoons, gathering moths, letting the moths mate and separating males and females. He instructed artisans to string cocoons for egg production and hang the threads on a stick, while Yang Shen recommended spreading cocoons in a large basket, similar to that used for *Bombyx mori* eggs.¹¹⁵ In his report, d’Incarville described the same process as the *Yangcan chengfa*. Kaer Jishan explains technical terms, showing a great concern for popularizing relevant knowledge. For example, when there are not enough male moths for the mating, “early in the morning, take off the lid of the basket containing the female moths and hang it outside. Male moths come naturally for mating: they are called ‘wind moths’” (*feng’e* 風蛾, Fig. 2.1).¹¹⁶ At the end of his work, Kaer Jishan provided an explanation of how to identify species of *boluo*, following an analysis of their particular suitability for wild silkworm rearing, before describing the methods for planting these trees. He also specified the shape of the leaves of each:

Kinds of *boluo*: The *hu* with large leaves is named great *boluo*; the *hu* with small leaves is named little *boluo*; the white and red *zuo* are also called *boluo* with pointed leaves; *qinggang* also called *qinggang boluo*.¹¹⁷

All the trees in this category are quite different from the *chu*. The focus on the methods for creating artificial forests shows a change in wild silkworm rearing away from reliance on existing natural resources.

In 1763, Han Mengzhou completed a work also entitled *Yangcan chengfa*, when he called for wild silkworm raising in the region under his jurisdiction. Compared to Kaer Jishan’s work, Han’s description is written in a popular style and better organized. He increased to six the headings for tools that he included in the section devoted to “tools for silkworm rearing” (*yangcan qiju* 養蠶器具). Also, he united the sections on the trees used for feeding silkworms in an appendix at the end of the text. In his “Quanyu yangcan wen” 勸諭養蠶文 (Declaration for promoting silkworm rearing), published in 1768, Han Mengzhou advised owners of *boluo* or *chun* trees to immediately begin rearing wild silkworms, and people who did not have

¹¹⁴ *Zhong* 種 literally refers to species or eggs, but in many ancient Chinese texts, authors tended to mix up terms such as *zhong*, *e* 蛾 and *jian* 繭. According to the context, *zhong* here clearly refers to the cocoons.

¹¹⁵ *Nongsang jiyao* 農桑輯要, *juan* 4, pp. 1b-2a, 1339 edition, in *XXSK* vol. 975, pp. 122-123.

¹¹⁶ [*Qianlong*] *Lianzhou fuzhi*, *juan* 9, p. 19a, “Qiu shancan” 秋山蠶, “Chuanzhong” 穿種: “Shuan’e” 拴蛾.

¹¹⁷ *Ibid.*, *juan* 9, p. 22a, reproduced in Han Mengzhou, *Yangcan chengfa*, Fu: *Zhong boluo, chunshu fa* 附：種簸蘿、椿樹法, in *Zuocan sanshu* 柞蠶三書, annotated by Yang Hongjiang 楊洪江 and Hua Degong 華德公 (Beijing: Nongye chubanshe, 1983), p. 11.

suitable trees for this activity to learn how to plant these.¹¹⁸ According to the annotators, *boluo* refers to the trees growing leaves that do not fall in the autumn and winter.



Figure 2.1 Female Wild Silkworm Moths (*yecan'e* 野蠶蛾) Tied on a Tree to Attract Male Moths. Source: *China Imperial Maritime Customs, II. Special Series: N° 3, Silk* (Shanghai: Statistical Department of the Inspectorate General, 1881).

At the end of the Guangxu 光緒 reign (1875-1903), in his *Yecanlu*, Wang Yuanting criticized Han Mengzhou's writings as republished in the *Gazetteer of Lai'an District* (*Lai'an xianzhi* 來安縣志) as too simplified.¹¹⁹ Unfortunately, I have not found a copy of this to compare with the other editions. However, Han's work provides essential information written in an oral style for the spread of wild silkworm raising and seems to have circulated widely owing to his reputation as a Confucian scholar. During the Guangxu reign, a period of active promotion of wild silk production across the empire, there were several editions of the *Yangcan chengfa*. In the early

¹¹⁸ See Han Mengzhou, *Litang riji* 理堂日記, "Quanyu yangcan wen" 勸諭養蠶文, pp. 4b-5a (1824 edition), in *Lidai riji congchao* 歷代日記叢鈔 (Beijing: Xueyuan chubanshe, 2006), pp. 294-295.

