

**Serving China through Agricultural Science:
American-Trained Chinese Scholars and “Scientific Nationalism”
in Decentralized China (1911-1945)**

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Abstract

Throughout the Republican era in China (1911-1949), American-trained Chinese scholars played critical roles in establishing Chinese institutions for agricultural education, research, and extension. This dissertation argues that it was the sense of “belonging to China” as a cultural and social entity—not a political one—that motivated Chinese scientists to study in the U.S. and to return to China, to apply their knowledge to the social problems of their homeland. Based on the American model, the scientific institutions established by these scholars nonetheless developed into a pattern uniquely adapted to the Chinese situation. This dissertation also explores the motivations and strategies used by these American-trained Chinese scholars to fulfil their desire of serving China by developing hybrid agricultural ideas, practices, and institutions. Due to political decentralization in Republican China, scholars with similar motivations and goals adopted diverse strategies, which was unusual for nationalistic scholars in other historical contexts. I demonstrate the flexibility of their ideas and practices, which proved adaptive to the dynamic social and natural environments in which they worked (from the Northeast to the Southwest, and from the early “warlord period” through the turmoil of war in the 1940s). Hoping to improve the lives of Chinese people and to strengthen China’s international status, these scientists not only survived during this turbulent era and established a new model for agricultural research and education, but also succeeded in creating and circulating agricultural knowledge for global scientific communities.

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Introduction

“For the past three decades, a noun has been endowed highest status in China. No matter understanding it or not, no matter conservative or reform, no one dare to publicly undervalue this noun. The noun is ‘science’ [*Ke Xue*, 科学].”¹ (Hu Shi, 1923)

As one of the first Boxer students taking advanced education in America and the most famous philosopher, essayist, educationalist, and diplomat in twentieth-century China, Hu Shi’s assessment of “science” represented that of many of his contemporaries and deeply influenced younger Chinese researchers.² Although “science” in early twentieth-century China was influenced by western countries, it was (and is) remarkably different from science in western countries. While European and American scientists were debating the autonomy of science as a pure pursuit of truth versus a tool of social responsibility, twentieth-century Chinese intellectuals, on the contrary, had taken for granted that science should be applied to serve the needs of society and the people. Their concerns and debates centered on how best to use scientific knowledge and practice to save and serve China. As I will demonstrate, the ideology of *KeXue Jiu Guo* or *KeXue*

¹ Hu Shi, “Preface of *Science and Views of Life*,” 1923, *Collected Works of Hu Shi*, Volume 3, Peking University Press, 1998, page 152.

² Hu Shi (1891-1962), one of the most influential writers, philosophers, and diplomats in 20th – century China. He was one of the leaders of the New Culture Movement, and had served as president of Peking University, chief director of Academia Sinica, and Chinese ambassador to the United States.

Bao Guo (科学救国 or 科学报国,³ “saving or serving the country through science”)⁴ was a central motivation of early twentieth-century Chinese intellectuals. The effort of *Ke Xue Jiu Guo* during the Republican era was part of a series of social movements begun during the nineteenth century, focused on “saving and surviving China (救亡图存).” As historians have argued, Chinese people’s consciousness of their national identity of being Chinese emerged in the twentieth century largely in relation to the tensions between China and powerful foreign countries.⁵ Reform intellectuals’ enthusiasm in serving China with science was largely inspired by their belief that western countries established supremacy over China because of the power derived from science and technology. As a result, those intellectuals with close and direct experience of powerful western countries sometimes were more passionate in saving and serving China through science, and most of the leading scholars engaged in scientific research and education in Republican China had foreign educational backgrounds. For example, among the 869 scientists recorded by the five volumes of the *Zhongguo Kexuejia Cidian (Xiandai)* (《中国科学家辞典（现代）》), *Dictionary of Chinese Scientists [Modern]*, Shandong Science and Technology

³ For convenience and consistence, I will use simplified Chinese characters in most cases in this dissertation, although the scholars were usually writing traditional Chinese, in which way 科学报国 and 科学救国 would write as 科學報國 and 科學救國.

⁴ The Chinese word “国” (or “國” in traditional Chinese) has multiple meanings as country, nation, and state. Here I translate it as “country,” and I will explain the reason for this translation later.

⁵ For examples see Lucian Pye’s 1992 book *The Spirit of Chinese Politics* (Harvard University Press); John Fitzgerald’s *Awakening China: Politics, Culture, and Class in the Nationalist Revolution* (Stanford University Press, 1996); Henrietta Harrison’s *The Making of the Republican Citizen: Political Ceremonies and Symbols in China 1911-1929* (Oxford University Press, 1999); and Arthur Waldron, *From War to Nationalism: China’s Turning Point, 1924-1925*, (Cambridge, New York: Cambridge University Press, 2003).

Press, 1982-1986), 626 had studied abroad (72%), and 388 of them went to the United States for study (45%).⁶ In addition, American-trained Chinese scholars had also been famous university presidents, social scientists, diplomats, politicians, and so on.⁷ Generally speaking, among all foreign-trained Chinese scholars in Republican China, those returned from America have gained highest achievement in the movements to save and serve China through science. Therefore, it is important for historians of modern China to explore and analyze how the American-trained Chinese scholars understood, studied, and applied science in their careers.

This dissertation aims to answer the question of how American-trained scholars served China and Chinese people with agricultural science. To be more specific, through case studies of Chinese scholars with American educational background, I will explore what motivated these scholars to devote themselves to both China and science; how these historical figures understood “science” and “China” in the historical context of turbulent and decentralized Republican China; how the American experience had influenced their attitudes towards their country; what strategies they had taken for advancing *KeXue BaoGuo*; and what they achieved in realizing their goals.

The time period I examine in this dissertation starts with 1911, the year when Republic of China replaced the Qing Dynasty via revolution and also the year when the Chinese state government formally started to send large numbers of Boxer students to America; and ends with 1945, the end of the War of Resistance against Japan (1937-

⁶ The rest mainly went to Japan and European countries such as Germany, France, and Britain.

⁷ Zhang Yufa, “Returned Chinese Students from America and the Chinese Leadership (1846-1949)”, *Chinese Studies in History*, vol. 35, no. 3, Spring 2002, p. 54.

1945). The year 1911 was widely known as the establishing year of Republic of China, but it was especially important for my dissertation because it was the year when the Boxer Indemnity Scholarship program formally started. Selected young Chinese intellectuals received sponsorship from this program to travel to the United States for higher education, and they were required to return to China after finishing American training. This scholarship was derived from the Boxer Indemnity. Because of the Boxer Rebellion in 1900, the Qing Empire was fined an indemnity of four hundred and fifty million taels of silver to the Eight-Nation Alliance. This indemnity claim took 39 years to extinguish and, with an annual interest of 4%, required over nine hundred and eighty-two million taels (about U.S. \$726 million at that time). The United States shared 7.32% of this indemnity. However, the Qing government quickly argued that the Boxer Protocol awarded the U.S. more than it should have demanded. After a seven-year negotiation, the U.S. government (under President Theodore Roosevelt) agreed to use the surplus portion to set up a scholarship program for Chinese students to study practical knowledge such as engineering, agriculture, and medicine in the United States. For China, this program was meant to bring in advanced scientific and technical knowledge. For the U.S., it was a chance to export American culture and influence to China. This program started to select and prepare Chinese students to study in the U.S. in 1909, and Tsinghua College began as a preparatory school in April, 1911 with part of the first remission. After 1911, the number of Chinese students travelling to the United States rocketed, and the United States gradually replaced Japan as the most preferred destination of Chinese scholars.⁸

⁸ Ye, Weili, *Seeking Modernity in China's Name: Chinese students in the United States, 1900-*

About half of the scientists I investigate were Boxer students whose American training was directly sponsored by the Boxer Scholarship, and almost all the rest had some association with this program. The Boxer Program was important not only because of the sponsorship but also because its establishment was intertwined with China's failure in competing with other powerful countries. Many scholars discussed in this dissertation confessed that the Boxer Indemnity Scholarship seemed to them a "national humiliation (国耻)" and that sensibility motivated them to study hard in order to "improve" China.⁹ The Boxer Program required 80% of the Chinese students to major in studies related to science, engineering, agriculture, and medicine. Therefore, from the very beginning of their American training, these Chinese scholars' patriotism was closely connected to the knowledge they studied, which makes them ideal examples to explore the concept of "scientific nationalism" (a topic I discuss in detail below).

During the decades between 1911 and 1945, China was divided by regional warlords and political factions. Although all the relatively powerful political and military forces had been pursuing unification of the country, none of them was able to achieve that goal by 1945. The so-called central government—first the warlord government in Beijing, then the Nationalist government in Nanjing—could only effectively control certain provinces, while dozens of warlords controlled other parts of China. I would like to describe this status as "decentralization," which means that the central government existed and was acknowledged by the periphery and foreign countries, but its control and

1927, Stanford: Stanford University Press, 2001, p. 10.

⁹ For example, Dai Fanglan in chapter 2, Zhao Lianfang in chapter 3, and Tang Peisong in chapter 4.

influence over the peripheral regions was very weak. In decentralized China, the state, country, and nation could hardly coincide with each other because of the actual divisions and the lack of a powerful central government. However, cases in this dissertation will demonstrate that the decentralized condition of Republican China is also different from what some historians of modern China have described as “disintegration” or “fragmentation,” because even during the most turbulent era (such as civil war among warlords in the early 1920s), political, military, and intellectual leaders still believed that China should and must be unified and centralized again. The desire and faith of reestablishing a powerful central state co-existed with the actual decentralized condition, which made this period an excellent case to explore the implications and significance of the ideology of *KeXue Baoguo*, serving China with science.¹⁰

The idea to serve and improve China with science was very popular among twentieth-century Chinese intellectuals, and historians of science in modern China have examined American-trained scientists’ desires and efforts to serve their country with science.¹¹ For example, James Reardon-Anderson points out in his 1991 book *The Study of Change: Chemistry in China, 1840-1949* that “scientism” was widely accepted by

¹⁰ For the Republican era as an excellent time to examine the diverse understandings and implications of “China,” also see Grace Shen’s recent book *Unearthing the Nation: Modern Geology and Nationalism in Republican China* (2014, the University of Chicago Press).

¹¹ For instance, James Reardon-Anderson, *The Study of Change: Chemistry in China, 1840-1949*, Cambridge: Cambridge University Press, 1991; Peter Neushul and Zuoyue Wang, “Between the Devil and the Deep Sea: C.K. Tseng, Mariculture, and the Politics of Science in Modern China,” *Isis*, Vol. 91, Issue 1 (March 2000), 59-88; Zuoyue Wang, “Saving China through Science: the Science Society of China, Scientific Nationalism, and Civil Society in Republican China,” *Osiris*, Vol. 17, (2002), pp. 291-322; Grace Shen, *Unearthing the Nation: Geology and Nationalism in Republican China*, University of Chicago Press, 2014. Also refer to articles in *Science and Technology in Modern China, 1880s-1940s*, edited by Jing Tsu and Benjamin A. Elman, Brill Academic Publishers; Lam edition, 2014.

Chinese intellectuals and scientific activities in China usually had a utilitarian purpose to save and strengthen the country. Under this precondition, the first-generation of western-trained Chinese scientists were more likely to devote themselves to establishing scientific institutions. Second-generation scientists behaved more like their western colleagues by working in the existing institutions and creating and circulating scientific knowledge.¹² Zuoyue Wang's 2002 *Osiris* article "Saving China through Science: the Science Society of China, Scientific Nationalism, and Civil Society in Republican China" explores how Chinese scientists with American educational backgrounds fulfilled their desire of "saving China through science" by establishing a Chinese style of civil society and professionalizing science in China. Wang describes this process as "scientific nationalism" and argues that "scientific nationalism" in Republican China was different from that in Germany and Japan, because the SSC scientists' ultimate goal was to save their country from subjugation and humiliation rather than improving the status of China in international scientific communities. More recently, historians have paid attention to Chinese intellectuals' purpose of "saving China through science," but their works reveal that Chinese intellectuals' understanding of this ideology and the strategies they took were not always same as Wang has described. For example, in her 2014 book *Unearthing the Nation: Geology and Nationalism in Republican China*, Grace Shen explores the career of a group of geologists accepting the responsibility of "saving the nation through

¹² Reardon-Anderson roughly defines the first generation as scientists returned to China in late Qing Dynasty and early Republican period, and the second generation as those returning after the Nationalist Party's coming into power in 1928. Most historians of modern Chinese science's classification coincide with Reardon-Anderson's. I will follow this definition too in this dissertation.

science.” She argues that for Chinese geologists with western education, “nation” was the object of their political and cultural loyalty. These geologists believed that geology was of primary importance in saving China and therefore connected nationalism with their field works of geological investigation of territory and their efforts to strive for international recognition for Chinese geology.

A similar idea of “serving the country with science” also existed in other non-western countries. In her 2008 book *Science for the Empire: Scientific Nationalism in Modern Japan*, Hiromi Mizuno uses “scientific nationalism” as an analytic tool to explore how Japanese technocrats, social scientists (Marxists), and popular writers considered *science* as the most important factor for Japan to survive and improve internationally.¹³ She uses “scientific nationalism” to describe the idea of “science in the service of nation” (which is also written as “科學報國” in Japanese Kanji, the same as it is in traditional Chinese characters), and illustrates that various scientific promoters had diverse and distinct explanation and expectation of what a “scientific Japan” should be. The time period Mizuno focuses on is the 1920s to 1940s, roughly the same period as Republican China. However, there were noticeable differences between Japan and Republican China. At that time, Japan was one of the powers in the world, while China was an underdeveloped semi-colonial country. Although Japan may also be considered as a post-colonial country, Republican Chinese intellectuals usually considered Japan as one of the foreign powers oppressing China, and in many cases equated Japan to developed

¹³ Hiromi Mizuno, *Science for the Empire: Scientific Nationalism in Modern Japan*, Stanford, California: Stanford University Press, 2009.

western countries. When Japanese scientific nationalists had gone through the stage of “serving the nation through science” and were attempting to strengthen the Japanese Empire in international competition, the concerns of Chinese “scientific nationalists” were still about “saving and surviving” (*Jiuwang Tucun*, 救亡图存) by eliminating foreign powers—including Japan. More importantly, by the 1920s, Japan had formed a typical nation-state. Despite inevitable internal tensions, the state was powerful enough to control its entire territory. China, on the other hand, was in a much chaotic situation than Japan. As I have mentioned, the official central governments during the Republican period—first the Beijing government, then the Nationalist government—were only able to control several provinces near their respective capitals. Therefore, Chinese scientific practitioners were facing social and academic conditions very different from their contemporary Japanese colleagues, and their primary concerns were distinct based on the realities they knew. During the three decades of Republican China, institutional establishment coincided with tensions between pure and applied scientific research, between the foreign influence and the Chinese people, and between the central and the local political and social forces; these were different from the beginning stage of Japanese agricultural institution. Therefore, Chinese scientific nationalists faced more complicated historical context, and their strategies exhibit characteristics distinct from their western and Japanese colleagues. My emphasis in this dissertation will be the distinct strategies taken by patriotic Chinese scholars.¹⁴

¹⁴ An interesting example to illustrate the different concerns between Chinese scholars and their contemporary Japanese colleagues comes from Shen Zonghan. When attending the third Pacific

Therefore, although historians of science were using the same phrase “scientific nationalism”, their definitions and explanations for it have been diverse; none of them have adequate explanatory power for the Chinese case during the Republican period. Actually, in using the phrase “scientific nationalism” to represent non-western intellectuals’ desire or responsibility to save or serve the country through science, we must keep in mind that this phrase itself has multiple and complicated meanings and the ideology it stands for has diverse manifestations. My examination of the American-trained Chinese scholars engaging in agricultural science will demonstrate that exploring motivations and strategies of historical figures is an effective way to analyze “scientific nationalism,” or the ideology of “serving the country through science.” By doing so, I

Science Congress in Tokyo, Shen Zonghan met a Japanese agricultural expert, who suggested to him that:

“When you improve agriculture in China, please do not learn from what young Japanese scholars are doing; you should follow what Japanese agriculturalists did two decades ago. At that time we have few institutions and colleagues. On the one hand, we had to conduct practical improving research to demonstrate the value of agricultural research and improvement; on the other hand, we had to conduct administrative works to cooperate with the government, increase agricultural funding, and establish agricultural experimental stations and colleges, so that young scholars were able to concentrate on scientific research. Now our publications are not as profound as those of young scholars, but the extension works are made our responsibility—that is all because of different situations and needs of society at different eras.” (See *Shen Zonghan’s Memoir*, volume 1, pp. 99-100).

