The Object of Extension:

Agricultural Extension and Uneven Economic Development in Shandong Province, 1928-37

Spencer Stewart

Presented at 2015 Edward F. Hayes Graduate Research Forum

In 1929, the Republic of China (1912-1949) passed a set of regulations regarding agricultural extension – the promotion and outreach of agricultural research and methods from agriculturalist to farmer. Although extension work in China predates 1929, this set of regulations formalized and regularized extension work nationally under the direction of the central government located in Nanjing. According to these regulations, the fundamental objective of extension was to "popularize agricultural scientific knowledge, increase farmers' technical abilities, advance agricultural production methods, improve village organization and farmers lives, and promote farmer collaboration."[1] Extension work, therefore, was to be centered on the farmer and his or her needs.

This paper questions this oversimplified understanding of extension, arguing that instead of focusing on the farmer, agricultural extension was highly concentrated on export promotion and securing national markets from foreign powers. As such, this overemphasis on strategic market-oriented regions led to uneven economic development, promoting growth in some regions while marginalizing and neglecting others. [2] Previous scholarship has already highlighted the limitations of agricultural extension as seen primarily through agricultural universities and schools.[3] The focus of this study, in contrast, is on provincial agricultural experiment stations, with Shandong as my case study. Though a comprehensive study is beyond the scope of this

[1] "Nongye tuiguang guicheng" 農業推廣規程, Jun. 13, 1929. Reprinted in Li Ying 李瑛, *Minguo shiqi daxue nongye tuiguang yanjiu* 民国时期大学农业推广研究 (The study on the agricultural extension of universities in China) (Hefei: Hefei gongye daxue chubanshe 合肥工业大学出版社, 2012), 212-215.
[2] This is a common theme in state-led economic development and extension work. For examples of third-world uneven agricultural development, see Lawrence A. Brown, *Innovation Diffusion: A New Perspective* (New York: Methuen & Co., 1981). For a classic critique of the United States land-grant university extension system, see Jim Hightower, *Hard Tomatoes, Hard Times: A Report of the Agribusiness Accountability Project on the Failure of America's Land Grant College Complex* (Cambridge, MA: Schenkman Publishing Co., 1973).
[3] See, for example Randall E. Stross, *The Stubborn Earth: American agriculturalists on Chinese soil, 1898-1937* (Berkeley: University of California Press, 1986); also Li Ying. For a comprehensive overview of the development of agricultural education in the 20th century, see Bao Ping 包平, *Ershi shiji Zhongguo nongye jiaoyu bianqian yanjiu* 二十世纪中国农业教育变迁研究 (Beijing: Zhongguo sanxia chubanshe 中国三峡出版社, 2007).

paper, many of the findings in Shandong appear to be representative of other regions under Nationalist control. This paper first outlines the historical development and central critiques of agricultural extension beginning in the late-Qing dynasty (1644-1911) and ending with the outbreak of the Second Sino-Japanese War in 1937. Next, a close study of the tobacco and cotton experiment stations in Shandong reveals the state's efforts to gain control over local markets, leading to uneven economic development.

Developing a System of Agricultural Extension

The establishment of agricultural experiment stations and schools were an integral part of state making in the first half of the twentieth century, and paved a way for the establishment of a centralized system of agricultural extension. The earliest experiment station was established in Hunan in 1901. Three more experiment stations were established in the two years following, and by 1909, forty had been established nationwide, including a national-level station in Beijing. [4] Despite political instabilities and warlordism through much of the Republican era, national and local governments continued to ambitiously establish agricultural institutions. In 1916, one source counted a total of 113 stations nationwide.[5] Between the years of 1927 to 1931, 322 provincial and county stations were established.[6] A survey of seven provinces[7] in 1934 and 1935 listed 3 national, 20 provincial, and 271 county experiment stations.[8] Given that only seven of

[4] See Xia Rubing 夏如冰, "Qingmo de nongzheng jigou yu nongye zhengce" 清末的农政机构与农业政策, *Journal of Nanjing Agricultural University* 3 (2002), 47.
[5] "Zhongguo nongshi shiyanchang zhi tongji" 中國農事試驗場之統計, *Science* 科學 2, vol. 6 (1916), 711.
[6] Zhang, Zhiwen 章之汶 and Li Xingyu 李醒愚, *Nongye tuiguang* 農業推廣. (Shangwu yinshuguan 商務印書館, 1936), 59.
[7] Provinces surveyed were Hebei, Shandong, Shanxi, Henan, Shaanxi, Chahar, and Suiyuan.
[8] See Li Zhiji 李治楫, "Guonei nongshi shiyan jiguan gaikuang" 國內農事試驗機關概況, *Nongye tuiguang* 农业推广 6 (1934), 5-9; Li Zhiji, "Guonei nongshi shiyan jiguan gaikuang (er)" 國內農事試驗機關概況 (二), *Nongye tuiguang* 7 (1934), 1-12; Li Zhiji, "Guonei nongshi shiyan jiguan gaikuang (san)" 國內農事試驗機關概況 (三), *Nongye tuiguang* 8 (1935), 1-18; Li Zhiji, "Guonei nongshi shiyan jiguan gaikuang (si)" 國內農事試驗機關概況 (四), *Nongye tuiguang* 9-10 (1935), 1-7.

the 28 provinces in the Republic of China were included in the survey, the number of experiment stations in operation prior to 1937 was likely close to 500, if not more.

The first agricultural school in China was the Hangzhou Sericulture Hall (*Hangzhou canxue guan* 杭州蠶學館), established in 1897.[9] In the following years, especially after the implementation of the New Policies, schools were established throughout China at the elementary, secondary, and higher education levels. By 1909, there were 95 agricultural schools with a total enrolment of 6,028 students.[10] Student attendance in agricultural programs increased throughout the Republican era, especially attendance abroad. As historian William Kirby pointed out, there was an international dimension to everything in the Republican era, and agricultural education was no exception. [11] According to one scholar's count, from 1901 to 1949, a total of 2,048 Chinese students studied agriculture abroad.[12] The most popular destinations for agricultural studies were Japan and the United States, especially U.S. land-grant universities such as Cornell University. Students returning to China from abroad helped fill the need for agricultural educators, and facilitated the expansion of higher agricultural education. Additionally, several agriculturalists from the United States were important in the development of agricultural education at the university level, such as Joseph Bailie (1860-1935), Harry H.