¹¹⁹ Wang Yuanting, *Yecanlu*, p. 641.

twentieth century, the work was included in the *Nongxue congshu* 農學叢書, a collection of agricultural works compiled by Luo Zhenyu 羅振玉 (1866-1940), one of the founders of the Society of Agriculture (Nongxue hui 農學會).¹²⁰

3.4. *An Illustrated Handbook (1827)*

Liu Zuxian's *Xiangjian tushuo* is an illustrated handbook of more than seventy double pages divided into two chapters. From the identification of *xiang* trees up to silk weaving, the book contains forty-one sections explaining step by step the processes of wild silk production. Each section contains one descriptive text and one illustration with a poem (Fig. 2.2).

Liu was the first author of extant wild silk handbooks who was not from Shandong: he came from Fujian. Liu held the post of magistrate of Anping in Guizhou at a time when the provincial government promoted wild silkworm rearing there. While active across the province (he served at Yongcong 永從, Danjiang 丹江, Pu'an 普安 and Wuchuan 婺川), he introduced wild silkworm rearing into the areas under his jurisdiction, most of which were populated by non-Han populations. He brought in skilled artisans from Zunyi to teach the methods of cultivating wild silkworms. In 1827, hoping to expand the practice, he modeled his *Xiangjian tushuo* on Lou Shou's 樓壽 *Gengzhi tu*.¹²¹ His work is based on the instructions published by an earlier governor, as well as his own eight or nine years of personal experience in promoting cultivation, and on what he had learned from artisans.¹²²

In the first section, entitled “Xiang li” 橡利 (Benefits of the *xiang* tree), Liu discussed the tree's name and uses:

Xiang. In the *Erya* it is called *li*; in Shandong and Guanzhong it is called *hu*, in Guizhou, it is called *qinggang*. Young trees can feed wild silkworms; old trees

¹²⁰ Zhang Kai 章楷, “Zuizao de zuocan zhuan shu shi ‘Yang shancan chengfa’” 最早的柞蠶專書是《養山蠶成法》, in *Canye kexue* 蠶業科學 1987.3, p. 128.

¹²¹ Roslyn Hammers, *Pictures of Tilling and Weaving: Art, Labor, and Technology in Song and Yuan China* (Hong Kong: Hong Kong University Press, 2011). The author mistakenly dates the *Gengzhi tu* to in or around 1145 (p. 9), although the actual date must be circa 1133, when Lou Shou served as magistrate in Yuqian 於潛, near by Hangzhou. See Mau Chuan-hui 毛傳慧, “Song Yuan shiqi cansang jishu de fazhan yu shehui bianqian” 宋元時期蠶桑技術的發展與社會變遷, in Chu Pingyi (Zhu Pingyi) 祝平一, ed., *Zhongguoshi xinlun—keji yu Zhongguo shehui fence* 中國史新論—科技與中國社會分冊 (Taipei: Academia Sinica; Lianjing, 2010), pp. 314-315.

¹²² Liu Zuxian, *Xiangjian tushuo*, xu, pp. 2b-3a (p. 555).

can be used for fuel. The seeds can feed pigs. The bark can be used as a black dye.¹²³

In the second section, he continued:

The *xiang* tree is suitable for feeding [wild] silkworms; people of Guizhou called it “narrow leaved *qinggang*.” There are two kinds: one has green-colored [leaves]; the other has leaves with light red edges. Both have long serrated leaves.¹²⁴



Figure 2.2 Stringing the Cocoons and Hanging Them up to Make the Moths Come Out. Source: “Chuanzhong shang-liang chu’e 穿種上晾出蛾,” in Liu Zuxian, *Xiangjian tushuo*, *shang juan* 上卷, 14b (p. 564). In *Xuxiu Siku quanshu*, vol. 978. Shanghai: Guji chubanshe, 1995.