In the mind of this Japanese agriculturalist, at that time (the 1920s) agricultural improvement in China was similar to that in Japan two decades before, and he believed that learning from earlier Japanese agriculturalists’ experience would help Chinese agriculturalists to establish agricultural institutions. Shen Zonghan had high admiration for these Japanese scholars, because they owned a political vision of long-term agricultural improvement while developing scientific research.

A considerable number of Chinese scholars had largely devoted themselves to establishing agricultural institutions from the 1910s to 1930s, and considered institution building as the primary strategy to resolve the most urgent problem of China. In this sense, Chinese scholars believing in serving the country through agricultural sciences shared similarities with the earlier Japanese scholars. However, at the same time, there were also scholars such as Dai Fanglan (see chapter 2) focusing on research of fundamental scientific problems (fungi classification) from the very beginning. Co-existence of diverse strategies was a remarkable and interesting character of nationalist scientists in Republican China.

will propose a new conception of how leading non-western intellectuals understood the relations between science and society, and how they endeavored to realize their goals in both basic science and social responsibility. Moreover, by stressing motivations and strategies, I will be able to integrate the Republican intellectuals desiring to serve China through science with “scientific nationalists” in other historical contexts, such as post-1949 China, because they shared similar motivations, and their different attitudes towards the state was largely based on whether the strategies were most adaptive to the social and historical contexts and most effective to realize their ultimate goals: serving China and the Chinese people.

“Science” as an ideology and approach to serve the country

During the twentieth century, no matter the Republican era or the post-1949 period, almost all Chinese intellectuals considered science as something with strong utilitarian potential. And in modern Chinese language, the term “science” is usually connected to “technology”—when Chinese people, both scientific practitioners and non-scientific, talk about “science,” they usually mean “science and technology” (*Ke Ji*, 科技). When Chinese intellectuals became concerned about their country’s perceived backwardness, they usually believed that it was the utilitarian power of science and technology along with the rational and critical ideology that had made western countries much powerful than China. To them, modern science was a cure-all to promote the country’s academics, politics, economy, and social lives. This faith in science had formed a prevailing

“scientism” in the Republican era.¹⁵ Although some scholars (such as Liang Qichao 梁启超 and Zhang Junmai 张君勱) had assented that science was not all-powerful, more reform intellectuals were inclined to accept Hu Shi’s rebuttal that China had not even reached the stage to truly understand and enjoy the benefits brought by science, and therefore did not deserve to doubt its utility and power.¹⁶ Therefore, the main stream intellectuals were exploring how to utilize western scientific knowledge and use it to improve agriculture, industry, military, and social lives in China.

A briefly introduction of the general picture of Republican China will help us to understand historical context of the American-trained Chinese scholars. For over two thousand years, China has been a unified, single unitary state, and it maintained a centralized country with only several interludes of division. Therefore in most cases in the long history, the state represented the entirety of China. The Republican era, subject of this dissertation, happened to be one of the remarkable interludes of division in Chinese history. I will use “decentralization” to characterize the chaotic political condition of China during the first half of the twentieth century. China was considered as the “central empire” until the nineteenth century. However, the imperial Qing government had been defeated by modernized foreign countries and had not been able to control and strengthen the entirety of China effectively since the late 19th century. After the loss in the 1895 Sino-Japanese War and the 1900 Boxer Rebellion, local military

¹⁵ See Wang, Hui, “The Fate of ‘Mr. Science’ in China: The Concept of Science and Its Application in Modern Chinese Thought.” *Positions*, Springer, 1995, 3(1), 1-68. Also see Shellen Xiao Wu’s book review of Grace Shen, *Unearthing the Nation: Geology and Nationalism in Republican China*, *Studies in History and Philosophy of Science*, 48, 2014, pp. 38-41.

¹⁶ Hu Shi, p. 154.

governors gradually gained dominance of their provinces from the central government, and they later became warlords in the Republican era. The 1911 Revolution ended the Qing Empire with the accession of a republican government. Yuan Shikai (袁世凯), the most powerful military leader, held the country for several years. During the decades after Yuan's death in 1916, China fell into many parts governed by different warlords, which was usually called the "Warlord Era" (1916-1928). (See Figure 1, on page 35)

Although the Nationalist Party (KMT) government became the central government authority in 1928 and unified China in form, it was not capable of overcoming the warlords and establishing a strong national identity for all Chinese people. (See Figure 2, on page 36) The Nationalist government had undertaken reforms—such as the New Life Movement and the Rural Revival Movement—to improve its political authority.

However, policies made by the Nationalist government were largely ignored in regions controlled by other political forces (including other warlords and the Communist Party, CCP). Even within the provinces directly under the Nationalist government's influence, these reforms were highly restricted to the urban areas, while most rural areas remained untouched. Therefore, China after 1911 must be considered as quite decentralized.¹⁷

During the Second Sino-Japanese War between 1937 and 1945, the Japanese occupied northern and eastern China. The Nationalist government and hundreds of thousands of

¹⁷ For the general situation of agriculture in Republican China, see Guo, Congjie, and Chen Lei, "Kangzhan Qian Nanjing GuoMin ZhengFu De NongYe TuiGuang ZhengCe (Nanjing KMT Government's Policies for Agricultural Popularization before the Anti-Japanese War)," *Li Shi Dang An*, No. 1, 2008 (郭从杰、陈蕾, "抗战前南京国民政府的农业推广政策", 《历史档案》, 2008年第一期); also see Zhang Shijie and Guo Hairu, "Jiang Jieshi De NongCun HeZuo JingJi SiXiang (Jiang Jieshi's Ideology of Agricultural Economics)," *Min Guo Dang An*, No. 4, 2004 (张士杰、郭海儒, "蒋介石的农村合作经济思想", 《民国档案》, 2004年04期).

Chinese people had to retreat to the southwestern inland provinces, which were still extremely undeveloped at that time. Although living and working conditions declined horribly for most Chinese people, the decentralized political situation got simplified during the war. After the Sino-Japanese War, only two strong political forces—the Nationalist Party and the Communist Party—remained to compete for political domination. My dissertation will complement and revise previous historical works by examining the activities of American-trained Chinese scholars in this chaotic and decentralized context.

Clearly, for the period between 1911 and 1945, the Chinese state government was only able to dominate part of China. Meanwhile, when Chinese intellectuals were exposed to western cultures, they endowed *Guo* with new implications such as “country” and “nation.” Then come the questions: when talking about *Ke Xue Bao Guo* (科学报国, serving China through science), did those Chinese scholars mean to serve *Guo* as the Chinese state or the entirety of China? In addition, did they mean to devote themselves to the country, the nation, or the state? My answer is: in the consciousness of American-trained Chinese scholars, *Guo*, the object of their service, was actually China as a country and nation in the sense of culture and history, rather than the Chinese state. By focusing their attention on the welfare and benefits of their country people, they were able to ensure that they were serving the country for which they felt love and belonging and dedicated loyalty to, rather than any specific (and continuously changing) state government. For these patriotic scholars, “serving” or cooperating with the state was merely one of the many strategies they had taken to achieve their goals. Their ultimate

goals were to improve the welfare of Chinese people and to strengthen China as a country. The profound love and loyalty for their country and country-people (not a state) motivated them to choose diverse strategies to realize the goals. In this sense, Chinese intellectuals aiming to serve the country through science functioned in some ways as “scientific nationalists.” But we must keep in mind that being a scientific nationalist during the Republican era does not necessarily mean love or loyalty toward the state, because there was no centralized state. Through identifying the objects these American-trained Chinese scholars were serving as well as their motivations and strategies, my dissertation examines the careers and lives of several representative scholars and illustrates the development of agricultural science and education in China during the first half of the twentieth century.

Chinese scholars’ ideology about the relations between science and the state was different from both the western intellectuals and their Japanese neighbors. In America and European countries, historians have argued that science was originally considered as value-free activity to explore truths of nature. As I previously described, European and American scientists were debating the autonomy of science as a pure pursuit of truth versus science’s social responsibility. Even today, scientists may hesitate to cooperate with the state, worrying about whether state intervention would deviate from the intrinsic non-utilitarian spirit of science. Certainly, historians of science have been interested in the tension between ideology and the application of scientific knowledge.¹⁸ The majority

¹⁸ During the past century, many volumes of historical works by western researchers have explored issues about science’s non-utilitarian nature and its social responsibility, relations between pure and applied science, or relations between the state and scientists’ autonomy. An

of twentieth-century Chinese intellectuals, to the contrary, were motivated by the faith that scientific ideas and practices *should* be applied to serve the country and the people. They did not reject cooperating with the state, but saw this relationship as a tool or strategy. When the state was able to facilitate improving the lives of Chinese people and strengthening China, this would be a good strategy taken by a large number of agricultural science practitioners. Unfortunately, during the Republican period, the powerless state could hardly be relied upon in most cases. More diverse strategies were required. Chinese scientific nationalists made multiple and varied choices among the state, the local, and the foreign forces depending on the power and reliability of these forces to help them meet their goals. Their strategies were much more diverse than the contemporary Japanese scientific nationalists, who lived in a nation-state where the state was powerful enough to promote agriculture through science in the entire country.¹⁹

For Chinese intellectuals in the early twentieth century, science (or studies of the natural world) innately had a practical goal of serving the country, according to both traditional Confucian ethics and what they had learned through overseas education. For the former, the ultimate goal of an intellectual was to pacify and improve China and the Chinese people. And for the latter, modern science was widely viewed as the foundation

early example is William Cecil Dampier's *A History of Science and Its Relations with Philosophy and Religion* (Cambridge University Press: 1929); and this topic remains central to recent works, such as James E. McClellan's *Science and Technology in World History: An Introduction* (Johns Hopkins University Press, 2nd edition, 2006). The influence of political ideology on scientists has dominated historical analysis about certain sciences and places, such as agricultural sciences in Russia/the USSR. For a brief and useful introduction to major debates in the Russian agricultural historiography, see Nils Roll-Hansen, "Wishful Science: The Persistence of T.D. Lysenko's Agrobiological Politics of Science," *Osiris* 23, no. 1 (2008): 166-188.

¹⁹ See Mizuno, *Science for the Empire*.

for western countries and Japan to become technologically developed and powerful, so it was crucial to develop science in order to save China from weakness and underdevelopment, and to make China competitive among the great powers. The words of the chief historical figures in this dissertation reveal that almost all of these American-trained Chinese intellectuals took the utilitarian property of science for granted. Therefore the essential problem for them became how to realize the goal: to serve China through science.

Strategies to Serve China with Agricultural Science

American-trained scholars were essential members of the reform intellectuals believing in saving and serving China through science. Compared with the earlier Japanese-trained scholars, who had been focusing more on social studies and were more inclined to engage in political and economic research, most Chinese students studying in the United States after 1911 majored in applied studies such as science and engineering, and they were more likely to engage in academia after returning to China.²⁰ Since the 1910s, when modern science was widely introduced to Chinese intellectuals, it was the Chinese students in America that established the first Chinese association of science (Science Society of China, 中国科学社), published the first Chinese magazine named “science” (*KeXue*, 科学), confirmed the Chinese translation of science (I will explore this later in this section), and endeavored to improve Chinese people’s lives with the ideology

²⁰ See Zhang Yufa, “Returned Chinese Students from America and the Chinese Leadership (1846-1949).”

and methodology of science. Similar to other leading reform intellectuals, they considered science as one of the most advanced forms of knowledge. Studying at institutions in western developed countries would enable them to help China to get stronger and help Chinese people to live better.

Scholars with an American educational background are ideal examples for exploring Chinese intellectuals' desire to serve China with science. Firstly, because of their experience in western countries, they were usually more aware and sensitive to the tension between China and developed western countries, and therefore more conscious about the national identity of being Chinese people. These scholars reacted and responded differently to the Chinese-foreign tension. Some reacted in a "negative" way by feeling strong humiliation from comparison with foreign people, while some of them answered in a positive way by stressing that foreign power could be utilized to improve China. An interesting comparison came from the missionary University of Nanking. Shen Zonghan and Dai Fanglan (both educated in the U.S.) were two leading plant pathologists at the University of Nanking around 1930. Dai Fanglan felt humiliated by the fact that Chinese scientists were so much less well-educated than their western colleagues that usually they could only assist foreign scientists in exploring natural resources in China. He devoted himself to establishing the science of mycology in China, and finally made China one of the three leading centers of fungi research in the world. Shen Zonghan, on the other hand, invited foreign scientists such as H. H. Love to visit China and to help with training Chinese agriculturalists. Largely because of Shen's efforts in building up networks for scientific communication, by the 1940s a considerable number of Chinese

agricultural scientists became well-known among American scientists despite disruptions caused by the war. The strategies of Dai and Shen at this stage were opposite, but their motivations were similar: serving China by improving China's status in international scientific communities.²¹

Secondly, in addition to motivations, these scholars usually knew much more about the power of science and technology compared with their country people (who had not been exposed to modern science and technology). They were all deeply impressed by how science and technology had shaped the lives of foreign people and believed that it was science and technology that made America and Japan so powerful in the world. According to *Liu Mei Xue Sheng Nian Bao* (《留美学生年报》, *Annual Reports of Chinese Students in America*), when Chinese students first arrived in the United States, “seeing the highly developed material civilization, none of them could help changing countenance and feeling stricken (见物质文明之发达，未有不变色而却步者).” In the eyes of these Chinese students, America was a country with “high-rise buildings as tall as clouds, railways leading to everywhere, famous cities and big towns as numerous as strings of pearls,” all of which were based on advanced science and technology.²² After comparing China and the United States, these students reached the conclusion that the two countries had similar land area and natural conditions, so China's backwardness

²¹ I will make a more detailed examination and analysis of this point in chapter 2.

²² Li Xisuo & Liu Jilin, *Jin Dai Zhong Guo De Liu Mei Jiao Yu* (*American Education and Modern China*), Tianjin: Tianjin Guji Press, 2000, pp. 103-104. (李喜所、刘集林著，《近代中国的留美教育》，天津市：天津古籍出版社，2000).

should be attributed to its lack of modern science and technology.²³ This is one of the chief reasons why they developed the ideology of serving and saving China through science.

Among diverse scientific disciplines, agricultural science was one of the most fundamental studies to serve and improve China and Chinese people according to scholars in my project. Some of them made systematic studies and expositions on the importance of agricultural sciences. For instance, Zou Bingwen (邹秉文) made a careful and detailed analysis in a letter to the China Foundation, arguing that improving agricultural science was the essential solution for the seven most critical social problems in China he had identified.²⁴ Others simply borrowed an old Chinese proverb to express their motivation, such as Jin Shanbao (金善宝)'s saying that "food is the first necessity of people, agriculture is the foundation of the country (民以食为天, 农为国之本). I should devote myself to this necessity and foundation."²⁵ The unpretentious saying of "food is the first necessity of people," or "food is the heaven of people," frequently shows up in the writings of these scholars, and this constitutes an essential motivation for these scholars in choosing agriculture science as means to improve China.

During the Republican era, especially during the 1930s and 1940s, we could see American-trained Chinese agricultural scientists and educationalists serving in diverse professions and organizations. In this dissertation, I mainly focus on cases from universities, because I think compared with those working in governments or industry,

²³ Ibid.

²⁴ See my exploration of Zou's analysis in chapter 1.