[9] There is some debate regarding the first agricultural school to be established in China. Some believe that it was the Jiangxi Gao'an Sericulture School (*Jiangxi Gao'an cansang xuetang* 江西高安蚕桑学堂) established in 1896. Other issues arise as there was often a period of time between when a school was established and when student enrollment. For a brief description of the issues surrounding the debate, see Bao, 12.

[10] More specifically, there were 5 higher-education level agricultural schools with 530 students, 31 secondary-level agricultural schools with 3,226 students, and 59 elementary-level agricultural schools with 2,272 students. See Bao, 21-22.

[11] William C. Kirby, "The Internationalization of China: Foreign Relations At Home and Abroad in the Republican Era" in *Reappraising Republican China*, ed. Frederic Wakeman, Jr. and Richard Louis Edmonds (New York: Oxford University Press), 179, 200-202.

[12] The statistics are given as follows: 1901-1911, 312 students; 1912-1927, 367 students; 1928-1937, 875 students; 1938-1945, 350 students; and 1946-1949, 144 students. Shen Zhizhong 沈志忠, "Nongke liuxuesheng yu Zhongguo jindai nongye keji tizhihua jianshe" 农科留学生与中国近代农业科技体制化建设, *Anhui shixue* 安徽史学 5 (2009), 6.

Love (1907-1964), and John Lossing Buck (1890-1975).[13] By 1927, there were 24 established higher-level agricultural institutions and departments of agriculture, and by 1937, this number increased to 39.[14]

The establishment of agricultural experiment stations and agricultural schools paved the way for a formal system of extension in 1929 with the joint publication of "Regulations of Agricultural Extension" (*nongye tuiguang guicheng* 農業推廣規程), discussed above, by the Department of Education, Department of Internal Affairs, and the Department of Agriculture and Mines.[15] Contrary to the objectives laid out by these regulations, the actual central object of extension, however, was not improving farmers' lives, but decreasing reliance on foreign imports and increasing national exports. Indeed, the promotion of agricultural extension coincides with China's "agricultural crisis" from 1920 to 1949, which, according to economist Ramon Myers, was caused by an accumulation of civil war, poor weather conditions, and global market instability. The latter of these proved especially problematic as the Republic of China became increasingly dependent on foreign imports, while simultaneously witnessing a decline in food grain and handicraft exports.[16] Further, the authors of a textbook on agricultural extension used at Jinling University in Nanjing, dedicated the first fifteen pages of their text to a discussion of this issue. They presented tables and charts to show that from 1929 to 1933, China was heavily reliant on foreign countries for agricultural goods, and at the same time, exports declined in some

[13] See Stross.
[14] Bao, 31.
[15] The regulations were again modified in March of 1933. For a comprehensive introduction to legislation regarding agricultural extension from the late-Qing to Republican era, see Zhou Xiaoyan 周晓焱 and Zhang Jianhua 张建华, "Nanjing guomin zhengfu de nongye tuiguang lifa yanjiu" 南京国民政府的农业推广立法研究 *Journal of Northwest A&F University* 西北农林科技大学学报 12, no. 4 (2012), 139-145.
[16] Ramon H. Myers, "The Agrarian System" in John K. Fairbank and Albert Feurwerker eds. *The Cambridge History of China: Vol. 13. Republican China 1912-1949, Part 2* (Cambridge, UK: Cambridge University Press, 1986), 256-66.

of its most important international markets, including tea and silk.[17] Agricultural extension, as presented by these authors, was framed in nationalistic terms, with the "urgency" (*poqie* 迫切) of agricultural improvement as "the only way to national rejuvenation."[18] Kenneth Pomeranz has similarly pointed out that the extension efforts, as seen in Nanjing, North China, and Shaanxi, "all emphasized crops that could improve China's balance of trade and thus, it was hoped, help protect its autonomy; rural living standards per se got far less attention."[19] Research conducted at agricultural schools and experiment stations, consequently, focused on cash crops.

It is important to note that these agricultural schools and experiment stations functioned as separate institutions with differing priorities.[20] The focus of agricultural experiment stations was to conduct research, distribute seeds, and publish extension leaflets for farmers, typically called *qianshuo* 淺說. The agricultural experiment stations worked closely with the regional agricultural extension office, as outlined in Article 13 of the 1929 "Regulations of Agricultural Extension."[21] As emphasized by one author, the promotion of the agricultural extension system in the late 1920s was not for the purpose of replacing agricultural research, but to finally put the research to use. This author states, "While we emphasize experiment research, we must simultaneously advocate extension in order to ensure that the first goal of experiment research is reaching the village, benefiting the farmer, and thoroughly improving agriculture."[22]

---

[17] Zhang and Li, 1-15.
[18] Ibid., 14.
[19] Kenneth Pomeranz, *The making of a hinterland: state, society, and economy in inland north China, 1853-193.* (University of California Press, 1993), 74.
[20] Zhang and Li, 86. Although many agricultural schools in China, especially at the university level, also had agricultural experiment stations, these should not be confused with the provincial and county experiment stations discussed in this paper. This system differs from the U.S. land-grant model, where experiment stations were established as an integral part of the college.
[21] Reg.
[22] Yu Gong 愚公, "Nongye tuiguang gailun" 農業推廣概論 *Nongye tuiguang* 農業推廣 1 (1930), 8.