He also described other trees—varieties of *qinggang* or *li*—whose leaves could be used for feeding wild silkworms, but with inferior results. He devoted seven sections to techniques for preparing the seeds for choosing earth, planting, protecting and fertilizing, pruning trees, mixing them with other cultures and maintaining them in good condition. Here again, Liu mentions difficulties in nomenclature—these were common in pre-modern

¹²³ Liu Zuxian, *Xiangjian tushuo*, *Xiangli di yi* 橡利第一, p. 1a (p. 557).

¹²⁴ *Ibid.*, *Bian xiangshu di er* 辨橡樹第二, pp. 3a-b (p. 558).

China. The same plant might have different names from one province to another; the same name could be used in different provinces for naming different plants.

The silkworm described by Liu seems to be the same as the one described by Kaer Jishan in the *Canjian zhonglei* 蠶繭種類 (Species of silkworms).¹²⁵ Liu, however, gives a clearer idea of the evolution of the caterpillars:

A silkworm is born with a red head, a black body and hair. It has the size of an incense-stick two *fen* (c. 0.3 cm) long. It eats its own shell. Six to seven days after being placed in the [silkworm] farm basket, it commences its first molting, eating no leaves for four or five days. Then it molts, discarding its black hair. It becomes yellow and green, and larger.¹²⁶

Liu provides the first detailed description of the wild silkworm caterpillars:

Its body has eight sections; each section has several yellow hairs. At the back of the body, there are four large legs on each side. Near the head, there are twelve small legs distributed on both sides. When entering into molting, it secretes silk for binding its feet [to the tree]; therefore it fears neither the wind blowing nor the tree shaking.¹²⁷

Liu also explains carefully how to choose cocoons to produce the healthiest eggs, and gives details on how to set up a heated room for hatching eggs and how to move caterpillars between trees. He lists silkworm illnesses and provides prevention methods. He also calculates the price of each activity and the benefits it could bring. The book's appearance is that of a well-made handbook of domestic silkworm rearing. Evidently the authors of wild silkworm rearing handbooks benefited from millennia of experience in *Bombyx mori* rearing.

3.5. Zheng Zhen's 鄭珍 *Chujian pu* 樗繭譜 (1837)

The *Chujian pu* (Record on *chu* cocoons) by Zheng Zhen (1806-1864), a local literatus of Zunyi, was annotated by Mo Youzhi 莫友芝 (1811-1871). Both Zheng Zhen and Mo Youzhi failed the imperial examinations but were known for their literary talents. In a thirty-three page text, Zheng describes

¹²⁵ *Lianzhou fuzhi*, *juan* 9, *Canjian zhonglei*, pp. 22b-23a. Here the author uses *canjian*, lit. cocoons, for referring to silkworms. He mentions two kinds of silkworms, *shanjian* and *chunjian*.

¹²⁶ Liu Zuxian, *Xiangjian tushuo*, "Sanmian di ershisi" 三眠第二十, p. 6a (p. 576).

¹²⁷ *Ibid.*

the entire wild silk industry, from rearing wild silkworms through silk thread making and weaving, to the planting of *hu* trees. At the beginning and the end of the work, Zheng and Mou recapitulate its local history. They praise the benefits brought by the wild silk industry introduced by Chen Yudian, which made Zunyi the richest district of a province known for its mountainous and barren landscape that could not produce sufficient crops to contribute to taxes.¹²⁸ Indeed, Liu Zuxian had shown that silk goods made in Zunyi circulated in the provinces of Henan, Sichuan, Hubei, Shanxi, Shaanxi, Yunnan, and Guizhou; merchants from Henan even paid in the spring for orders to be delivered in the autumn.¹²⁹ In the hope of extending Zunyi's success to other locations in Guizhou, Ping Han 平翰, prefect of Zunyi, published Zheng Zhen's work and distributed it in the province.