²⁵ For more details about Jin Shanbao, see chapter 4.

the Chinese scholars working in universities could better exemplify “scientific nationalism” or the desire of serving China through agricultural sciences. University agricultural scientists and educationalists were ideal examples to demonstrate how Chinese intellectuals motivated by “scientific nationalism” were different from their western colleagues. On the one hand, the first American-trained intellectuals mainly focused on science, engineering, agriculture, and medicine, but only a small portion of them majored in social sciences, humanities, or business. When the scientists, agriculturalists, and engineers returned to China, they could hardly find proper positions to conduct serious research, because there were no existing institutions accommodating them and not enough experts to establish the institutions. More than half of the American-trained agriculturalists completely left agriculture after returning to China since they were not able to find proper positions. As a result, the first-generation agricultural scientists had to cooperate with educationalists to establish their own institutions. Thus almost all famous Republican-era agriculturalists had served in universities. Therefore universities could best represent institutions built up and developed by influential agricultural scientists. On the other hand, university intellectuals could reflect the distinctive character of “scientific nationalism” of Chinese scholars. As I have mentioned at the very beginning, western intellectuals have been debating about the autonomy of science as a pure pursuit of truth versus science’s social responsibility. Scholars in western universities were more sensitive to this tension than those serving in governmental organizations, because the later were more directly sponsored by the state and therefore more expected to devote themselves to practical necessities of the state and

society. In Republican Chinese universities, however, the situations were different. Chinese scholars in universities usually took for granted that intellectuals had a duty to serve their country and people. Therefore by examining cases of Chinese university scholars, we can explore how scientists and educationers with American-training experience and Chinese influence behaved different from their western colleagues and Chinese predecessors. They were establishing and developing modern methods of scientific studies to resolve Chinese problems. Moreover, in the 1930s and 1940s, Chinese university scholars had paid more attention to balancing pure and applied research at the same time of serving the country than they did during the early decades. The university scientists' careers illustrated how Chinese science was established and developed during the Republican era.

Despite the belief in agricultural science's potential in saving and serving China, the Chinese scholars in America did not think they *all* needed to major in agricultural disciplines. For example, Hu Shi started his study in the United States with the agriculture school at Cornell University, but transferred to philosophy and literature soon, because he believed that the need for ideological reform of the Chinese people was more urgent. During the late 1910s and 1920s, Hu Shi was one of the most influential essayists in China. He called on Chinese youth and intellectuals to adopt scientific ideology characterized by critical and rigorous thinking, and to abandon the traditional moderate and non-committal ideology. Hu's efforts helped to popularize science in China. In Hu's opinion, science was more a critical and rigorous way of thinking rather than dogmatic knowledge. His emphasis was different from the agricultural scientists in Nanjing, but his

efforts succeeded in appealing to young people to develop “scientific” life views and to devote their lives to science. I believe that this ideological shift was an essential prerequisite for the development of agricultural science after the 1920s. Yet it did not completely abandon traditional ways of thinking: as I explained above, the Chinese concept of *Ke Xue Bao Guo* (serving China through science) was shaped by the traditional *Ge Zhi Xue* (格致学). Using the tools of scientific critical thinking, Western-trained Chinese intellectuals created something that would help them meet their goals of improving the welfare of China and the world (*Ping Tianxia*). Examples include two chief figures in this dissertation who were not even agricultural scientists themselves. Guo Bingwen (郭秉文) and Luo Jialun (罗家伦), were two famous presidents in the history of the National Central University (named as the Nanjing Higher Normal School/Southeastern University when Guo served as president). When studying in the United States, they majored in education and history respectively. However, they placed significant emphasis on establishing and developing agricultural science, education, and extension, and built this university into the most successful center of agricultural science in China between the 1920s and 1940s.²⁶ In my opinion, and according to the results of

²⁶ In Chapter One and Chapter Three, I will explore Guo Bingwen and Luo Jialun’s efforts to establish the agriculture school at their university and how they themselves, their colleagues, and their students realized the goal of saving and improving China through agricultural science. For other activities about their careers at the National Central University, see Xu Xiaoqing’s book *ZhengJu Yu XueFu: Cong DongNan DaXue Dao ZhongYang DaXue, 1919-1937* (《政局与学府：从东南大学到中央大学，1919-1937》), *Politics and Universities: From the Southeastern University to the National Central University, 1919-1937* (China Social Science Press, 2009). For more details about the life of Guo Bingwen, see Mao Rong’s 2004 book *Zhi Ping Zhi Shan, Hong Sheng Dong Nan: DongNan DaXue XiaoZhang Guo Bingwen* (《至平至善，宏声东南：

my research, modern science is not merely scientific research. It has a complex social existence that involves numerous factors such as materials, methodology, knowledge, institutions, and social contexts. The achievements of Guo Bingwen and Luo Jialun corroborate the importance of non-scientists in the development of agricultural sciences in China. Moreover, the involvement of non-scientists in scientific activities strengthened the connection between scientists and their social contexts. In my case studies, this connection is reflected in how the agricultural scientists often directed their basic research toward problems of practical agricultural production.

After returning from America, the first-generation scholars mainly gathered in Beijing and Nanjing, the two political and cultural centers in China at that time. They formed two main schools. In Beijing, leading scholars of the New Culture Movement considered “science” as something similar and equal to “democracy,” which would be a remedy to cure problems in all fields of semi-colonial China. They also believed that science was an essential part of a new, western culture²⁷ that could replace the old traditional Chinese cultures. Chen Duxiu (陈独秀), one of the leaders of the New Culture Movement, appealed to Chinese youth and intellectuals to replace “Mr. Confucius” with “Mr. Science” and “Mr. Democracy.”²⁸ Chen himself had not studied abroad, but there

东南大学校长郭秉文》, *Biography of Guo Bingwen, President of the Southeastern University*) (Shandong Education Press, 2004).

²⁷ Chinese intellectuals during the Republican era sometimes used “western culture,” “western knowledge,” or “foreign” to describe what they thought they had learned or should learn from the powerful modern countries including Japan. Therefore, when historical figures in this dissertation were talking about “western,” they may mean not only the western/westerners, but also something modern, developed, and different from the old Chinese tradition.

²⁸ The Chinese phrases they used were *Sai Xian Sheng* (赛先生, Mr. S) and *De Xian Sheng* (德先生, Mr. D). In the 1910s there were no unified translation of the terms “science” and “democracy”

were a large number of intellectuals with overseas experience supporting Chen. Hu Shi, for example, claimed that the desperate maladies of China (the most urgent and vital problems preventing China from being strong and developed) must be treated with desperate remedies. Science and democracy might not be perfect remedies, but they promised to be the most effective ones to repel China's fatal illness caused by backward old culture. Overcorrection was necessary for the deadly situation, while mild modification and re-evaluation might be applied later after China and the Chinese people had enjoyed the goodness of science and democracy and were able to control them.²⁹ Hu Shi did not completely agree with Chen Duxiu's interpretation of science. For example, he later claimed that "it is improper to personify this term and consider it as a person. Once personified, it would be inclined to be idolized; once idolized, it would easily result in idolatry. At that time my friend Chen Duxiu only knew the two terms. He did not realize that science is an approach, and democracy is a life pattern."³⁰ In spite of such disagreements, both Hu and Chen were highlighting the application of science (as they understood it) in serving and saving the country. Although these leading scholars were more devoted to social sciences and humanities rather than science and engineering, their thoughts were widely accepted by younger Chinese intellectuals and were highly praised

in Chinese language, as I have explained before. Chen Duxiu used the initials of these terms' English pronunciation to avoid confusion.

²⁹ Hu Shi, "Preface of *Science and Views of Life*," 1923, *Collected Works of Hu Shi*, Volume 3, Peking University Press, 1998, page 153.

³⁰ Hu Shi's speech at his inauguration of president of the Academia Sinica in 1958. The original Chinese speech is "把这个抽象名词人格化，把它看作人，最容易错误的。容易人格化，也就容易偶像化，偶像化了，便会盲目崇拜.....当时我的朋友陈独秀只认得两个名词，不知道科学是一个方法，民主是一种生活习惯。”

by both the Chinese Nationalist Party and Communist Party,³¹ so the extreme honor they endowed to science profoundly influenced younger-generation Chinese intellectuals in the twentieth century. Scholars in the New Culture School were not as accomplished in agricultural scientific research as those in Nanjing were. However, their ideological reforms doubtlessly facilitated the later development of agricultural science and scientific agriculture.

On the contrary, in South China, another group of scholars based in the Nanjing Higher Normal School formed a school of *XueHeng* (学衡, Academic Balance). The core figures of this school included founders of the Science Society of China such as Hu Xiansu³² (胡先骕, 1894-1968) and Zhu Kezhen³³ (竺可桢, 1890-1974). They agreed that western science was an essential approach to save China, but they also insisted that traditional Chinese culture deserved attention and continuation. This school agreed to enlighten Chinese people with science, but also insisted on balancing and combining

³¹ Both the Nationalist Party and the Communist Party claim themselves to be the authentic inheritor of the New Culture Movement who has really inherited the spirit of Mr. Science and Mr. Democracy, although the two parties fought for over half a century. For more information about the New Culture Movement, see Vera Schwarcz, *The Chinese Enlightenment: Intellectuals and the Legacy of the May Fourth Movement of 1919*, Berkeley, CA: University of California Press, 1990.

³² Hu Xiansu was a famous botanist and educationalist during the Republican Era. He received a bachelor's degree in botany from the University of California at Berkeley and a doctoral degree in agriculture from Harvard University. Hu Xiansu was founder of plant taxonomy and one of the pioneers of botany in China. In 1920, Hu established the Journal *XueHeng* in Nanjing to rival the New Culture School and to justify traditional Chinese culture. In spite of ideological disagreements, Hu Xiansu and Hu Shi had a good personal relationship in their lives and careers.

³³ Zhu Kezhen graduated from the College of Agriculture, University of Illinois in 1913, and received a doctoral degree in meteorology from Harvard University in 1918. He was one of the most prominent Chinese meteorologists and educationalists in the twentieth century. In addition, he was founder of the Institute for the History of Natural Sciences at Chinese Academy of Sciences.

Chinese and western cultures. Despite disagreements between these two schools, all of these reform intellectuals believed that science was the most efficient approach, and should be applied, to save and improve China. The New Culture School in Beijing seemed less noticeable in creating scientific knowledge, but the New Culture scholars' contributions in ideological reform should not be underestimated. On the other hand, the *XueHeng* School in Nanjing engaged more leading agricultural scientists, and built in Nanjing the center of agricultural science during the Republican period.

I explore the lives and careers of more than forty Chinese scholars with American educational backgrounds, and concentrate on nine of them in this dissertation to analyze how these scholars made choices among diverse strategies to realize the goal of serving China with agricultural science. Six of the nine scholars started their career in China between 1915 and 1928 (the early Republican Period, or Warlord Era): Guo Bingwen (郭秉文), Zou Bingwen (邹秉文), Dai Fanglan (戴芳澜), Shen Zonghan (沈宗瀚), Luo Jialun (罗家伦), and Zhao Lianfang (赵连芳). Three of them finished their American education and returned to China in 1933, when the Nationalist Government had largely integrated and reformed educational and scientific institutions: Tang Peisong (汤佩松), Feng Zefang (冯泽芳), and Jin Shanbao (金善宝). Roughly these two groups coincided with James Reardon-Anderson's division of the first and second generation of scientists respectively in his *The Study of Change: Chemistry in China, 1840-1949*. The six first-generation scientists returned to China before 1928 and had to be more devoted to establishing scientific institutions for scientific research, education, and extension rather

than focusing on research and education, while the younger-generation were able to work in the established institutions and to develop and circulate scientific knowledge. When choosing external facilitation, the first generation had to rely more on warlords and missionary forces. After 1928, state power (the Nationalist government) began to play a more important role in the development of agricultural science. This is just a rough description; of course, there were overlaps between the two generations. The first and second generations of returned scholars had differences in their conditions and strategies. However, their patriotic motivations, as well the common goals to serve China through agricultural science were similar. Therefore, these scholars provide historians the keys to decipher how and why the agricultural scientists and promoters redefined “scientific nationalism.”

In contrast to their profound love for the country and strong desire to serve the country, most of these scholars’ attitude toward the state was indifferent or even negative. Among my nine chief cases, Luo Jialun (罗家伦) strongly supported the Nationalist Party (KMT) state. Shen Zonghan (沈宗瀚) and Zhao Lianfang (赵连芳) finally left universities and took administrative positions in the nationalist government, because they believed that state power could best facilitate university scientists’ goals of reforming the social and economic structure of rural China and of extending achievement in agriculture science. All the other scholars expressed more or less dissatisfaction with the state. For example, Zou Bingwen (邹秉文) directly expressed his discontentment that “our central

government had long paid little attention to the promotion [of agricultural science].”³⁴ Dai Fanglan (戴芳澜) asserted that all political parties would inevitably corrupt and degenerate once they became the ruling government of the state.³⁵ Tang Peisong (汤佩松) recalled in his memoir that he had little affection for the government and party that had secretly murdered his father when he was young, although he had a strong feeling of belonging to China.³⁶ There are opposite or competing attitudes in most countries and eras. However, with a stable central government, patriotic scholars usually had to cooperate with or directly take positions in governmental organizations, because it was the most effective way to serve the country. As I mentioned earlier in this introduction, the absence of an effective central state government allowed the existence of extraordinarily strong local forces, which were very rare during other historical periods in Chinese history when power was more centralized. Republican scholars aiming to serve China through science had multiple choices of political forces with whom they could ally themselves. As a result, the unique decentralized situation of Republican China provides an important opportunity for historians to explore what diverse strategies patriotic scientists might adopt to serve the country and nation through their knowledge.³⁷

³⁴ Zou Bingwen’s 1925 letter to the China Foundation. See chapter 1.

³⁵ Qiu Weifan, “Several Anecdotes of Mycologist Dai Fanglan,” *Yi En Shi (Recalling Our Advisers)*, China Agricultural University Press, 2010. 裘维蕃, “忆真菌学大师戴芳澜二三事”, 《忆恩师》, 中国农业大学出版社, 2010。

³⁶ Tang Peisong, *Wei Jie Zhao Xia Gu Xi Yang (Review Sunset and Look forward to the Sunrise: Memoir of a Physiological Scientist)*, Beijing: Science Press, 1988. (汤佩松, 《为接朝霞顾夕阳: 一个生理学科学家的回忆录》, 北京: 科学出版社, 1988)

³⁷ For “scientific nationalism” in Germany, see J.L. Heilbron, *The Dilemmas of an Upright Man: Max Planck as Spokesman for German Science* (Berkeley: University of California Press, 1986); and Paul Forman, “Scientific Internationalism and the Weimar Physicists: The Ideology and Its

Methodology and Structure of this Dissertation

My exploration and analysis of the American-trained Chinese scholars are based on archival materials and publications in both China and the United States, including the Second Historical Archives of China, the Tsinghua University Archives, the Peking University Archives, the National Science Library at the Chinese Academy of Sciences, archives of the Institute of Microbiology at CAS, the University of Minnesota Archives, and the Division of Rare and Manuscript Collections at Cornell University. I am especially interested in correspondence between the Chinese scholars and their American colleagues and friends. It is significant for a historian to discover that these historical figures expressed their thoughts and facts in English writings quite distinctly from those in their Chinese writings. For example, in chapter 2, I will explore the reason why Shen Zonghan partly gave up his work at the University of Nanking and joined the newly established governmental institute, the National Agricultural Research Bureau. Historians in both China and the United States have examined this fact, but their interpretations have followed the words in Shen Zonghan's memoir, arguing that Shen transferred to the Bureau because he thought the new Nationalist state government would be more effective

Manipulation in Germany after World War I," *Isis* Vol. 64, 1973, pp. 151-80. For science in Japan, see James R. Bartholomew, *The Formation of Science in Japan* (New Haven, Connecticut: Yale University Press, 1989); and Hiromi Mizuno, *Science for the Empire: Scientific Nationalism in Modern Japan* (Stanford, California: Stanford University Press, 2009). On the cases of P.R. China, see Sigrid Schmalzer, *The People's Peking Man: Popular Science and Human Identity in Twentieth-Century China* (Chicago: University of Chicago Press, 2008); Zuoyue Wang, "Science and the state in Modern China," *Isis*, Vol. 98, No. 3, September 2007, pp. 558-570; and Fa-ti Fan, "Redrawing the Map: Science in Twentieth-Century China," *Isis*, Vol. 98, No. 3, September 2007, pp. 524-538.

in improving Chinese agriculture.³⁸ However, in his 1934 letter to Professor Harry H. Love, Shen's adviser and friend at Cornell University, Shen Zonghan confessed that he left the University of Nanking because of intolerable personal conflicts, rather than faith in the state.³⁹ I am not assuming that the American archives in English language was the true reflection of what these Chinese scholars really thought or what really happened, but these materials definitely provide more information that we can ever find in Chinese archives. American historical materials contribute to critical analysis of Chinese scholars and Chinese science. In other words, transnational historical methodology could contribute to studies of both transnational history and the history of one single country.