Despite ambitions to improve agriculture and farming life, Myers pointed out that experiment stations were poorly funded, disconnected from the villages, and findings were only disseminated to surrounding regions.[23] Further, he suggested that additional stations were not established due to a lack of political stability and an urban-centered leadership viewing agriculture as "an industry to exploit" rather than develop.[24] The introduction of modern experiment stations and new seed development methods in the 1920s and 1930s also fundamentally changed the traditional characteristics of seed selection and rural society. Although farmers no longer needed to rely on the precarious "whims of nature,"[25] they also became increasingly dependent on the state.

Agricultural schools, conversely, focused primarily on training students to work in provincial and county extension centers and experiment stations.[26] However, graduates of agricultural schools, especially at the university level, seldom sought out such positions, seeking jobs in education, government, and business. For example, as a 1946 report on the agricultural conditions of China recorded, many workers in the county extension offices were political appointees with little to no experience in agricultural extension work or farming in general.[27] Zhang Fuliang (Chang Fu Liang, 1889-1984), former rural secretary of the National Christian Council, argued that the cause of this was that higher-level agricultural education attracted mainly urban students, a consequence of charging tuition fees and the nature of the admittance process, which placed greater importance on formal education than on actual farm experiences.

---

[23] Ramon H. Myers, *The Chinese peasant economy: agricultural development in Hopei and Shantung, 1890-1949* (Harvard University Press, 1970), 183.
[24] Ibid., 213.
[25] Dwight Perkins, *Agricultural Development in China, 1938-1968* (Chicago: Aldine Publishing Company, 1969), 52.
[26] Zhang and Li, 86.
[27] China-United States Agricultural Mission, *Report of the China-United States agricultural mission* (Office of Foreign Agricultural Relations, 1947), 77.

In Zhang's words, agricultural education attempted to make farmers out of city boys, and "agricultural scientists out of the sons of Mandarins and Compradores."[28] After graduation, the majority of agricultural-college students did not engage in agricultural work, with most becoming urban-based politicians, bureaucrats and teachers. Not only was this caused by better economic and career opportunities outside the village, graduates also tended to have a Confucianist view of manual labor, which was "beneath his dignity to participate in," an idea that "the instruction in most agricultural institutions seems to accentuate."[29]

Further, even when graduates sought to work in the countryside, they were often alienated culturally and socially. For example, in her study of silk production in Wuxi, Lynda Bell showed that extensionists (those engaged in extension work) and farmers viewed one another through the lens of "the other;" that is, farmers saw extensionists as being "foreign" while extensionists viewed farmers as being "backwards" and confined to "tradition." Although extensionists perceived themselves as the bearers of scientific truth and modern technique, farmers tended to be largely skeptical.[30] Randall Stross similarly argued that agriculturalists were detached from the social conditions of the countryside, and believed in a "technological fix" to the complex problems facing China's agriculture. In doing so, they failed to address or even recognize the underlying political, economic, and social changes needed to actually improve rural conditions.[31]

These findings coincide with what Wen-Hsin Yeh referred to as the "alienated academy" of the Republican era. Yeh argued that higher education during this time was secluded to

---

[28] Zhang Fuliang (Chang Fu Liang), "Agricultural education and country life," *Educational Review* 22, no. 2 (1930), 190.
[29] Ibid., 189.
[30] Lynda S. Bell, *One Industry, Two Chinas: Silk Filatures and Peasant-Family Production in Wuxi County, 1865-1937* (Stanford University Press, 1999), 141-145.
[31] Stross, 215.

urbanites, focusing on subjects of study that distanced them from the countryside linguistically, culturally, and socially. To the townspeople and villagers, the college-educated elite were both foreign and remote, who rarely looked back, leaving their countrymen behind.[32] Even agricultural schools at the village level appear to have suffered from cultural and social alienation. In Stig Thogersen's study of village schools in 20th century Zouping, Shandong, he argued that low enrollment numbers and an utter lack of agricultural schools in local historical memory suggest the limited value that locals placed on such institutions. Not only did they have little impact economically, but those who were educated through such institutions tended to feel as if they were "enlightened" or somehow better than their fellow villagers. This sense of elitism distanced them from farming and alienated them from their own rural upbringing.[33] As Fei Xiaotong (1910-2005) similarly pointed out, educated ruralites found it too disgraceful to return to the fields, a sense of shame that was felt by both themselves and their families.[34]

Overall, agricultural extension during the Republican era, comprised of agricultural experiment stations and educational institutions, was restricted by larger economic, political, social, and cultural barriers. Lack of funding and political support for agricultural experiment stations left them inefficient and incapable of promoting uniform and balanced economic growth. Additionally, agricultural education produced socially- and culturally-alienated graduates, not ready nor willing to work at experiment stations and extension offices. Such factors form the historical background for an in-depth inquiry into agricultural experiment stations in Shandong.

---

[32] Wen-Hsin Yeh, *The Alienated Academy: Culture and politics in Republican China, 1919-1937* (Cambridge, MA: Harvard University Press, 1990), 7-48. In all fairness, Yeh does point out a few exceptions to this generalization. In the 1920s, for example, Zhongshan University specifically sought to "break down the barrier between school and society." (p. 176).

[33] Stig Thogersen, *A county of culture: Twentieth-century China seen from the village schools of Zouping, Shandong* (Ann Arbor: University of Michigan Press, 2002), 57-90. The first agricultural schools in Zouping was opened in 1910, only to shift focus to sericulture two years later. In 1912, enrollment reached 19 students. (p. 50).

[34] Fei Xiaotong (Fei, Hsiao-tung), *China's Gentry: Essays in Rural-Urban Relations* (Chicago: University of Chicago Press, 1953), 136.