Zheng Zhen for the first time provided long descriptions of both wild silkworms and trees suitable for feeding them in order to facilitate their identification. He also discussed the nomenclature of plants: "The tree used for feeding wild silkworms is called *qinggang* by the villagers of Zunyi. . . . In reality, it is *hu*."¹³⁰ Mo Youzhi added: "Shandong people call the *qinggang* of Zunyi *huli* 榭櫟, while people of Zunyi use *huli* to identify a variety that has large green leaves. People residing in Guizhou and in the region between the rivers Huang 晃 and Yuan 沅 in Hunan call the *qinggang* of Zunyi *limu* 櫟木, and call the *huli* of Zunyi *qinggang*." He concluded: "These differences come from the diversity among local dialects."¹³¹

According to Zheng, the Zunyi silkworm underwent four stages of molting. Mo Youzhi added: "The young caterpillar is black. It [sheds its] skin and becomes brown."¹³² After the second molting, "it becomes yellow and green."¹³³ This is evidently the same species described by Liu Zuxian, but more closely observed. The wild silkworm promoted in Guizhou, the eggs of which came from Shandong or Henan, was the species of mountain silkworm identified as *Antheraea pernyi* by Guérin-Méneville in 1855 and called *zuocan* by Wang Yuanting in his *Yecanlu*.¹³⁴

¹²⁸ Zheng Zhen, *Chujian pu*, pp. 29b-31b (pp. 637-638).

¹²⁹ Liu Zuxian, *Xiangjian tushuo*, p. 1b (p. 557); Zheng Zhen mentioned similar phenomena in his *Chujian pu*, pp. 1a-2b (p. 623).

¹³⁰ Zheng Zhen, *Chujian pu*, p. 3a (p. 624).

¹³¹ *Ibid.*, p. 5b (p. 625).

¹³² *Ibid.*, p. 11b (p. 628).

¹³³ *Ibid.*

¹³⁴ Wang Yuanting, *Yecanlu*, "Yecan ming" 野蠶名, p. 660.

Conclusion

The expansion of wild silkworm rearing under the Qing came at a time of population pressure and emerging limitations on cultivable land. The introduction of this technique into new areas enabled farmers to make good use of tracts of forest that had previously been devoid of economic benefit, except as sources of wood for fuel. In addition, it increased silk production at a time when domestic and foreign demand was increasing. Qianlong's opening of the Kazakh trade and the British East India Company's occupation of India, where the Company got its supplies of opium for trading with China, further increased the need for silk. The spread of wild silk production into new areas was an undoubtedly positive factor for the Qing Empire and its subjects.