Motivations, goals, and strategies are the keys for me to disclose and illuminate the American-trained scholars' "scientific nationalism" or "serving China through agricultural science." The motivations, goals, and strategies can be found in the writings of these scholars, and also are revealed in how they responded to the challenges and tensions in Republican China. The most noticeable tensions include that between the foreign and the Chinese (caused by the semi-colonial society since the nineteenth century), as well as tension between the central and the local (which always exists in Chinese history but was extraordinarily critical during the Republican era). Earlier in this introduction, I sketched how the foreign-Chinese tension such as a feeling of "national humiliation" caused by powerful foreign countries stimulated and inspired the Chinese intellectuals in semi-colonial China, and I will exemplify this tension in each chapter.

³⁸ For example, Randall E. Stross, *The Stubborn Earth: American Agriculturalists on Chinese Soil, 1898-1937*, Berkeley, CA: University of California Press, 1986.

³⁹ See chapter 2 for more details about Shen's entering the National Agricultural Bureau.

The Chinese-foreign and central-local tensions were significant features of Republican China. Although the tension between central and local in China has existed for thousands of years, in most cases the central governments were influential enough to effectively control local political forces within this country. The era from the late Qing Dynasty to the Republic, however, was one of the several remarkable intervals when China did not have a powerful central government. Meanwhile, as a semi-colonial country penetrated by foreign forces, foreigners usually had more privilege in China than Chinese people did. Institutions and organizations with foreign support usually had more stable funds and environments for development. Local and foreign powers were sometimes decisive for the existence and development of agricultural scientific institutes and programs. Chinese scholars aiming to serve the country through science might not approve of the local and foreign powers—and sometimes also the state power. Actually they usually criticized these powers for aggravating the decentralization of China and contributing to the suffering of the Chinese people. However, in many cases they had to rely on these forces to maintain and develop their agricultural science.

This dissertation roughly follows a chronological outline. Chapter One explores how the first generation of scientific nationalists managed to awaken the interest of Chinese people and establish institutions of agricultural science during the 1910s and 1920s. I begin with establishment of the earliest agricultural science institutes in China during the late Qing Dynasty and the initiation of Boxer Scholarship Program, which sponsored the first state-funded students to pursue post-graduate education in America. Peking University made significant contributions to the establishment of agricultural science. It

had the first state-funded institute of agriculture, and moreover, it led the New Cultural Movement that enlightened Chinese youth and popularized science as a utilitarian way to save and serve China. A new model would supplant this effort, however. While in Nanjing, Guo Bingwen (郭秉文) and Zou Bingwen (邹秉文), drawing support from local gentry, warlords, and foreign foundations, established an agricultural section at the Nanjing Higher Normal School/Southeastern University modeling the agricultural college at Cornell University, which merged education, research, and extension. They succeeded in developing this agricultural section into the center of agricultural science in China at that time. Because of extremely complicated and turbulent political and personnel conflicts, both Guo and Zou were forced to leave this university. However, their efforts had set the foundation for later accomplishments of the National Central University.

In the turbulent warlord era, the only peaceful place for scientists to conduct long-term agricultural research seemed to be missionary schools supported by foreign powers and funds. However, the advantage of missionary schools was based on the privileges of foreigners in China, and this implied one of the most crucial social tensions in Republican China: tension between the Chinese and the foreign. Chapter two analyzes the history of the College of Agriculture at the University of Nanking (*JinLing DaXue*, 金陵大学), the most accomplished and influential missionary university in Republican China. During the warlord era, this college was the undisputed top agricultural college in China, but it was under the control and operation of American scholars at that time. Dai Fanglan and Shen Zonghan exemplified how Chinese scholars resolved the Chinese-foreign tension with different strategies but moving toward the same goal of using

science to improve living conditions and autonomy for China. Dai Fanglan founded the discipline of mycology so that China would have a recognized, independent status in this field within international scientific communities. Shen Zonghan cooperated with his American colleagues and other missionary schools in China to improve wheat breeding research and extension. In 1934, both Dai and Shen left the University of Nanking. Dai Fanglan joined the Tsinghua University because he felt more comfortable in a university run by Chinese people. Shen Zonghan transferred to the National Agricultural Research Bureau and later became the most famous Chinese agricultural activist. Because of the Nationalist government's reforms as well as rising nationalism in the 1930s, University of Nanking gradually lost its overwhelming advantage in the competition with Chinese national universities. It eventually got transformed from an American missionary university in China into a Chinese university with foreign sponsorship, which was more acceptable for Chinese students and scholars.

In addition to reforming the missionary universities, the Nationalist government took more actions in reconstructing national universities. Chapter Three explores national universities during the Nanjing decades (1927-1937). It starts with how the Nationalist government reformed universities in Nanjing and Beijing and how scholars and students in the two cities resisted or supported these reforms in order to maintain their autonomy and identity. In Beijing, Tsinghua University changed from a preparatory school for the Boxer students into a formal national university and established an Institute of Agriculture in 1934 to investigate the most urgent and critical issues of improving agricultural production and rural people's living standards in North China. This small

institute was led by Dai Fanglan and Liu Chongle, two Boxer students who had taken doctoral degrees at Cornell. It was expanded during the War and formed an essential part of the Beijing Agricultural University after 1949. In Nanjing, Luo Jialun took charge of the National Central University since 1932. Luo expanded the Central University's agricultural extension programs into ten provinces. More importantly, when young intellectuals in Nanjing felt panic and resentment toward the impending Japanese invasion, Luo Jialun pointed out to them some clear paths toward the goal of serving China through science: endeavoring in scientific studies to make the National Central University comparable to the Tokyo Imperial University in academics, and to support the nation making preparation for the coming war with scientific knowledge. At the time preparing for the war, science could be used as a weapon to defeat the enemy. Luo Jialun calmed down the scholars and students with his rhetoric of scientific nationalism.

When the War of Resistance began in 1937, the Chinese agriculturalists had to migrate to the unoccupied southwestern region along with most scientific and educational institutions. Chapter Four follows the National Central University College of Agriculture in Chongqing and the Tsinghua IOA near Kunming through the war (1938-1946). When facing natural and social circumstances completely different from what they had been used to in the coastal provinces, the agriculturalists shifted their research focuses to adapt to local conditions and fit in with the new necessities in agricultural and industrial production during wartime. By examining the works of Dai Fanglan, Tang Peisong, Feng Zefang, and Jin Shanbao, I demonstrate that these scientists succeeded in expanding their institutes, resolving urgent scientific problems for increasing crop production, and

gaining significant achievement in pure scientific research such as fungi taxonomy and *in vitro* experiments of water metabolism. They not only survived and adapted to the chaotic environment, but also had made remarkable contributions to both their country and the sciences they worked on. Moreover, they developed more advanced scientific knowledge in the local environments and transmitted their findings back to their foreign colleagues, and therefore contributed to the global circulation of scientific knowledge.

I conclude with the American-trained Chinese scholars' postwar efforts to find new strategies to adapt to the new circumstances and to continue serve China through agricultural science. The civil war, the communist domination since 1949, and the reforms after 1978 brought tensions different from those they had faced during the Republican era. Only a small portion of these scholars chose the Nationalist state and moved to Taiwan. The majority of these scholars stayed in mainland China and kept serving their country and country people. Most of them suffered persecution during the Communist era, but those who survived the Cultural Revolution continued their scientific activities, especially international communication, after the 1980s. In the epilogue, I argue that these scholars were successful in realizing their goals of serving China through agricultural science because they found creative ways to resolve (or at least function within) the tensions they faced and to create Chinese institutions and knowledge based on (but distinct from) those of the West. They established a relatively complete educational system for agricultural sciences to train younger agriculturalists at all levels. Their research achievements had received international acknowledgement, which greatly elevated China's international status in the scientific community. And they had

successfully developed methods and crop varieties to increase agricultural production. Undeniably, their achievements during the Republican period were shaped by the difficult circumstances that limited their influence. Because of restrictions from both the chaotic environment and the obsolete rural living pattern, the majority of Chinese peasants was out of the reach of these scholars and did not get benefit from these scholars' activities. However, if we look to the Communist period after 1949 or even the post-reform period after 1978, a considerable portion of these agriculturalists' scientific achievements were extended into the new economic and political structure after 1949. The agricultural institutes they established during the Republican Era continued training younger agriculturalists in Communist China. Younger Chinese scientists have gained world recognition in many scientific disciplines established by these American-trained scholars. Moreover, the networks of scientific and educational communication between China and the West built by these scholars are still functioning today. Evaluating these American-trained Chinese scholars in a larger context of the entire twentieth century rather than the Republican Era, we should acknowledge that their strategies were effective in achieving the goals of serving China through agricultural science.



Figure 1 Political Situation of the Warlord Era: This figure roughly illustrates the political situation in China in mid-1924, when the Zhili faction of warlords reached its summit. The Beijing government was internationally considered as the legitimate Chinese government (but it only controlled the provinces around Beijing, not including Shanxi province). The blue area was controlled by the Nationalist Party; the green areas represent different warlord groups. (The Chinese administrative districts in 1924 were slightly different from those between 1928 and 1949. Here I use the same base map for the convenience of comparing the political situations.)



Figure 2 This figure shows the political and military situation in China before the Central Plains War in 1930. The Nationalist Government unified China in form in 1928. Beijing was renamed as Peiping; it was no longer the national capital. Most remaining warlords claimed to submit to the Nationalist government based in Nanjing (therefore I changed them into light blue), but they actually kept independence in politics and military matters. The Nationalist government could effectively control provinces in East and Southeast China (dark-blue-shadow area). Conflicts between the Nationalist and other warlords finally resulted in the Central Plains War. The red circles indicate main battlefields of this war.

Chapter 1: The First-generation of American-trained Agricultural Scientists and Institution-Building: the Early Republican Era (1912-1928)

The decade between the middle 1910s and 1920s was characterized by turbulent political and social circumstances. China was usually considered as a “central state” or “central nation,” which was one of the literal translations of its Chinese name “中国 (Zhongguo).” However, as I have illustrated in the introduction, during the early Republican period (1912-1928), we can hardly see a central state. The imperial Qing government had been defeated by modernized foreign countries and had not been able to control and strengthen China effectively since the late nineteenth century. After the loss in the 1895 Sino-Japanese War and the 1900 Boxer Rebellion, local military governors gradually gained dominance of their provinces from the central government, and they later became warlords in the Republican era. The 1911 Revolution ended the Qing Empire with the accession of a republican government. Yuan Shikai (袁世凯), the most powerful military leader, held the country for several years. During the decades after Yuan’s death in 1916, China fell into many parts governed by different warlords, which was usually called the “Warlord Era” (1916-1928), when dozens of political and military

forces in China fought against each other to compete for the highest power of the country (See Figure 3).

It is important to remember that this decade was a period when American-trained Chinese intellectuals started returning to China in large scale. The first-generation intellectuals traveled to the United States in the late 1900s and 1910s for education, and returned to China when Chinese scientific and high educational institutions were barely established. A considerable portion of them aimed to alleviate the suffering of Chinese people and save and strengthen China. Through their words we can see that many of these leading Chinese scholars aimed to improve their country through their academic work, and they considered education and research in the agricultural sciences as the most important way to realize these ultimate goals. These scholars endeavored to establish modern educational and scientific institutions based on their American training and the Chinese reality they confronted when they returned home. In this chapter, I will explore the earliest attempts of American-trained scholars to establish higher agricultural education institutions in China. I will focus on two American-trained Chinese scholars in Nanjing, Guo Bingwen and Zou Bingwen, to analyze the goals and strategies of Chinese scholars aiming to serve the country through knowledge and agricultural science.

1.1 Agricultural sciences in Peking University

Although agricultural education through apprenticeship had flourished in China for thousands of years, the institutional framework of university-based agricultural education and research appeared in the late nineteenth century. School education for intellectuals in

China had traditionally excluded agriculture. The entrance into higher education was through success on the imperial examinations. The students who succeeded on these examinations had chances to serve as governmental officials. Since the fourteenth century, these state exams were largely based on Confucian classics, which led Chinese intellectuals to focus on studies far away from what western people considered to be “science.” As Hu Shi pointed out in his dissertation, for over two thousand years, there was only one case of rational study of natural world known by all Chinese intellectuals (the Confucian *Bamu*, see the Introduction), but Chinese scholars had diverse understandings and explanations of the *Bamu*, most of which deviated from Western scientific approaches.⁴⁰ Although there were always Chinese scholars conducting scientific studies and intellectual officials conducting experimental research on agricultural problems, their works were out of the mainstream of official education, and were usually scattered and discontinuous. Chinese agricultural works conducted before the twentieth century involved few systematic research methods similar to modern science.⁴¹

⁴⁰ Hu, Shi (Hu Shih), *The Development of the Logical Method in Ancient China*, Shanghai: The Oriental Book Company, 1922, pp. 1-4.

⁴¹ Joseph Needham stressed in his 1943 speech that Chinese agriculture had an experimental tradition, just as the western did. However, I could not agree with him at this point, because although there were Chinese intellectuals who adopted an experimental approach to research and resolve agricultural problems, this type of approach was discontinuous, largely conducted by individuals, always out of the mainstream of intellectual studies, and overall had never formed a “tradition”.

The first modern university⁴² in China was the “Imperial University of Peking” (京师大学堂) established in 1898 during the Hundred Days Reform. This was also the first Chinese university to set up agricultural programs. It was created with a purpose to replace the traditional imperial examination system. Although suspended in 1900 due to the Boxer Rebellion and the siege of the Eight-Nation Alliance, it was restored in 1902 and continued receiving state funding. In August and September 1905, when the Qing government finally eliminated the official imperial examination,⁴³ the Imperial University of Peking reorganized its programs and established eight sections of Confucian classics, politics and laws, liberal arts, medicine, sciences, agriculture, engineering, and business.⁴⁴ During its early years, this university modeled Japanese agricultural schools in its curriculums and textbooks. In the “Constitutions of the Imperial University,” Japan was the only foreign country mentioned as specific example and model. For example, it was clearly stated that “Japanese universities only set six sections of liberal arts, laws,

⁴² In twentieth-century China, “modern” has been considered as a positive description referring to something advanced or the characteristics of powerful western countries, and “modernity” has been the pursuit of reforming intellectuals aiming to improve China (see Ye Weili, *Seeking Modernity in China's Name: Chinese Students in the United States, 1900-1927*). “Modern university (现代大学)” was considered as higher educational institutes characterized by rational studies, the unification of research and education, and academic independence. German, American, and Japanese models of universities had all contributed to the establishment and development of Chinese universities. Although Chinese historians and educationalists have not yet reached an agreement about what the essence of the modern “Chinese” university might be, there is consensus that the modern university should borrow structures and elements from western universities and should abandon the old organization and operation of traditional Confucian-based Chinese schools.

⁴³ This decision was officially published on September 2, 1905.