Agricultural Experiment Stations in Shandong

Agricultural Experiment Stations in Shandong

From 1903 to 1937, seven provincial-level experiment stations were established in Shandong, forming the diffusion infrastructure at the provincial level. The earliest of these experiment station, as mentioned above, was the Shandong Agricultural Experiment Station established in 1903, in the northeastern region of Jinan. In the early years, this station primarily conducted basic research on basic food crops, but by 1915, when relocated to western Jinan, four departments of research were established: agriculture, horticulture, agronomic chemistry, and pesticide science.[35] In 1918, the first of two cotton experiment station was established in Linqing County, known at the time as the Shandong Provincial Linqing Cotton Experiment Station (*Shandong shengli Linqing mianye shiyanchang* 山東省立臨清棉業試驗場, hereafter Linqing Cotton Station).[36] In 1926, the second cotton experiment station, the Shandong Provincial Cotton Station (*Shandong shengli mianzhongchang* 山東省立棉種場, hereafter Qidong Cotton Station), was established in Qidong County.[37] The first of two sericulture stations was established in 1918 in Yidu (later Qingzhou),[38] and the second in Yantai in 1935. Also in 1935, two tobacco stations were established, the first in Linzi, the Tobacco Improvement Station

[35] The station was established at the current location of the Shandong Academy of Agricultural Science. However, in 1915, this station was located to a larger site in western Jinan. The name of the station changed in 1929 to the Shandong Provincial First Agricultural Experiment Station(*Shandong shengli di'yi nongshi shiyanchang* 山東省立第一農事試驗場). In 1936, the name once again changed to the Shandong Provincial Agricultural Research Institute (*Shandong sheng nongye shiyansuo* 山東省農業實驗所). To avoid confusion, I refer to this station as the Shandong Agricultural Experiment Station.

[36] In 1926, the name of the station changed to the Shandong Provincial First Cotton Experiment Station (*Shandong shengli di'yi mianye shiyanchang* 山東省立第一棉業試驗場). In 1935, the name changed again to the Shandong Provincial Cotton Improvement Branch (*Shandong shengli mianzuo gailiang fenchang* 山東省立棉作改良分場).

[37] In 1930, the name of the station changed to the Shandong Provincial Second Cotton Experiment Station (*Shandong shengli mianye shiyancheng* 山東省立棉業試驗場) and in 1934 changed to the Shandong Provincial Cotton Improvement Station (*Shandong shengli mianzuo gailiangchang* 山東省立棉作改良場).

[38] Known in 1918 as the Shandong Silkworm Production Office(*Shandong canzhong zhizaosuo* 山東蠶種製造所). Its name changes to the Shandong Provincial Sericulture Experiment Station (*Shandong shengli canye shiyanchang* 山東省立蠶業試驗場) in 1930.

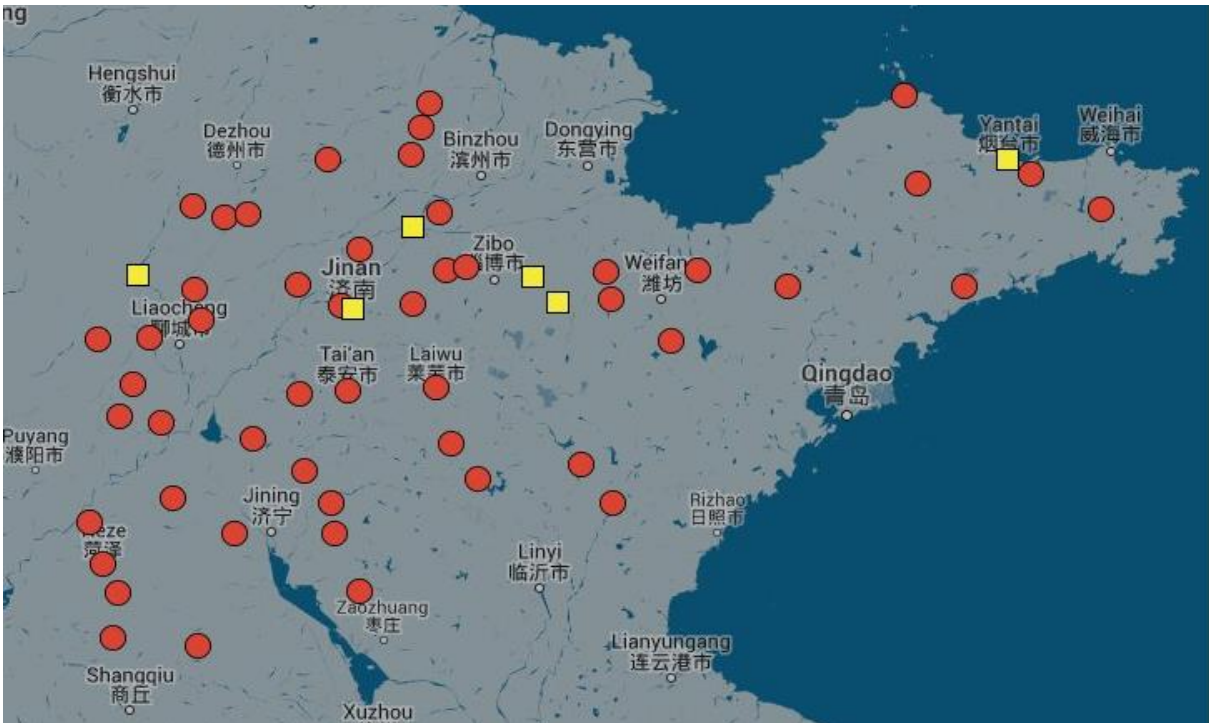
(*yancao gailiangchang* 煙草改良場, hereafter Linzi Tobacco Station), and the second in Qingzhou, the Tobacco Experiment Station (*huangyan shiyanchang* 黃煙試驗場, hereafter Qingzhou Tobacco Station).[39]