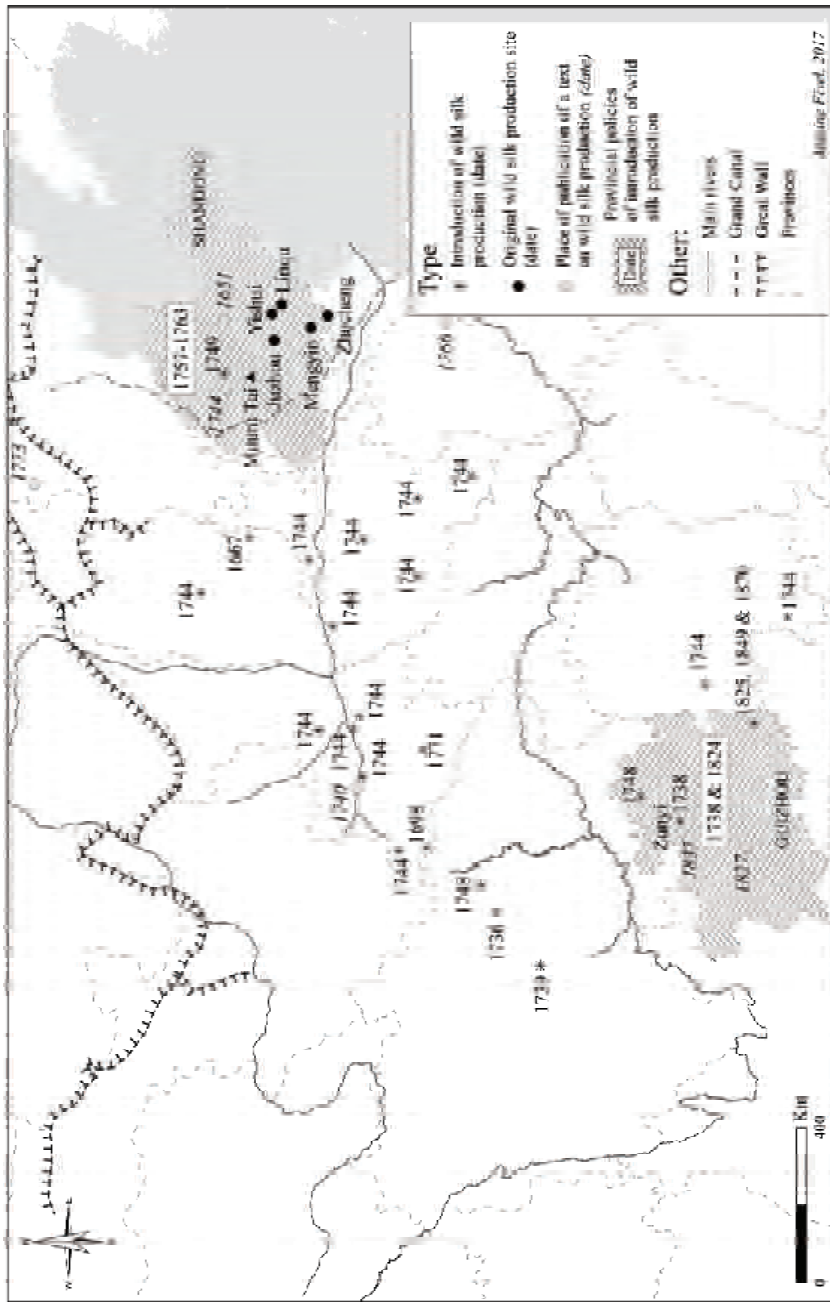
But whatever the benefits of the exploitation of wild silkworms may have been, technical innovation of this kind does not take place simply because its consequences may be beneficial to those who adopt it and to the wider society in which they carry out their activities. Change requires change agents, and at first these change agents were mainly officials from the home area of wild silk production in Shandong such as Wu Guan and Liu Qi, whose arrival in a post far from their native province enabled them to act as vectors of innovation.

In some sense, such officials were simply continuing a process that may have previously occurred sporadically as farmers emigrated from their native province, taking with them their techniques for wild silk production. But once the practice had drawn the attention of those with official responsibilities, a number of "multiplier effects" began to operate, as we have seen in the course of this essay. In the first place, there was the patronage eventually given by the central institutions of the imperial government, personified by the emperor himself, but also represented outside the capital by the leaders of provincial governments—which in turn encouraged other officials and local literati to become involved. Secondly there was the influence exerted through the medium of book publication by officials who thought it socially desirable (or at least beneficial to themselves) to publish accounts of the work they had done in promoting technology transfer in this field. And finally, we have seen examples where officials encouraged the migration of farmers skilled in wild silk into the areas they administered: they thus deliberately promoted a form of population movement that had previously been a matter of decisions made by individuals on the basis of their personal circumstances.

If we draw a map tracing the spread of knowledge of wild silk production as a result of deliberate official promotion of this technique, the results are

revealing. Thus, the first efforts were certainly made by officials from Shandong in the late seventeenth century. But by the late eighteenth century, Zunyi in Guizhou, to which wild silk production had been introduced in the 1730s, had become a new center from which knowledge of the practice in turn flowed. Zunyi's supremacy was marked by the reputation of its products, but more importantly by the compilation of technical manuals. Its success may well have been due to its poverty: no other profitable activity competed with wild silk production.

The story of the spread of wild silk production from its homeland in Shandong is a complex one in which many factors operated at different times and in different ways, at different levels of society. If only because different areas reacted to the new techniques in different ways, the story we have told here cannot be a simple one of officials spreading knowledge as they travelled from post to post. But that such mobility was an essential ingredient in the geographical expansion of this technique is beyond doubt.



Map 2.1 The Circulation of Wild Silkworm Rearing, 17th to 19th Centuries.