⁴⁴ “Constitutions of the Imperial University,” January 13, 1904, (“奏定大学堂章程”光绪二十九年十一月二十六日), *The Compilation of Historical Archives of the Chinese Agricultural University, 1905-1949*, vol. 1, (《中国农业大学史料汇编 1905-1949》上册), Beijing: Chinese Agricultural University Press, 2005, pp. 29-38.

medicine, sciences, agriculture, and engineering, but the section of laws actually covers the studies of business. ... Now our Chinese university sets up the section of Confucian classics and separates business as an independent section. Therefore there are totally eight sections,” and that “Japan has two universities: the Kyoto Imperial University and the Tokyo Imperial University and is still planning to establish two more universities. ... China has huge territory and population. We should establish universities in every province. Establishment of the Imperial University at Peking may encourage the development of higher education in future.”⁴⁵

The section of agriculture had four programs of agronomy, agricultural chemistry, forestry, and veterinary medicine, but it did not start recruiting students at once. In 1909, Luo Zhenyu (罗振玉, 1866-1940), a famous linguist and archeologist, was appointed as director of the section of agriculture at the Imperial University. Luo Zhenyu visited Japan to investigate agricultural colleges in May that year. After returning from Japan, Luo Zhenyu changed the rules of his section in March 1910 and decided to lecture in the Japanese language. Four of the six agricultural faculty members were Japanese and one of the other two Chinese scholars (Zhang Hongzhao, 章鸿钊) had received a bachelor's degree in Japan.⁴⁶ New students entering the reformed agricultural section in September

⁴⁵ See *The Compilation of Historical Archives of the Chinese Agricultural University, 1905-1949*, vol. 1, p. 29.

⁴⁶ *The Compilation of Historical Archives of the Chinese Agricultural University, 1905-1949*, vol. 1, p. 90.

1910 were separated into two programs—agronomy and agricultural chemistry—and needed to take lessons in the Japanese language first.⁴⁷

After the 1911 revolution, Luo Zhenyu, profoundly loyal to the Qing government, escaped to Japan. The new republican government commanded Ye Keliang (叶可梁, 1888-1972), a missionary-trained scholar who received a bachelor of agriculture from the Cornell University in 1908 and a master of engineering from Michigan in 1909, to supervise the section of agriculture in February 1912. In May 1912, the Ministry of Education renamed the “Imperial University of Peking (京师大学堂)” as “Peking University (北京大学),” and the section of agriculture became the Agricultural College of Peking University. In February 1914, the agricultural college became independent from the Peking University under an instruction from the Ministry of Education, and was renamed as the National Beijing Agricultural College (国立北京农业专门学校). Lu Xiaozhi (路孝植, 1868-??) was appointed as the first president of this national college.⁴⁸

Lu Xiaozhi had studied at the Japan Higher Agricultural School during the Qing Dynasty and had taken governmental positions for both the Qing Empire and the Republican government. Although he received training in Japan, Lu was more open than Luo Zhenyu in accepting agricultural scientists and knowledge from other foreign traditions. Lu set up an institution to send outstanding graduates visiting Japan for surveys and further studies, but the formally required foreign language was English. In

⁴⁷ “Development of the National Peking University (after 1905),” pp. 1-3.

⁴⁸ For the early history of this agricultural college, also see Wang Xuezheng, *Peking University Chronicle, 1898-1997*, vol. 1, (《北京大学纪事 1898-1997》上册), Beijing: Peking University Press, 1998.

July 1914, the Beijing Agricultural College set up a new section of forestry, with German as the required foreign language.⁴⁹ By 1916, there were nine full-time faculty and twenty-four part-time lecturers working at this college.⁵⁰ All the full time faculty members of agricultural studies were Japanese-trained,⁵¹ but some of the part-time lecturers had received education from different European countries and the United States. From 1917 to 1920, Jin Bangzheng (金邦正, 1886-1946), an American-trained educationalist, had served as president of this college.⁵² Generally speaking, the Beijing Agricultural College (although it changed its name several times after 1923) had been modeling Japanese agricultural education in its curriculum and practice until the 1940s, when it was re-integrated into Peking University and administrated by a group of American-trained scientists.

The separation of the agricultural college from Peking University was followed by similar changes of organization of this first university in China. From 1914 to 1917, the sections of medicine and engineering were separated as well to transform into an independent college. When Cai Yuanpei (蔡元培, 1868-1940), the most well-known and influential educationalist in Republican China became president of Peking University in

⁴⁹ “Development of the National Beijing Agricultural College, 1914.3-1922.12,” pp. 109-110.

⁵⁰ See “Beijing Agricultural College’s report to the Ministry of Education,” 1916, p. 199, and the “Directory of faculty and staff”, pp. 199-203.

⁵¹ In addition to Lu Xiaozhi, the president, six of the eight full-time faculty—Wu Zongshi (吴宗棻), Cheng Hongshu (程鸿书), Xu Xuan (许璇), Wan Shengyang (万声扬), Liang Xi (梁希), and Wang Zhidong (王之栋)—had received degrees from Japanese schools or universities, while the rest two were English and German teachers.

⁵² Jin Bangzheng was among the first batch of Boxer students receiving education in American universities. He had studied forestry at the Cornell University and Lehigh University from 1910 to 1914, and was one of the founders of the Science Society of China (中国科学社).

January 1917, the first important decision he made was to build Peking University an institute concentrating on fundamental academic studies. Cai received traditional Confucian education in the Qing Dynasty, but he was a reformer in both politics and education. After visiting Germany and France during 1907-1911 and 1913-1916, Cai was deeply impressed by the universities in Germany following Wilhelm Von Humboldt's ideology of education. When appointed as the president of Peking University by the Ministry of Education, he determined to apply the German model to higher education in China—that is to say, universities should focus on studies of liberal arts and sciences, while education of applied knowledge such as agriculture, engineering, business, and medicine should be taken by professional schools and colleges. Cai's reforms finally caused the colleges of medicine, engineering, and agriculture to become completely independent from Peking University, and this received both positive and negative feedback from the public. Even at that time, there were scholars doubting the separation of applied studies from university. However, Cai and his supporters resisted such pressure and insisted on their reforms, which set the path for the development of Peking University even until now—focusing on pure studies of sciences and liberal arts. Although some later university presidents and deans tried to reintroduce and reestablish sections of applied studies such as agriculture, law, business, engineering, and medicine in the 1940s⁵³ and after the Cultural Revolution, Peking University has been highly concentrating on fundamental studies of the liberal arts and sciences. The Beijing

⁵³ For example, when appointed as President of Peking University in 1946, Hu Shi managed to recover the Beiping Agricultural College and Beiping Medical College as agricultural and medical schools of Peking University.

Agricultural College still kept a connection with the Peking University—and had been re-integrated into Peking University and become the agricultural school of Peking University in the 1940s—but agricultural sciences played an unimportant role in the history of Peking University after 1917.

Despite the decline of agricultural education, Peking University still maintained critical importance for the later development of the ideology of serving China through agricultural science. It was the most influential center to introduce modern science⁵⁴ to Chinese intellectuals. It was the place of origin and center of the New Cultural Movement that enlightened Chinese youth and popularized science as a utilitarian way to save and serve China. When students at Peking University during this movement (such as Luo Jialun) became educational, scientific, and political leaders in the following decades, the ideology of serving China through science was passed on to more and more younger Chinese scholars. I will explore this aftereffect in Chapter 3 and Chapter 4 through Luo Jialun's career at the National Central University.

1.2 Agricultural Program at the Nanjing Higher Normal School

/Southeastern University

Almost at the same time that agricultural sciences were excluded from Peking University, a group of American-trained Chinese scholars reformed another university in South China to include both pure and applied studies—the Nanking Higher Normal

⁵⁴ Or a Chinese version of modern science; see the section on Hu Shi in my introduction.

School (南京高等师范学校, abbreviated as “Nangao, 南高”), which was established in 1914 (later transformed into the national Southeastern University between 1921 and 1923 and was renamed as the National Central University in 1928). Under the operation of a group of American-trained scholars, this university had a special emphasis on agricultural sciences following an American model to combine education together with research and extension.

The establishment and development of this university was closely related to reforms aiming to improve China since the late Qing Dynasty. In May 1902, when hearing that the central Qing government intended to reform old Confucian schools into new-style schools, Jiangsu province established a higher normal school at Nanjing to train new-style teachers, named as Liangjiang Normal School. From 1906 to 1911, this normal school had set up programs of mathematics, sciences, natural history and agriculture, history and geography, and music and arts. The number of students at this school had reached six hundred in 1910. These students were from Jiangsu, Anhui, and Jiangxi provinces and had to pass three strict examinations to enter this normal school. Most of them became lecturers in primary and secondary schools of the three provinces after graduation, but there were also graduates sent to work in other provinces such as Sichuan, Shanxi, Hunan, Guizhou, Guangdong, and Zhejiang.⁵⁵ After the 1911 Revolution, Nanjing, one of the biggest and most influential cities in south China, suffered a series of fierce battles between 1911 and 1913. Almost all students, faculty, and staff fled to

⁵⁵ “Liangjiang Normal School’s newly establishing a program of arts and crafts,” *The Centennial Records of Nanking University—Historical Materials of the National Central University*, pp. 19-20.

escape. Troops of different military forces had seized the campus of this school several times. Most campus buildings were burned, staff trying to protect their schools were killed, and all book collections and educational equipment were ruined.⁵⁶ Therefore, the Liangjiang Normal School was forced to suspend operations after 1911. The Department of Education of Jiangsu province had to close this school and blocked the campus in January 1914.⁵⁷

However, as the modern educational system had already started to develop in Southeast China, suspension of the normal school caused a big inconvenience for primary and secondary schools in need of teachers. Considering this necessity, in August 1914, the Jiangsu provincial government decided to establish a Nanjing Higher Normal School on the campus site of the suspended Liangjiang Normal School. Jiang Qian (江谦, 1876-1942), Director of Education of Jiangsu province, was appointed as president and began to make preparation for the new higher normal school.⁵⁸ Jiang Qian invited Guo Bingwen (also spelled as Ping-wen Kuo or Kuo Ping Wen, 郭秉文, 1880-1969), who had recently received a doctoral degree for education from Columbia University in 1914, to serve as dean of the Nanjing Higher Normal School. Later Guo Bingwen became the real founder of this school.

⁵⁶ “Li Chengyi’s report on situation of the Liangjiang Normal School” (February 23, 1913) and “Li Chengyi’s report on the troops robbing the Normal School” (September 20, 1913), *The Centennial Records of Nanking University—Historical Materials of the National Central University*, pp. 36-37.

⁵⁷ “Han Guojun’s Instruction to block the Normal School,” January 15, 1914, *The Centennial Records of Nanking University—Historical Materials of the National Central University*, p. 38.

⁵⁸ “The Jiangsu governor Han Guojun’s instruction of appointing Jiang Qian as school president in order to establish the Nanjing Higher Normal School,” August 30, 1914, *The Centennial Records of Nanking University—Historical Materials of the National Central University*, pp. 41-42.

Guo Bingwen was born in a Chinese family believing in Christianity in Shanghai in 1880. He received primary and secondary education at a missionary school, Lowrie Institute (清心书院). After working at the Lowrie Institute, the Shanghai customs, and Shanghai postal bureau for about ten years, Guo Bingwen noticed that modern higher education was budding in China. He believed that secondary education would be inadequate for saving and strengthening China, and therefore decide to pursue higher education in the United States. In 1908, Guo Bingwen entered the College of Wooster in Ohio and received a bachelor's degree of science in 1911. After that he moved to Columbia University in New York City and majored in education. Guo Bingwen defended his doctoral dissertation, "The Chinese System of Public Education,"⁵⁹ in 1914, which was considered as the first academic exploration of educational institutions in China. The years when Guo Bingwen studied in the United States coincided with the time when the earliest Chinese students funded by the Boxer Scholarship arrived in the United States. Although Guo himself was not a Boxer student, he built up connections with many of these students and kept in contact with them after returning to China.

When finalizing his dissertation, Guo Bingwen received the invitation from Jiang Qian to take the position of the dean of the future Nanjing Higher Normal School. At that time, Guo had other invitations from organizations such as the Commercial Press, the Chinese customs, and some financial companies which would provide better salary. However, Guo Bingwen believed that education was the most important and effective

⁵⁹ Guo Bingwen's dissertation was published by the Teachers College of Columbia University in 1915. He rewrote it in classical Chinese language and the Chinese edition was published by the Commercial Press in 1916.

way to improve China. When his doctoral dissertation was published by the Teachers College of Columbia University in 1915, Guo argued in the conclusion that patriotic enthusiasm was as important as educational theories and skills in serving China through education, which required large number of patriotic educators to help China figure out her own way of improvement that would differ from the already enlightened western institutions and traditional Chinese institutions:

“The problem of supplying educational facilities for China’s millions is so gigantic in its scope and so complicated in its character that its successful solution calls for not only the highest professional skill, but a great deal of enthusiasm, patriotism, and altruism. ... Of one thing there is not the slightest doubt, namely, China is now confident that given sufficient time she will be able to work out her salvation in spite of the fact that the problem is fraught with difficulties. For the present she needs time to regain her breath from the shock which she experienced in the transition from monarchy to republic. She needs time to consider what are the elements in western education best adapted to further her vital interest, and what are the elements in her own system which have proved most favorable through the centuries of her history and which should be preserved with all vigor and tenacity. ...”⁶⁰

When the Chinese version of his dissertation was re-published in 1922, Guo re-emphasized his thoughts of serving China through education:

⁶⁰ Guo, Bingwen (Kuo Ping-Wen), *The Chinese System of Public Education*, New York City: Teachers College, Columbia University, 1915, pp. 170-171.

“Education is the axis of reforms. Its changes may result in changes in all other fields. Education may cultivate pillars for the country and save the fate of a country. That is to say, education was the field of study most closely related to the improvement of country and people.”⁶¹

Guo Bingwen accepted Jiang Qian’s invitation without hesitation.⁶²

Although Guo did not stress agriculture or science in his ideology about serving China through education, his educational activities largely facilitated the efforts of agricultural scientific nationalists such as Zou Bingwen. The proposal of improving China by cultivating capable patriotic intellectuals overlapped and coincided with the ideology of saving and serving China through (agricultural) science. I believe that this idea motivated other first-generation American-trained Chinese scientists in the 1910s to devote themselves to improving the educational system in China, even though they were not majoring in education. These scholars were impressed by the fact that China fell far behind modern western countries. They realized that scientific knowledge about agriculture, industry, and other practical issues related to the livelihood of Chinese people and the development of China would help to improve their country and compatriots. However, traditional Chinese intellectuals had paid little attention to studies of experiment and reasoning. For example, Guo Bingwen described in his dissertation that

⁶¹ Guo Bingwen, *The Chinese System of Public Education*, Shanghai: Commercial Press, 1922, p. 147.

⁶² For the life and career of Guo Bingwen, see *Memorial Collection of Mr. Guo Bingwen (In Memoriam: Ping Wen Kuo 1880-1969)*, Taipei: China Academy, 1971 (《郭秉文先生纪念集》, 台北: 中华学术院, 1971); also see Mao Rong, *Supreme Harmony and Goodness in the Southeast: Guo Bingwen, President of the Southeastern University*, Jinan: Shandong Education Press, 2004 (冒荣, 《至平至善鸿声东南: 东南大学校长郭秉文》, 济南: 山东教育出版社, 2004).

“for many centuries Chinese education was purely literary, philosophical, and ethical in character. There was little that could be called concrete or practical in the modern sense of the word, neither was there anything requiring the knowledge of the experimental method or of inductive reasoning.”⁶³ Other American-trained scholars such as Hu Shi had also criticized the lack of reasoning and logical methods in traditional Chinese intellectual systems, as I described in the Introduction. The number of intellectuals capable of studying and applying the scientific knowledge was extremely small at that time.⁶⁴ During the first decade of Republican China, hundreds of American-trained Chinese scholars were insufficient to directly improve a country with a population of four hundred million. Therefore, it is quite understandable that most American-trained Chinese scientists chose higher education as their career after returning to China—they needed to cultivate younger scientists—as many and quickly as possible—in order to spread and extend the knowledge to improve their country.