In addition to these provincial-level experiment stations, county experiment stations were established throughout Shandong. In 1922, 50 county stations were in operation. By 1931, one source showed 58 provincial, city, and county experiment stations with annual expenditures of 75,167 yuan.[40] A 1934 report listing 54 county experiment stations, showed that funding between the county stations varied widely, from 4,000 yuan at one station to a mere 58 at another. On average, however, county experiment stations typically had annual expenditures of around 300 to 400 yuan.[41] It appears that county experiment stations were financially unstable compared to provincial stations. For example, when tobacco stations were being established at the provincial level in 1935, all county experiment stations closed due to financial reasons, and were consolidated into four experiment districts, each dedicated to researching one crop: Licheng, wheat; Huimin, soybeans; Juxian, sorghum; and Laiyang, fruit trees.[42]

The provincial- and county-level experiment stations form the diffusion infrastructure, as shown in Map 1. Provincial and county experiment stations were important hubs of information and resources, as research findings and improved seed varieties disseminated outward from these centers. Although county experiment stations are relatively evenly distributed between north and

[39] General introduction to these stations can be found in *Shandong sheng zhi: nongye zhi (xia)* 山东省志: 农业志 (下) (Jinan: Shandong renmin chubanshe 山东人民出版社, 2000), 934-936.
[40] Ibid., 936.
[41] See Li Zhiji, "Guonei nongshi shiyan jiguan gaikuang (er)", 9-12.
[42] *Shandong sheng zhi*, 936. The relative financial instability of county experiment stations appears to have been a problem outside of Shandong as well. For example, in his study of Ding County (Ting Hsien), Hebei province, Sidney Gamble notes that in 1919, a cotton experiment station was established, only to be shut down in 1928, while county money was being spent on a tree nursery, which likely brought in more direct revenue than cotton experimentation. See Sidney D. Gamble, *Ting Hsien, A North China Rural Community* (New York: International Secretariat Institute of Pacific Relations, 1954), 136.

south Shandong, provincial-level experiment stations were all located in the northern half, giving relative advantage to northern farmers within closer proximity to the stations, as will be discussed in greater detail below.



Map 1: *Shandong Agricultural Experiment Stations, 1935.* Provincial-level (yellow square) and county-level (red circle) agricultural experiment stations. Note: Qingzhou (or Yidu) had two provincial-level experiment stations and one county experiment stations, but is represented by a single yellow square.[43]

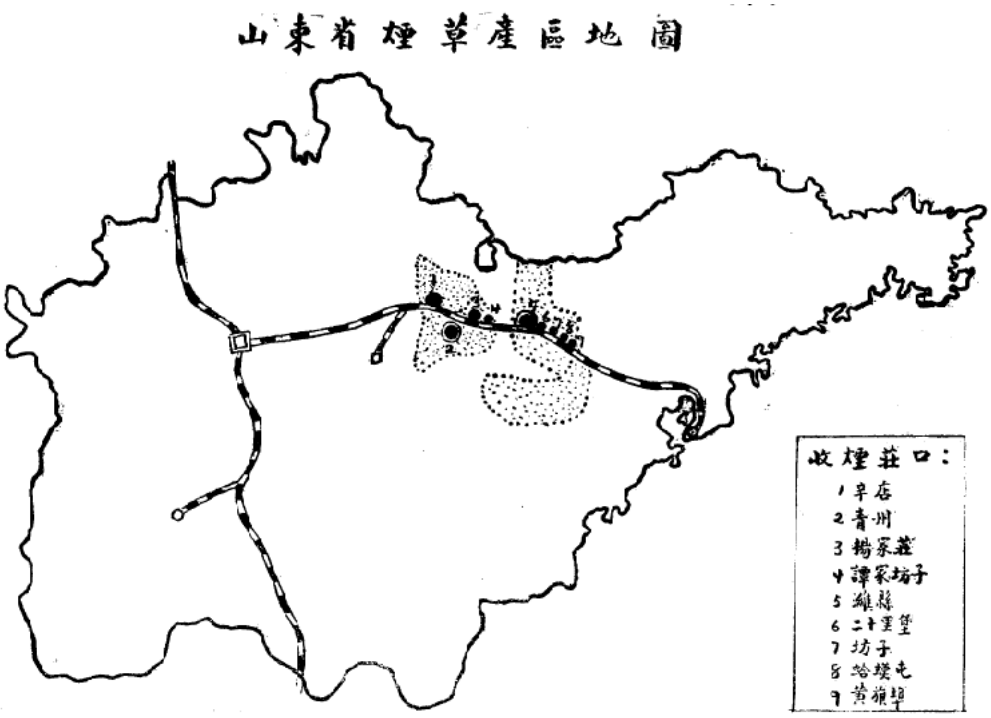
Tobacco Experiment Stations

The establishment of tobacco experiment stations in Linzi and Qingzhou did not occur until 1935, long after the tobacco market was well established. These stations were only in operation for roughly two years before work was disrupted with the invasion of Japan into Shandong in 1937. Therefore, there is less evidence suggesting that extension work by these stations created uneven development, as appears to be the case with cotton. Rather, their

[43] Generated by Google Maps. Data is derived from Li Zhiji, "Guonei nongshi shiyan jiguan gaikuang (er)", 9-12.

establishment can be seen as an attempt by the provincial government to gain access to, and greater control over this important international market, monopolized by foreign companies from the United States and England.

Expansion of tobacco cultivation in Shandong occurred along lines of transportation, such as the Grand Canal, large roads, and in the late-nineteenth to twentieth centuries, railroad lines. A map of the main tobacco production regions in 1932, for example, showed that cultivation followed the Jinan-Qingdao railway line (see Map 2).