From August 1914 to August 1915, Jiang Qian, the school president, focused on applying for financial support, persuading troops to move out of the campus of the normal school, and repairing buildings and educational equipment; meanwhile Guo Bingwen took on the task of designing institutions and employing faculty for the new school. The Nanjing Higher Normal School officially started to recruit students in August

⁶³ Guo Bingwen, *The Chinese System of Public Education*, New York City: Teachers College, Columbia University, 1915, p. 163. Guo’s comments on Chinese education seem similar to how Meiji Japanese intellectuals understood Japanese traditions; however, Guo and his contemporary Chinese intellectuals usually included the Japanese into models of “modern.”

⁶⁴ Through the entire republican era (1911-1949) there were no more than fifty thousand Chinese people receiving training in foreign countries, most of whom went abroad during the 1930s and 1940s, when there were more financial supports for foreign education and the governmental restrictions for travelling abroad became looser and more flexible.

1915. Because of poor health, Jiang Qian felt unable to deal with all affairs of this school and always asked for help from Guo Bingwen. Therefore Guo had enough chances to put his ideals of education into practice. By October 1918, when Guo Bingwen took the position of acting president, there were seven sections at the Nanjing Higher Normal School: liberal arts, sciences, education, agriculture, engineering, business, and physical education. Ninety-four full-time staff and faculty were working at this school: 41 staff (including the president), and 53 lecturers. 32 of these lecturers had foreign educational background, most of whom were European- or American-trained scholars. The school provided funding to support outstanding lecturers without foreign background to pursue further training in the United States. The number of students had reached 357.⁶⁵ At that time, this normal school's scale and educational level had exceeded all other higher normal schools and got very close to full universities in China.⁶⁶ Graduates from this school had taken less courses than full university graduates, but usually had more practical training, and were very popular in job market.

In September 1919, because of Jiang Qian's long-term sick leave, the Jiangsu provincial government officially appointed Guo Bingwen as president of the Nanjing Higher Normal School. During that fall, Guo Bingwen began to unite gentry and scholars in the southeastern provinces (Jiangsu, Anhui, Jiangxi, Zhejiang, etc.) to appeal to the

⁶⁵ "Acting president Guo Bingwen's report on the general situation of our school," October 1918, *The Centennial Records of Nanking University—Historical Materials of the National Central University*, pp. 52-65.

⁶⁶ At this time, there were three other national universities in China, but all of them were in the North: Peking University in Beijing, Beiyang University in Tianjin, and Shanxi University in Taiyuan. Although there were other missionary and private universities such as the University of Nanking at Nanjing and the private Fudan University in Shanghai, the Nanjing Higher Normal School was doubtlessly the best governmental-funded school in South China.

public and the Beijing government to transform the Nanjing Higher Normal School into a full university—the Southeastern University.⁶⁷ In December 1920, the Ministry of Education in Beijing approved the proposal to establish the Southeastern University and authorized Guo Bingwen to take charge of transforming the Nanjing Higher Normal University into this new national university. The chief purpose of this university should be improve higher education in southeast China and, although it was registered as “national,” the Beijing government did not provide financial support for its development, but required four southeastern provinces—Jiangsu, Zhejiang, Jiangxi, and Anhui—to fund this university.⁶⁸ The Southeastern University absorbed most programs of the Nanjing Higher Normal School and set four sections with twenty departments in Nanjing: the section of liberal arts and science, the section of agriculture, the section of engineering, and the section of education. Moreover, it established a new section of business with three departments in Shanghai, the commercial center of southeast China that was not too far away from Nanjing. In August 1921, the national Southeastern University enrolled its first batch of students and the Nanjing Higher Normal School stopped recruiting students. In 1923, when the last group of students graduated from the

⁶⁷ For more details about the preparatory stage of the Southeastern University, see “Founding of the National Southeastern University,” “Guo Bingwen’s letter to the committee of transforming Nanjing Higher Normal School into the Southeastern University” (April 10, 1920), “Huang Yanpei and Guo Bingwen’s letter to the Ministry of Education on transforming the Southeastern University” (November 18, 1920), “Letter to the Ministry of Education about the plan to establish a national university in Nanjing” (1920), “Schedule and budget of transforming the Nanjing Higher Normal School into the Southeastern University” (1920), *The Centennial Records of Nanking University—Historical Materials of the National Central University*, pp. 99-106.

⁶⁸ Actually, only Jiangsu province (where the university located) provided funding. The financial situation caused a series of troubles for the later development of this university.

Nanjing Higher Normal School, the Southeastern University completely replaced this normal school.

By the beginning of the 1920s, there were only two really influential Chinese universities registered as “national” at the Ministry of Education in the Beijing government⁶⁹: one was Peking University in Beijing, north China, which is discussed in section 1.1; the other was the Southeastern University (Nanking Higher Normal School before 1923) in Nanjing.⁷⁰ At that time, the two universities were usually put together for comparison and there was a well-known saying: “the North has Peking University, while the South has the Nanjing Higher Normal School (北有北大，南有南高).”⁷¹ Compared with Peking University, which was more involved in political movements because of its tradition as an imperial university and location at the national capital, this university at Nanjing was more devoted to academic studies and paid more attention to academic autonomy and independence. Although Peking University was usually considered as the first modern Chinese university, the Southeastern University was more like a modern university in western countries characterized by academic independence. Such independent atmosphere of academics allowed the sciences to thrive quickly in this

⁶⁹ The two other national universities, Shanxi University in Taiyuan and Beiyang University in Tianjin, had fewer programs and smaller scale and were much less influential than the Nanjing Higher Normal School.

⁷⁰ In Chinese language, “Jing” (京) means the “national capital,” “Bei” (北) means “north” and “Nan” (南) means “south.” Literally, “Beijing” means the “north capital” while “Nanjing” means the “south capital.” During the twentieth century, Beijing and Nanjing took turns to be the political center of China. In the early 1920s, PKU and Nangao represented not only the top level of higher education, but also the political forces and cultural traditions behind them in north and south China respectively.

⁷¹ Zhang Qiyun, “Guo Bingwen’s principles of running universities,” *Memorial Collection of Mr. Guo Bingwen*, pp. 1-2. (张其昀, “郭师秉文的办学方针”, 《郭秉文先生纪念集》, 第 1 页)

university. A history professor from Peking University (Liang Jingdun, 梁敬鐸, also named as 梁和钧) praised the Southeastern University in his writings that “Peking University is famous for its liberal arts; the Southeastern University is famous for its sciences.” Liang also pointed out that “all professors at the Southeastern University were talents of the era (东大所延教授, 皆一时英秀).”⁷² The top-level faculty was an important reason for the Southeastern University’s rapid ascent in academics. By 1923, more than 64% of the 222 faculty had received advanced education in western countries. In the sections of sciences, engineering, and agriculture, this percentage was larger than 80%.⁷³ Considering that Chinese higher education was still in its infancy in the 1910s, the western educational experience was a guarantee for the capability of faculty.

Guo Bingwen’s success in gathering the high-level faculty was largely because of his experience in the United States. For example, after he was appointed as the acting president of Nanjing Higher Normal School, Guo invited his Columbia University junior, Tao Xingzhi (陶行知, 1891-1946), to take over the position of school dean. Tao Xingzhi was one of the most well-known educationalists in Republican China. He had studied under the advising of John Dewey between 1915 and 1917 and had been deeply impacted by the idea that education should be closely connected to practice and experience rather than merely teaching. From 1917 to 1923, Tao worked at the Nanjing Higher Normal

⁷² Wang Chengsheng, “A Chinese Sage: Mr. Guo Bingwen,” *Memorial Collection of Mr. Guo Bingwen*, p. 93. (王成圣, “中国哲人郭秉文先生”, 《郭秉文先生纪念集》, 93 页)

⁷³ “Directory of faculty and staffs at the Southeastern University” (January 1923), *The Centennial Records of Nanking University—Historical Materials of the National Central University*, pp. 149-164. This directory does not provide information of educational background for all faculty and staffs, so the real percentage of faculty with foreign educational background and graduate degrees might be higher than my calculation.

School and the Southeastern University and participated in almost all important institution building. Largely due to Tao's efforts, the Southeastern University had a strong emphasis in balancing both pure and applied studies in education, but kept distance from political movements—which was quite different from Peking University's focusing on pure studies in academia but actively participating in politics. While the balance of pure and applied knowledge is characteristic of the American model being followed in education in Nanjing, Peking University's preference reflected its background in the German-Japanese model as well as tradition as an imperial institute.

In addition to his early education experience, after returning to China, Guo had visited the United States several times for educational surveys. Guo took all these chances to contact famous American universities and had found many outstanding Chinese students at these universities. He managed to keep in touch with these students and invited them to join the Nanjing Higher Normal School/Southeastern University.⁷⁴ An interesting example was Guo's cooperation with the Science Society of China (SSC). The SSC was the earliest and most important civil society of science in Republican China. It was prepared during 1914 and formally founded in January 1915 by a group of Chinese students at Cornell University. Its chief initiators included Ren Hongjun (任鸿隽), Bing Zhi (秉志), Zhou Ren (周仁), Hu Mingfu (胡明复), Zhao Yuanren (赵元任), Yang Xingfo (杨杏佛), Guo Tanxian (过探先), Zhang Yuanshan (章元善), and Jin

⁷⁴ Zhu Yaozu, "Mr. Guo Bingwen and the Nanjing Higher Normal School/Southeastern University," *Memorial Collection of Mr. Guo Bingwen*, p.

Bangzheng (金邦正).⁷⁵ By 1918, most of these founders had graduated and returned to China. Therefore the base of SSC would move to China as well. Guo Bingwen grasped this opportunity to persuade the SSC to set its first main office in China at the Nanjing Higher Normal School and employed many chief members of the SSC: Ren Hongjun, Bing Zhi, Hu Mingfu, Yang Xingfo, and Guo Tanxian. Because of such relations, many SSC members joined the Nanjing Higher Normal School/Southeastern University in the following years after finishing their education in the United States. This university became the most active center for Chinese scientists in the early 1920s and its sections of sciences, agriculture, and engineering became unparalleled among national universities.⁷⁶ As for SSC's cooperation with the section of agriculture, the most noticeable scientist should be director of this section, Zou Bingwen.

1.3 Zou Bingwen, Agricultural Education, and the Ideology of Serving China through Agricultural Sciences

Zou Bingwen (邹秉文, 1893-1985, also spelled as Tsou Ping-wen) was the first to introduce an American model of agricultural institution—a combination of education, research, and extension—into Chinese universities. He spent almost ten years at the Nanjing Higher Normal School/the Southeastern University and built up a strong agricultural section based on which the National Central University was about to take the

⁷⁵ Seven of the nine were Boxer students.

⁷⁶ For the Science Society of China, see Wang Zuoyue “Saving China through Science: the Science Society of China, Scientific Nationalism, and Civil Society in Republican China”, *Osiris*, Vol. 17, (2002), pp. 291-322.

leading position of agricultural education among top Chinese universities during the 1930s and 1940s. Zou was born in Guangzhou in 1893 into a family of higher officials. His father was taking charge of the salt tax for the Guangdong government (which was the most lucrative position for provincial officials), and his uncle Zou Jialai (邹嘉来, 1853-1921) worked at the central government and had taken important positions such as Minister of Foreign Affairs. His uncle arranged for Zou Bingwen to travel to the United States in 1910 for secondary and higher education. He entered Cornell University in 1912 to study mechanical engineering and transferred to agriculture in 1913. After receiving a bachelor's degree in 1915, Zou Bingwen studied plant pathology at the graduate school of Cornell for about one year and returned to China in 1916.⁷⁷

Because of his family background, Zou Bingwen had considerable chances to work in government or financial organizations. However, similar to Guo Bingwen, Zou's love for China is reflected in his choice of occupation. With a strong desire to strengthen China by improving agricultural science and education, Zou Bingwen hoped to serve at an agricultural school. For Zou, even an unpaid position was acceptable—he just wanted to conduct agricultural research and education. Although several agricultural schools from Anhui and Jiangsu intended to employ him, only one could fulfill his requirements for research equipment and conditions: the missionary University of Nanking (I will introduce this university in Chapter 2), which had biological experimental devices like microscopes. Zou Bingwen did not like to work for this university. During the warlord

⁷⁷ Yun Baorun, "Agriculturalist Zou Bingwen", *Compilations of Literature and History Materials*, vol. 88, 1983, pp. 173-220. (恽宝润, "农学家邹秉文", 《文史资料选辑》, 第88辑, 文史资料出版社, 1983年, 173-220页)

era missionary schools were actually foreign schools in Chinese territory and were independent from Chinese educational system. It was hard to really reform Chinese agricultural education within a missionary school, but he had no other satisfactory choice at that time. In 1916, Zou Bingwen moved to Nanjing and joined the agricultural program at the University of Nanking, teaching botany, plant pathology, and plant breeding.⁷⁸

During a train trip from Nanjing to Shanghai in spring 1917, Zou Bingwen encountered Guo Bingwen, who was then serving as dean of the Nanjing Higher Normal School and planning to establish a section of agriculture. Guo Bingwen was deeply impressed by Zou's ideas of improving China through agricultural sciences. He invited Zou to join the Nanjing Higher Normal School and to serve as director of the agricultural section. Zou accepted this invitation and began to work for Guo Bingwen's school in summer 1917. With Zou Bingwen's assistance, Guo Bingwen was able to attract a group of agricultural scientists to join the section of agriculture and the department of biology at his school/university. Some of these scientists included Bing Zhi, Hu Xiansu (胡先骕), Qian Chongshu (钱崇澍), Chen Huanyong (陈焕镛), Hu Jingfu (胡经甫), Dai Fanglan (戴芳澜), Zhang Jingyue (张景钺), all of whom had received American education.⁷⁹

The careers of these people were characteristic of the first generation of American-trained Chinese scientists, who built institutions and established institution for agricultural science according to the American model combining research, education, and extension. Compared with his colleagues such as Dai Fanglan, Zhang Jingyue, or Chen

⁷⁸ Ibid.

⁷⁹ Ibid.

Zhen, Zou Bingwen's achievement in creating scientific knowledge was less remarkable. However, he contributed to establishing an institution for agricultural sciences in China in that he was the first to systematically investigate conditions and problems of agricultural science in China, to propose viable strategies of building up new scientific institutions, and to illustrate why agricultural science was of primary importance in saving and serving China.

Zou Bingwen himself was very successful in scientific education. He was the first Chinese scientist teaching plant pathology in China and composing an agriculture textbook in the Chinese language. Since his teaching at the University of Nanking, Zou had noticed that the contemporary botany textbooks in Chinese were all translated from Japanese textbooks, while the Japanese books were usually based on some earlier European publications (often German). Zou Bingwen felt that the knowledge introduced in these textbooks was out-of-date and not quite relevant to the environment in China, because natural and social conditions of both Japan and Germany were different from those in China. Missionary schools such as the University of Nanking were teaching with original textbooks in the English language, but those books were beyond the reading ability of most Chinese students in non-missionary schools. Zou Bingwen saw the need for a distinctive Chinese version of botany. Therefore, from 1918 to 1922, he wrote the first Chinese botany textbook for higher education, the *Advanced Botany* (《高等植物学》), with fifteen chapters and Chinese-English glossaries. This book was published by the Shanghai Commercial Press in 1923 and became the most influential botany textbook in Chinese universities during the 1920s and 1930s.

For agricultural programs in higher education, Zou Bingwen believed that scientific research and extension work had equal importance with teaching. During the ten years he worked at the Nanjing Higher Normal School/Southeastern University, Zou reformed and expanded the section of agriculture. By 1926, this section had set six departments of agronomy, husbandry, gardening, sericulture, biology, and pathology with 26 professors. Zou believed that enough agricultural experimental fields were critical for students to practice the knowledge they had learned, for professors to conduct scientific research, and for the school to improve agricultural extension. When Zou Bingwen first joined the Nanjing Higher Normal School, the section of agriculture had only one experimental farm of 40 *mu* (0.027 km²) at Nanjing. By 1923 when the school transformed into the Southeastern University, Zou's section had nine experimental farms of over 4000 *mu* in Nanjing and Jiangsu, studying wheat, rice, sericulture, gardening, and cotton.⁸⁰ He and his colleagues and students also made surveys in Henan, Hubei, and Hebei provinces, which were very difficult, because it was very challenging for them to keep travelling to those regions, and they usually had to rely on assistance from local people. Luckily they were able to find some educated people at the local sites to keep recording the data and sending them samples via mail for over four years.⁸¹ These efforts largely enabled high level, standardized scientific research and extension at Zou's agricultural school. They also suggested that the agricultural experiment station model from America had to change

⁸⁰ The huge achievement implied huge expense. I noticed that the annual expense of Zou's agricultural section was four times of its annual budget. But I have not found evidence explaining why Guo Bingwen, the university president, agreed to support such expensive improvements.