Map 2: *Shandong Province Tobacco Production Regions in 1932*[44]

With easy access to the treaty port in Qingdao, the tobacco industry was controlled by foreign industries. Foreign industrial companies began to distribute U.S. tobacco seeds along the Jinan-Qingdao line as early as 1915. High expected returns converted many farmers to these new

[44]Ji Xing 濟行 and Chen Juanren 陳雋人, "Shandong yancao chanxiao diaocha" 山东烟草产销调查 *Zhonghang yuekan* 中行月刊 4, no. 3 (1932), 118.

varieties, and by 1936, cultivation along the railway was ubiquitous. As one observer commented, "traveling along the railway, one cannot fail to be impressed by the vast fields of large golden leaves."[45] Control by these foreign industries can perhaps be described at times as exploitative. For example, Philip Huang pointed out that the British American Tobacco Company (BAT) "extracted the 'surplus' from the peasant economy of Shandong in the sense that the company reinvested only about 7 percent of its profits in the years 1913-41."[46] Companies such as BAT made huge profits, as purchasing tobacco was much cheaper in China than the United States; for BAT, it cost eight to ten cents a pound in China compared to 43 cents if shipped from the United States. As such, tobacco cultivation was heavily reliant on industries such as BAT to drive demand.[47] In addition, these foreign industries exercised complete control over setting market prices, transferring the financial burden to farmers in times of economic crisis.[48]

In light of this, it is not surprising that the Shandong government sought to increase their influence in the market through extension work and experimental research. The Linzi Tobacco Station, for one, was quite active in engaging in research and extension. [49] Formal courses were set up running from August of 1935 to March of 1936 on topics such as cultivation, baking leaves, and pesticides; a series of extension leaflets (*qianshuo*) on the same topics were also published in 1935.[50] However, as a provincial-level experiment station, such extension work was

[45] Xu Yongsui (Hsu Yung-sui), "Tobacco Marketing in Eastern Shantung" in R. H. Tawney ed. *Agrarian China: Selected Source Materials from Chinese Authors* (Chicago: University of Chicago Press, 1938), 172.
[46] Philip C.C. Huang, *The Peasant Economy and Social Change in North China* (Stanford: Stanford University Press, 1985), 130.
[47] Ibid.
[48] Xu, 175.
[49] For examples of types of research conducted, see "Yancao cuiya shiyan baogao" 煙草催芽試驗報告 and "Yancao pinzhong bijiao shiyan baogao" 煙草品種比較試驗報告 in *Shandong sheng jianshe banyuekan* 山东省建设半月刊 1, no. 15 (1936), 1-8, 17-29.
[50] "Yancao gailiangchang Minguo ershisi nian zhuyao gongzuo baogao" 煙草改良場民國二十四年主要工作報告 *Shandong sheng jianshe banyuekan* 山东省建设半月刊 1, no. 15 (1936), 95-100.

focused solely on Linzi County,[51] one piece of evidence that geographic proximity to provincial experiment stations was important in resource allocation.

This focus on Linzi County also illustrates governmental interests in penetrating the foreign-dominated market. According to a 1937 survey, of 12 counties along the Jinan-Qingdao railway, Linzi ranked number three of twelve in the most amount of tobacco produced and land under cultivation, only slightly behind Linqu and Weixian; not surprising, the tobacco market for Linqu was located at Yidu (or Qingzhou), the location of the Qingzhou Tobacco Station. [52] Further, the market for Linzi County, Xindian, sold the largest amount of tobacco, totaling 16,080 tons. Of these, 78 percent were sold to foreign companies, with over half to BAT; of all the markets, BAT bought more tobacco from Xindian than any other market. Similarly, of the 4,800 tons of leaves sold at the Yidu market, 86.5 percent were sold to foreign companies, with 70 percent to BAT.[53]

Therefore, choosing the locations of Linzi and Qingzhou as sights for experiment stations can be seen as an attempt by the government to gain its share of the market and weaken the monopoly of foreign-run industries. This is not to diminish the value of research conducted at these stations, which likely helped farmers increasing output and insecticide use. However, the politics behind promoting the national economy and political sovereignty through trade balances and protecting economic and political autonomy should not be overlooked.

---

[51] Ibid.

[52]Li Xintian 李心田, "Shandong Meizhong yancao diaocha baogao" 山东美种烟草调查报告 *Guoji maoyi qingbao* 国际贸易情报 2, no. 9 (1937), 1-3.

[53]"Shandong Meizhong yancao diaocha baogao" 山东美种烟草调查报告 *Guoji maoyi qingbao* 国际贸易情报 2, no. 10 (1937), 25-30.

Cotton Experiment Stations

Before the 1920s, U.S. varieties of cotton diffused with limited success in Shandong by missionaries, cotton mills in Qingdao, and provincial and county governments. This process of diffusion was largely limited by warlordism and banditry. Ren Dekuan 任德寬 (dates unknown), former director of the Linqing Cotton Station, also pointed out in 1924 that the value of raw cotton in China was three-fourths the value of that in the United States. With lower returns in China, U.S. varieties requiring higher input-costs did not easily diffuse, despite producing more cotton per acre and selling for 20% more per pound than native varieties.[54] The mid-1920s, however, witnessed an increased interest by the provincial government in promoting U.S. varieties and improving native varieties of cotton, as illustrated by the establishment of the Qidong Cotton Station in 1926. The success of the Northern Exhibition and the collapse of warlordism in 1928 also led to greater political stability, allowing for increased attention to diffusing cotton varieties.

In his book *The Making of a Hinterland*, historian Kenneth Pomeranz traced the diffusion of U.S. cotton varieties in western Shandong. He showed that the northwestern region of Shandong (in which both provincial cotton experiment stations were situated) adopted the new improved varieties much more readily than the southwest region. The Shandong Office to Encourage Industry (*Quanye suo* 勸業所, OEI), along with foreign and domestic cotton mills, targeted villages to promote improved varieties. Although the southwest region was traditionally a strong region for cotton production, and studies showed that cultivating U.S. varieties would have led to higher profits relative to the northwest, the new varieties failed to catch on due to

[54] Ren suggests that the solution to the problem was to decrease production costs, increase yields, and increase the value of cotton. See Ren Dekuan 任德寬, “Shandong zhi meimian tuiguang wenti” 山东之美棉推广问题 *Nongxue* 农学 1, no. 5 (1924), 17-19.