⁸¹ *GuoLi ZhongYang DaXue NongXueYuan ZuoWu YanJiu BaoGao (Crop Research Reports of Agricultural School at the National Central University)*, Volume 1, Nanjing: the National Central University, June 1929.

to fit into Chinese conditions (such as poorly-educated farming people and natural environments different from those of the United States).⁸²

Zou's efforts in agricultural education and extension yielded remarkable accomplishments in the following decades. The experimental stations he established near Nanjing functioned until the Sino-Japanese War started in 1937. A lot of young students studying under Zou Bingwen during this period became famous agriculturalists during the following decades, including Jin Shanbao and Feng Zefang (I will explore them in chapter 4). In addition to establishing such an achieving model at the Southeastern University, he was the first scholar systematically surveying and illustrating what the agricultural education situation in China was and how to improve it.

1.3.1 *Agricultural Education in China: General situation of agricultural education in China in the early 1920s*

In the same year of the publication of *Advanced Botany*, Zou Bingwen published his best known work, *Agricultural Education in China*. This book was mainly composed in 1922 and published by the Commercial Press at Shanghai in 1923. This book was a summary of educational ideas based on Zou's experiences at the Southeastern University and University of Nanking as well as surveys on agricultural situation in other provinces. It was also Zou's assessment of the newly-established educational institution. It referred to examples from the United States, Japan, Germany, and Denmark and systematically analyzed the disadvantages and problems of Chinese agricultural education—from

⁸² For details about the American model of experimental agricultural stations, see Charles Rosenberg, *No Other Gods: On Science and American Social Thought*, Baltimore: The Johns Hopkins University Press, 1976.

primary professional schools to higher education. Aimed at these problems, Zou expounded his views of how to reform and improve agricultural education and emphasized the importance of integrating education, research, and extension in agricultural education. It was an excellent example showing how American-trained Chinese agricultural scientists had been influenced by an American model of agricultural institutions and how they endeavored to apply and adapt this foreign model to local conditions in China.

The book has eight chapters: “Discussions on Improving Agricultural Colleges in Our Country,” “Current Situations of Primary Agricultural Schools in Our Country and Ways to improve,” “Questions on the Main Purpose of Secondary Agricultural Schools in Our Country,” “Current Situation and Future Plans of Agricultural Education in Our Country,” “Outline Plans of Developing Agricultural Education all over the Country and Ways to Raise Funds,” “New Educational Institution and Agricultural Education in the New Institution,” “Agricultural Education in Each Province under the New Institution,” and “Agricultural Education in Jiangsu Province under the New Institution.” Zou Bingwen included detailed and specific data and examples accumulated through his earlier works and surveys in this book. At the very beginning of the first chapter, Zou pointed out the importance of agricultural education for China:

“Now the entire country has a population of four hundred million, eighty-five percent of which are working in farming. Half of the country’s annual revenue comes from farming taxation. In 1916, the revenue was 198,653,119

Yuan,⁸³ while farming taxation counted for 97,553,513 *Yuan*. ... The total export in 1916 was over 480,000,000 *Yuan*, while agricultural export of that year was over 352,000,000 *Yuan*, which counted for 73% of the total export. The most promising enterprises in our industry were cotton textile and silk textile, whose fates were largely dependent on the development of cotton and silkworm agriculture. Therefore, for the sake of the welfare of most people, the revenue of our country, the expansion of export trade, and the future of our industry, it is necessary to improve agriculture. In all countries of the world, the methods to improve agriculture are establishing agricultural experimental farms and agricultural schools.”⁸⁴

In the first three chapters, Zou Bingwen illustrated and analyzed the problems of China’s agricultural education. By the early 1920s, there were mainly three types of agricultural schools in China: agricultural college (农业专门学校), secondary agricultural schools (甲种农校), and primary agricultural schools (乙种农校). According to the official educational institution system set by the Ministry of Education in 1912 and 1913, their educational levels roughly corresponded to higher, secondary, and senior primary schools.⁸⁵ After putting this into practice for almost a decade, educators in China

⁸³ *Yuan* (元): silver dollar issued in at the beginning of the republican era, which was one of the most popular currencies during the warlord era. It was used until 1935 when the KMT government issued the “legal dollar” (法币) to unify and replace all the currencies issued by earlier warlords.

⁸⁴ Zou Bingwen, *Agricultural Education in China*, p. 1.

⁸⁵ According to the 1912-1913 educational institution constructed by the Ministry of Education at the Nanjing Provisional Government and the Beijing government, primary education included seven grades. Grades one through four were considered as junior primary school, which was

had accumulated huge dissatisfaction with this 1912-1913 educational system. Their appeals between 1919 and 1922 had brought about the 1922 new educational institution system issued by the president of the Beijing government, which affected the development of the Chinese educational system until the early 21th century. Zou's analysis on agricultural schools exemplified educators' discontent with the old educational system.

According to the 1912-1913 educational system, agricultural colleges were the highest agricultural educational institutes and their main purpose should be to cultivate agricultural experts. However, Zou Bingwen pointed out that graduates from these colleges were seldom qualified to be experts in either education or practical production.⁸⁶ He summarized three chief reasons. Firstly, courses taught in these colleges were too general. All students were required to take at least nineteen professional courses but had no time to study any of them intensively. Students graduating from such institutions "might be adequate to the extension of general agricultural knowledge, but definitely unable to serve as expert agriculturalists."⁸⁷ Secondly, time for experiment and fieldwork was too limited. Agricultural students could hardly fully understand what they had learnt from textbooks without experiment and fieldwork, and therefore could hardly practice book-knowledge effectively in their later careers. Thirdly, faculty were required to teach too heavy a course load and were not able to focus on their specialty and research—

compulsory education according to the laws—in reality, through the entire republican era, less than 20% people had taken this compulsory education. Grades five through seven were senior primary school.

⁸⁶ Zou Bingwen, *Agricultural Education in China*, p. 2.

⁸⁷ Zou Bingwen, *Agricultural Education in China*, p. 3.

because of rules of the ministry of education, all full-time faculty at agricultural colleges had to teach at least eighteen class-hours every week and they usually needed to teach seven to eight courses, most of which were not their research subjects. Under such rules, faculty usually had to give up their research, while students would not benefit from the faculty's skimping on teaching. Zou Bingwe accusingly characterized such rules as "slaughtering scientists (残杀专家)." Based on these problems, Zou provided three suggestions for agricultural college: to implement selective courses rather than requiring all students taking all agriculture-related courses, to set more compulsory courses for experiment and fieldwork, and to relax the faculty from too heavy a teaching burden and to have them pay more attention to their specialty and research. Zou believed that these would be effective ways to improve agricultural colleges in China: "currently even the best agricultural universities in Europe and America are following these patterns. I cannot accept the saying that these methods are not helpful in cultivating specialized professionals."⁸⁸

Zou Bingwen understood agricultural specialized professionals as the personnel capable for agricultural scientific research, higher education, and administration. Meanwhile, he believed that another purpose of agricultural education was to train farm workers directly conducting agricultural production. In the second chapter of his book, Zou Bingwen emphasized that agricultural professional training at this level must adapt to the actual conditions of a country. In the United States or European countries such as Denmark, farm workers were usually trained at the secondary educational level. In China,

⁸⁸ Zou Bingwen, *Agricultural Education in China*, p. 9.

it was the primary agricultural schools—or schools at the lower level—that fulfilled this task, because most of the farm workers were from ordinary peasant families. In China, the actual condition was that even rich farming families could only afford to support their sons to finish junior primary education. How could we expect farm workers to take secondary level education! Based on a survey conducted by the Nanjing Higher Normal School in 1919 (see Tables 1 and 2), Zou Bingwen stressed two critical problems for primary agricultural schools: the number of students was too small and was decreasing every year, and only 55% of the graduates were taking agriculture as their career. According to this survey, there were fewer than three thousand educated farm workers across the entire country, while the number of peasant families was over forty million. Zou proposed three principal reasons for these problems: 1) the educational level was too high for children of peasants to reach; 2) courses were too many and too general for resolving practical local problems; and 3) tuitions and fees were too much for poor peasants to afford. Therefore, Zou Bingwen suggested reducing the size and expenses, lowering the educational standards to junior elementary schools, and designing curricula that better fit the local conditions in order to improve primary agricultural schools in China.

Chapter three was about the problems of secondary agricultural schools. Zou Bingwen believed that this type of school did not have clear and practical purposes, and, that if his proposals for agricultural colleges and primary agricultural schools could be put into practice, there was no necessity to keep the secondary agricultural schools running in China. He advised opening provincial-funded agricultural middle school and

more short-term agricultural training schools or summer schools—as they were running at the Nanjing Higher Normal School—to replace the existing secondary agricultural schools. Zou believed that the training schools would be more economical and beneficial in cultivating agricultural practitioners.

The fourth chapter was an important transition in this book: Zou Bingwen first introduced the general situation of agricultural education in China based on extensive surveys. He listed the number and distribution of agricultural schools (Table 3) and number of students and funds for each type of school. This was the first survey of this type ever conducted, and it is worth repeating some of its findings here. Zou Bingwen considered the four agricultural schools at universities separately from the agricultural colleges. The total number of students at these “agricultural universities” was no more than three hundred, and the total annual funds were about 365, 000 *Yuan*. The eight agricultural colleges had a total number of students of no more than 1500 and the total annual funds were about 350,000 *Yuan*. It was beyond Zou’s ability to fully investigate the detailed situation of primary and secondary agricultural schools, so he took surveys on 30 representative secondary schools and 65 primary schools and estimated general numbers for these two types of schools. The 79 secondary agricultural schools all over the country might have a total student number of 10,192 and the average fund for each school was about 15,360 *Yuan* (totally 1,213,440 *Yuan* for all the 79 schools); while the total student number of the 329 primary agricultural schools was about 16,779 and the total funds were 1,432,635 *Yuan*, each school with 51 students and an average of 1,315 *Yuan*. As for the chief problems, Zou briefly reviewed the problems he had illustrated in

the first three chapters, such as “The higher agricultural educational institutes and agricultural experimental farms have not fulfilled their duty of resolving problems of Chinese agriculture;” “primary agricultural schools should lower their educational level;” and secondary agricultural schools must clarify their chief purposes and needed to be reformed.⁸⁹ Then he proposed methods to improve these schools, which he illustrated in detail in the following chapters.

Zou Bingwen proposed his ideal model of agricultural colleges and universities in China in the following three chapters: “Outline Plans of Developing Agricultural Education all over the Country and Ways to Raise Funds;” “New Educational Institutions and Agricultural Education in the New Institution;” and “Agricultural Education in Each Province under the New Institution.” He stressed that “higher agricultural education should include at least three main tasks: research, education, and extension” and depicted a scheme of the agricultural university as in Figure 5. This hierarchical scheme of the Chinese agricultural university had doubtlessly been influenced by the model of agricultural schools at American universities, and Zou Bingwen made this very clear in his seventh chapter:

“American agricultural universities have included three chief parts as their responsibility: research, education, and extension. Training students was only part of their work. Here I would like to generally translate the principal purpose of the agricultural school of Cornell University at New York State, the U.S. This purpose was published in 1906 and printed in the first page of the introduction of

⁸⁹ Zou Bingwen, *Agricultural Education in China*, pp. 35-36.

this school. ‘Principal Purposes of the New York state Cornell University Agricultural School’: 1) to develop agricultural approaches in their state, 2) to enhance agricultural resources of their state (the university need to research on improving strains of plants and animals, methods of storing and selling, and techniques of producing agricultural byproducts), and 3) to enhance agricultural knowledge of their state residents. To achieve these purposes, this university sets proper curriculum to cultivate personnel best fitting to the agricultural condition of its state, applies a series of approaches of agricultural extension to spread agricultural knowledge to ordinary peasants, and keeps researching on the practical agricultural problems of New York state to figure out resolutions.”⁹⁰

Zou Bingwen believed that this model should be a direction for the development of the new educational institution in China, and each Chinese province should establish agricultural schools similar to his scheme—although he was quite aware that the expense of money and qualified agricultural personnel for his scheme was beyond the ability of almost all provinces. According to his expectation, each agricultural university should have an annual budget of at least 500,000 *Yuan*, five times that of the richest existing agricultural college and university agricultural schools. Considering the chaotic political conditions and the poor economic situation of China, it was a Utopian dream to put his scheme into practice. As a compromise, Zou proposed that the ministry of education should first establish at least five agricultural universities based on the existing

⁹⁰ Zou Bingwen, *Agricultural Education in China*, pp. 54-55.

agricultural colleges.⁹¹ As for funding, he suggested to allocate part of the Customs revenue from agriculture and the Boxer Indemnity to agricultural education. He also suggested that provinces near the agricultural universities should take on the duty to provide financial support to supplement the national allocation, because agricultural universities would definitely benefit these provinces.⁹² This was the strategy Zou Bingwen and Guo Bingwen had tried out at the Southeast University. These suggestions showed how the reformist scholars attempted to negotiate with and adapt to the turbulent context in order to save and improve their country with the ideas and knowledge they had learned. However, in chaotic China at this time, even such a compromise could not work. The trouble at the Southeast University was a good example, which I will explore in the next section of this chapter.

Almost at the same time when Zou Bingwen was composing his *Agricultural Education in China*, other Chinese scientists and agriculturalists were seeking ways to improve agricultural education as well. For example, in 1922, Hu Heru⁹³ (胡鹤如, also named Hu Zi'ang 胡子昂, 1897-1991), a student at the Beijing Agricultural College, started a journal *New Agriculture* (《新农业》) to disseminate and extend modern agricultural knowledge to the public—especially peasants. The *New Agriculture* included

⁹¹ Zou Bingwen, *Agricultural Education in China*, p. 49.

⁹² Zou Bingwen, *Agricultural Education in China*, pp. 44-45 & pp. 49-50.

⁹³ Hu Zi'ang (Hu Heru, 1897-1991) was a famous political activist in twentieth-century China. He had promoted to reform the Beijing Agricultural College into a full university in 1922. After graduating from the Beijing Agricultural University, he had spent over twenty years establishing and improving industry in southwest China. In 1945, disappointed by the bureaucrat-capitalist enterprises of the Nationalist government, Hu gave up his earlier belief of saving the country by improving industry and turned to democratic construction in China. After 1949, he served as vice president of the Chinese People's Political Consultative Conference.

articles exploring the situation and improvement of Chinese agricultural production and education, as well as popular scientific writings dealing with practical problems in agriculture. In 1922, Hu Heru wrote a series of articles for this journal, such as “Main Purpose of Publishing the *New Agriculture*,” “How is Agricultural Education in China? How should it be?” and “The Agricultural University in China’s Agricultural Education.”⁹⁴ In these articles, Hu Heru pointed out many critical problems for the development of agricultural education in China and proposed his ideas about agricultural improvement. Hu had stressed some important issues that appeared in Zou Bingwen’s writings as well, such as the importance of fitting into local conditions within China and establishing agricultural universities. Hu’s estimate for the running fee of an agricultural university was very close to Zou’s (“five hundred thousand should be enough”⁹⁵). In addition, similar to Zou Bingwen, Hu Heru was asking for allocations from the Boxer Indemnity and Customs income to support agricultural education.⁹⁶ This should not be a merely coincidence or an agreement between them. At that time China was suffering from severe civil wars. It seemed that funding related to foreign affairs was the only available stable and reliable financial source that would not be interfered with by the

⁹⁴ See *The Compilation of Historical Archives of the Chinese Agricultural University, 1905-1949*, vol. 1, pp. 223-231.