strong village solidarity.[55] Pomeranz's analysis specifically drew from historian Joseph Esherick's study of the Boxer Uprising, which outlined important distinctions between southwest and northwest Shandong in the late nineteenth century. Esherick showed that historically the southwest region of Shandong tended to be more prosperous than the northwest, due to greater soil fertility and lower susceptibility to natural disasters, leading to higher rates of landlordism.[56] However, the southwest region also suffered from banditry, creating more close-knit communities. Conversely, the northwest tended to be more open and penetrable, and migration into and out of villages was relatively common.[57]

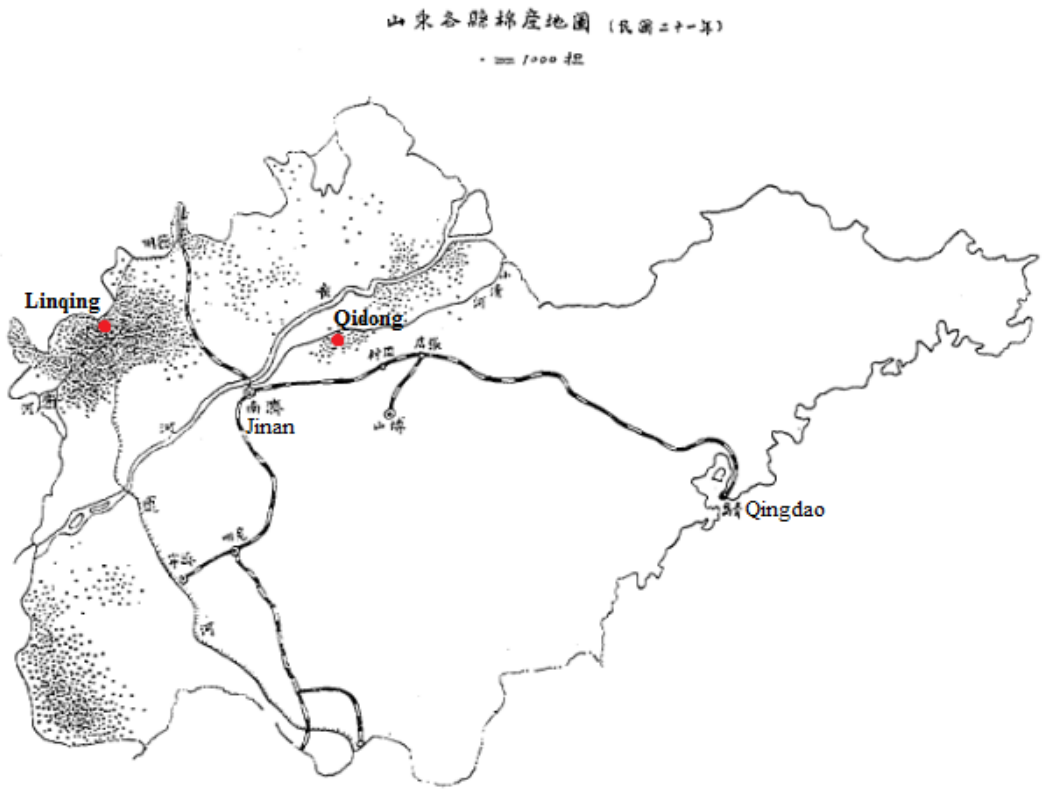
According to Pomeranz, therefore, greater village solidarity in the southwest translated into resistance to provincial- and county-promoted agricultural projects, as village elites sought to protect individual political power.[58] In other words, village leaders and elites, in order to retain political control, discouraged and even prohibited the adoption of new cotton varieties, fearing that through adoption, farmers would make connections and ties to mills or extension agents outside the village that could lead to a weakening of solidarity and ultimate loss of authority. Conversely, farmers in the northwest regions living in villages with less solidarity and banditry were free to adopt the new varieties.[59]

By 1932, roughly 40 percent of cotton grown in Shandong was U.S. varieties,[60] however, less than 20 percent of cotton grown in the southwest regions was of the U.S. variety. Failure to adopt led to a widening gap of cotton output between these two regions; where southwest output

---

[55] Pomeranz, 71-72.
[56] Higher rates of landlordism were caused by an "agricultural involution" in North China, or the intensification and devalue of agricultural labor, discouraging farmers from managing large-scale farms. See Huang, 202-216.
[57] Joseph Esherick, *The Origins of the Boxer Uprising* (Berkeley: University of California, 1987), 27-28.
[58] Pomeranz, 71-72, 114-119.
[59] Ibid., 77-81.
[60] *Shandong shengli di'er mianye shiyan chang tuiguang baogao* 山東省立第二棉業試驗場推廣報告 (Qidong: Shandong shengli di'er mianye shiyanchang 山東省立第二棉業試驗場, 1932).

was roughly half that of the northwest in 1932, output in the southwest declined relative to northwest output in the following years, falling to 33.5% (1934-1936) and finally 29% (1936-1937).[61] Map 3 shows cotton production for the year 1932.

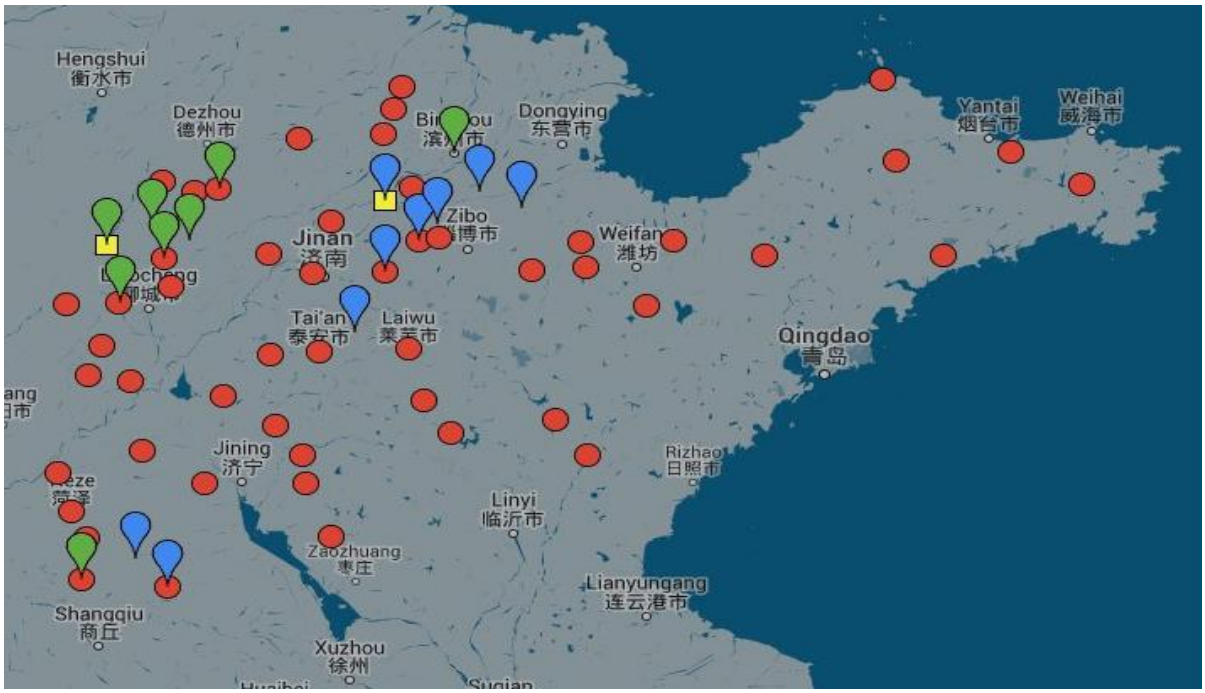


Map 3: *Shandong County Cotton Production, 1932*. Red dots represent the location of provincial cotton experiment stations; black dots represent 1,000 dan (or 50 metric tons) of cotton produced.[62]

As Map 3 suggests, in addition to village solidarity, proximity to provincial cotton stations appears to have had an impact on adoption and outputs. Indeed, the process of distributing improved varieties was infrastructure-constrained, according to Brown's framework of innovation diffusion. That is, seeds from the U.S. were provided to farmers through an extended transportation process from overseas to provincial experiment stations, then on to

[61] Pomeranz, 77-78.
[62] Adapted from *Shandong shengli di'er mianye shiyan chang tuiguang baogao*.

county extension centers or experiment stations and OEI agents, and finally to the farmer.[63] Not only did such a process require a high level of reliance and trust in the infrastructure by the farmer, but was likely limited by geographic limitations and low budgets. A look at the highest yielding counties of U.S. and native varieties further confirms the relationship between proximity of provincial cotton stations and improved varieties (see Map 4).



Map 4: *Cotton Production in Relation to Provincial and County Experiment Stations*. Map shows county experiment stations (red circles), provincial cotton experiment stations (yellow squares), highest-yielding counties of U.S. varieties (green markers) and native varieties (blue markers) in the early 1930s.[64]

As shown in Map 4, the Linqing Cotton Station was within 30 miles of five of the eight highest producing counties of U.S. varieties in the early 1930s, and within 50 miles of another.

[63] Pomeranz, 79-80.

[64] Generated by Google Maps. Data is derived from Li Zhiji, "Guonei nongshi shiyan jiguan gaikuang (er)", 9-12; and Wang Xian 王仙, "Shandong zhi mianye" 山東之棉業 *Guoji maoyi daobao* 國際貿易導報 6, no. 4 (1934), 166, 169. Regions with the highest yields of U.S. varieties were Linqing, Xiajin, Qingping, Gaotang, Tangyi, Binxian, Enxian, and Caoxian. Highest yields for native varieties were Binxian, Qidong, Zouping, Gaoyuan, Guangrao, Zhangqiu, Putai, Enxian, Chengwu, and Danxian. Note that Binxian and Enxian were both high yielders of U.S. and native varieties and that these counties are signified by a green marker, not blue, on the map above.

Binzhou was roughly 30 miles from the Qidong Cotton Station and Caoxian in the south had a county experiment station. Where U.S. varieties clustered around Linqing, high-yielding counties of native varieties appear to have grouped more around the Qidong Cotton Station; five stations are within 30 miles, and another three within 50 miles.

These findings suggest that the diffusion of cotton varieties through provincial cotton stations favored regions within closer proximity to the stations, thus leading to uneven development. The lack of a provincial cotton station – equating to greater infrastructural constraints – in the southwest region of Shandong can be viewed as an additional reason diffusion of U.S. varieties were unsuccessful. After unsuccessful adoption in the southwest, urban mills vacated the area and cotton farmers had to adapt to a dwindling local market by growing less lucrative crops such as wheat and sorghum.[65] Inequality fostered more inequality. However, the growth of cotton production in the northwest was not without consequence. In times of famine, such as 1920 and 1928, northwestern Shandong suffered higher causalities than the southwestern region with greater subsistence agriculture.[66]

Conclusion

This paper shows that instead of focusing on improving the conditions of the farmer and rural communities, agricultural extension in Republican China was focused primarily on promoting exports and securing national markets, leading to uneven economic growth and regional inequalities. Indeed, agricultural extension was inseparable from efforts to promote national rejuvenation and penetrate local society. Instead of modernizing agriculture nationally, agricultural extension was restricted by infrastructural and geographic constraints, creating uneven development and contributing to growing region inequalities. The focus of agricultural

[65] Pomeranz, 75.
[66] Ibid., 118-119.

extension, especially with agricultural experiment stations, on a technological fix to China's rural problems failed to address the roots of rural poverty and discontent. The case of Shandong is not unique. Indeed, this study is one example among many globally showing that state-led economic development and agricultural extension, despite any good intentions, has the *capacity* to create more problems than it solves. The case of Republican China illustrates how states are often so concerned about the needs of the nation that they often forget about the needs of their own people.