⁹⁵ *The Compilation of Historical Archives of the Chinese Agricultural University, 1905-1949*, vol. 1, p. 229.

⁹⁶ *The Compilation of Historical Archives of the Chinese Agricultural University, 1905-1949*, vol. 1, pp. 229-230.

conflicts among warlords. Therefore, almost all reformist educationalists and scholars were thinking about these funds.⁹⁷

However, the two authors showed significant differences as well. For example, Hu Heru's articles provided less data and specific examples—largely because the author was still in college and not able to conduct comprehensive surveys as Zou Bingwen did. But more important, these articles reflected the thoughts of Chinese scholars without American educational background, which were different from the pattern of Zou's understandings. In addition, they also reveal that the local social atmosphere might have shaped the authors' ways of thinking. Hu Heru's experience in Beijing, the political center and the main stage of the New Cultural Movement, made him pay more attention to the agricultural educator's responsibility of enlightening Chinese people and of building up a new social value system. For example, just as Zou Bingwen did in his 1923 book, Hu Heru also discussed the lack of educated agricultural practitioner at primary level in his article:

“Over 80% of Chinese people are peasants with little education and not aware of ... (modern) agricultural methods. ... While educated ‘Agriculturists’

⁹⁷ For example, in the early 1920s, leaders of the Science Society of China were appealing that “some of the income from Boxer indemnity funds should be used to establish national learned societies and to subsidize laboratories and museums operated by those entities; that another part of the same money should be used to support research institutes within China's colleges, and universities; that those colleges and universities should cooperate with the ministries of agriculture and commerce and education in creating independent research centers; that the Chinese government should follow the lead of the American government and develop a National Academy of Science and a National Research Council.” See Peter Buck, *American Science and Modern China, 1876-1936*, Cambridge University Press, 1980, pp. 161-162.

... seldom practice agriculture in the rural areas and do not have the sense of duty to educate the peasants and improve agriculture at all!”⁹⁸

The difference was that Hu Heru was inclined to criticize a general view among common Chinese people that officialdom was the natural outlet for scholars and that people not wishing to be officials did not need education at all. He encouraged his contemporaries endeavoring to change this situation by “research, extension, lecturing in practice to realize our ideals” in order to “awaken the peasants and improve agriculture (觉悟农民, 改进农业).”⁹⁹ Scholars in Nanjing, the city far away from the center of politics and the New Cultural Movement, such as Zou Bingwen, usually seemed less critical of the old Chinese traditions and less passionate in enlightening the peasant—at least they did not use the same type of expressions as those scholars in Beijing had done.

Another example was that, both Zou Bingwen and Hu Heru agreed that the agricultural university should be the highest agricultural educational institute. However, Zou Bingwen considered the main purposes of agricultural university as research, education, and extension, which was similar to those of American agricultural universities, while Hu Heru described the aim of establishing agricultural universities as “Common people still have doubts about agricultural education. We must have a powerful highest organization to conquer the thoughts of common people. In order to arouse the awareness and attention of our country people, it is necessary to establish

⁹⁸ *The Compilation of Historical Archives of the Chinese Agricultural University, 1905-1949*, vol. 1, p. 225.

⁹⁹ *The Compilation of Historical Archives of the Chinese Agricultural University, 1905-1949*, vol. 1, p. 225.

large-scale agricultural university. Or we will fail!” and that “Agricultural university was a leading organization integrating the entire agricultural education. It has the duty and function of directing and administrating agricultural production all over the country.”¹⁰⁰ Again, the enlightenment spirit of the New Cultural Movement appeared in Hu’s writings. Moreover, as a student at the Beijing Agricultural College, a branch of the Peking University and the highest agricultural educational institute at the political center, Hu Heru had been impacted by the remaining ideologies of the Imperial University, which included in its principles not only academic and educational but also social and political responsibilities for Chinese intellectuals.

Therefore, by the early 1920s, there were Chinese agricultural scholars with different backgrounds and different ideas advocating reform and improvement in agricultural education, especially higher education in universities and colleges, in China. Their major goals were similar, but because of their dissimilar experiences and environments, the specific approaches they were planning to adopt were distinct. For intellectuals at Beijing, where old-school Chinese intellectual traditions and political movements were influential and active, agricultural reformers were advocating the awakening and enlightening of the farming people. Meanwhile the American-trained agriculturalists were stressing improving agricultural science to promote agricultural production. The reason of their preference was probably that these agriculturalists were deeply impressed by the fact that American agricultural production had been largely elevated by adoption of advanced agricultural science and techniques. Therefore,

¹⁰⁰ *The Compilation of Historical Archives of the Chinese Agricultural University, 1905-1949*, vol. 1, p. 229.

compared with scholars without an American background, these American-trained agriculturalists were more inclined to consider agricultural science or scientific agriculture as the most critical approach to saving and improving China. The comparison between Zou Bingwen and Hu Heru's contemporaneous propositions of serving China through agriculture perfectly illustrate how American training might influence Chinese scholars.

1.3.2 Agricultural Science as the Primary Solution to Improve China

During the decade from the late 1910s to the 1920s, it seemed that the methods adopted by American-trained scientists were more promising in scientific research and higher education. With the Nanjing Higher Normal School/Southeast University as their base, agricultural educationalists such as Zou Bingwen and Guo Bingwen had gathered the highest-level scientists and most abundant funds to realize their plans—to conduct agricultural research, education, and extension in the regions around Nanjing. In this way the Southeast University was able to both benefit local agricultural production and maintain academic communication with western academic organizations. However, Zou's research, education, and extension required a large amount of funding and a stable social environment, which was almost impossible to maintain under the chaotic social and political circumstances during the Warlord Era. Without a powerful central state, it was impossible for Zou to establish the type of agricultural institution he proposed in *Agricultural Education in China*. In 1923 and 1924, even Zou's university, the National Southeastern University, did not receive its annual funds from the Jiangsu government.

Therefore he had to turn to private and foreign funds for help. Interestingly, although Zou Bingwen and Hu Heru had different opinions about agricultural science and education, they both considered the Boxer Indemnity Scholarship as the most possible financial source for improving agricultural education in China, because in the turbulent warlord era, foreign funds seemed much more reliable than those from Chinese governments. In 1925, Zou Bingwen applied to the China Foundation (this foundation was reformed from the Boxer Indemnity Scholarship in 1924) to support cotton research and extension at the Southeastern University. In his application letter, Zou expressed how disappointed he was in the Beijing central government by saying that the central government had paid little attention to the promotion of agriculture.

“It seems to us, who have specialized in agriculture and served in higher agricultural institutions for a number of years, that one of the most important enterprises to be undertaken in present-day China is the development of agriculture, since this is the occupation of three hundred million farmers, or about eighty percent of the total population. Our Central Government has long paid little attention to the promotion of this occupation. Even though it has done a little along this line, it has hardly acquired and practiced a well-devised system; therefore no result can be specially mentioned.”¹⁰¹

Zou also explained why agriculture deserved more attention and support by saying “agriculture is the occupation of three hundred million farmers” and “all the existing

¹⁰¹ Zou Bingwen’s 1925 letter to the Board of Trustees of the China Foundation for the Promotion of Education and Culture, Collections of Harry H. Love, File #890, materials of Tsou P.W. 1925-1937.

problems in China can be best solved by the development of her agriculture.” He exemplified these arguments that:

“Improving agriculture was the fundamental way to improve the country’s income and to solve all problems related with financial crisis...Soldiers have now become the chief factors in local disturbance and violence. Most of them were originally farmers. ... if the living conditions of the farmers were improved by the development of agriculture few rural people would choose to be soldiers and the militarists would lose their power and could easily be done away with. It is in this way that China can be brought to a peaceful condition...There is no better way to stop militarism and to eliminate the baneful practices of the selfish politicians than to give the majority of the farmers sufficient education to enable them to participate in political and social activities. ...the source of large sums of money for promoting public education in the future must be the land.”¹⁰²

Clearly, according to Zou Bingwen, agricultural research was the fundamental solution for eliminating poverty, enhancing public education, enriching the people and the country, eliminating warlordism and finally unifying the country. These words represented the opinions of the leading agricultural scientists at that time, according to my research. In addition, considering Zou’s position in higher education, numerous younger scholars had developed similar ideas under Zou’s influence.

¹⁰² Ibid.

Zou successfully received a three-year grant of \$35,000 from the China Foundation to support crop improvement research at the Southeastern University. However, he was not able to finish this research. After 1926, the Chinese Nationalist Party and its alliance warlords launched a Northern Expedition and got closer and closer to Nanjing. Faculty and students at the Southeastern University were involved in the political strife. Zou Bingwen and his family belonged to a political faction disagreeing with the Nationalist government, so he was forced to leave this city and his agricultural college in 1927. Luckily Zou Bingwen did not have to leave agriculture. When the situation settled down, Kong Xiangxi (孔祥熙), one of Zou's close friends, became a leader in the Nationalist Central government in charge of economics. Kong helped Zou get some critical positions in finance and politics. Zou Bingwen did not take official position in the Nationalist government, but he continued working on improving agriculture by serving as senior advisor for governmental departments. More important, he took advantage of his status in finance and sponsored a series of agricultural activities. Although he left scientific research and education, Zou helped the works of a large number of agricultural scientists during the 1930s and 1940s.

Zou's later career is beyond the scope of my dissertation. However, I have to point out that, by the time that *Agricultural Education in China* was first published, Zou Bingwen and his colleagues at the Southeastern University did not realize that the essentially different social and political situations, economic structures, and cultural traditions between China and America determined that it was almost impossible for Chinese scholars to fulfill the desire of improving China merely through applying the

American model of agricultural science and education. Due to various interruptions from non-academic external factors, such a thriving situation was hard to sustain in chaotic China at this time. I will return to Guo Bingwen and the fate of intellectuals in the very turbulent political atmosphere in the next section to illustrate how tough it was for Chinese scholars to figure out a feasible strategy to realize their desire of serving China through knowledge and science.

1.4 Guo Bingwen, “Cultivating Capable People for the Country,” and Efforts at the Southeastern University

Guo Bingwen’s courageous and resolute efforts and strong sociality enabled him to gather the best faculty in China and quickly build the Southeastern University into the most promising university in China. But his ambitious program also caused problems. Guo was very capable in persuading high-level scholars to join his university, but he failed in, or did not pay attention to, keeping effective communication and interaction with his faculty. Although he endeavored to build up a free and democratic atmosphere at the Southeastern University, when facing disagreement from colleagues, he was inclined to suppress dissent with presidential authority, which usually intensified his colleagues’ discontent.¹⁰³

On the other hand, the total number of well-educated scholars in China was extremely small in the 1910s and early 1920s and the institution of scientific research and

¹⁰³ Xu, Xiaoqing, *ZhengJu Yu Xuefu: Cong DongNan DaXue Dao ZhongYang DaXue 1919-1937 (Politics and Universities: From the Southeastern University to the Central University, 1919-1937)*, Beijing: China Social Sciences Press, 2009, chapter 1.

higher education was extremely undeveloped. Guo Bingwen spared no effort to draw outstanding educators and researchers to his university, which was highly effective for building the Southeastern University an institute conducting top-level research and education and communicating with western universities. However, his manner did not always bring positive effect on the development of Chinese science and higher education. Even Tao Xingzhi, one of Guo Bingwen's early followers and supporters, expressed disagreement with Guo's policy of draining other Chinese institutes of the top scholars. For example, in November 1920, Tao heard that Guo Bingwen planned to compete with the private Nankai University at Tianjin for Zhong Xinxuan (钟心焯, 1892-1961), a plant scientist with a masters degree of botany from Harvard University. He wrote to Guo at once, saying that,

“We are running the normal school to cultivate capable people for the country. Boling¹⁰⁴ is running Nankai University to cultivate capable people for the country as well. Cultivating people for the same country, if we gain, Nankai will lose. Considering the entire country, such competition won't help. Organizations should take care of friendship just like individual people. We should take care of our relationships with institutes in Nanjing as well as those with Peking University and Nankai University, and not to hurt the friendship. ... Considering improving the faculty, it is better to cultivate for ourselves than to grab from others. ... I understand Mr. Zou Bingwen's enthusiasm for

¹⁰⁴ Zhang Boling (张伯苓), founder and president of the private Nankai University.

development, but our improvement and development should not hurt other institutes.”¹⁰⁵

Although Guo Bingwen accepted Tao’s suggestion at that time and did not employ Zhong Xinxuan, it was inevitable that he would hurt the relationship with other Chinese educators during his expansion of the Nanjing Higher Normal School/Southeastern University.

The most critical troubles for Guo Bingwen were the university financial situation and his political position. Guo advocated the idea that academic institutes like universities should keep autonomy and not be political. But such an idea was totally impractical in China during the early Republican era. The Nanjing Higher Normal School was funded by the Jiangsu provincial government. When it transformed into the Southeastern University, the central government in Beijing endowed it with a “national” status, which meant a duty to recruit students from the entire country, but did not provide direct financial support. Instead, the Ministry of Education at Beijing government requested four provinces in southeast China—Jiangsu, Anhui, Jiangxi, and Zhejiang—to fund the Southeastern University. Governors of these four provinces belonged to three cliques of warlords and they were fighting against each other in the early 1920s. Although Guo Bingwen and his colleagues repeatedly requested funding, the provincial governments always declined to provide funding with the excuse of tight budget (but they always had the money for warfare!). Only the Jiangsu provincial government performed its duty, and it actually supplied two-thirds of the running expenses of the Southeastern

¹⁰⁵ Tao Xingzhi, “It is better to cultivate for ourselves than to grab from others—to Guo Bingwen,” *The Complete Works of Tao Xingzhi*, vol. 8, Sichuan Education Press, 1991, 222-223.

University. As a result, Guo Bingwen had to suspend his idea of academic autonomy and to seek private funding from social and political forces. His personal networks helped a lot in this situation. For example, he maintained close relationship with Qi Xieyuan (齐燮元), the warlord governing Jiangsu from 1920 to 1924, and Qi made a personal donation which enabled construction of the library of the Southeastern University. During 1922-1924, with the assistance of Paul Monroe, his advisor at Columbia University, Guo succeeded in applying for funding from the Rockefeller Foundation to construct the science building and biology building. Monroe and evaluators from the Rockefeller Foundation believed that the Southeastern University was the most high-quality university operated by Chinese people capable of conducting serious, world-level scientific education and research.¹⁰⁶

However, the turbulent political situation did not allow steady development for the Southeastern University. After two fierce battles with Zhejiang province, the Jiangxi provincial government ran out of money and its allocation for this university decreased 30% in 1924. Compared with 1923, the total income of the Southeastern University decreased more than 40% in 1924. Under this financial pressure, Guo Bingwen decided to close the section of engineering and department of western literature in the section of liberal arts and sciences. All faculty and students at these programs were dismissed and had to leave the Southeastern University for other places. This action significantly irritated the faculty and students. Although the termination of these programs was forced

¹⁰⁶ *The Centennial Records of Nanking University—Historical Materials of the University of Nanking*, Nanjing University Press, 2002, volume 1, Section of the Nanjing Higher Normal School and the Southeastern University.

by financial shortages, many faculty members believed that Guo Bingwen was taking this chance to expel scholars disagreeing with him. One of them was Yang Xingfo, who traveled to Guangzhou in October 1924 and became the secretary of Sun Yat-sen, premier of the Nationalist Party at that time.¹⁰⁷

In the early Republican era, political infighting and chaos was the rule. It was the time when Sun Yat-sen led the Nationalist Party and troops from Guangdong province to ally with several cliques of warlords to fight against the Zhili clique of warlords which was controlling the Beijing government. In October 1924, because of a coup at Beijing, the Anhui clique of warlords replaced the Zhili clique and controlled the Beijing central government. Qi Xieyuan, the warlord and president of Jiangsu province, belonged to the Zhili clique of warlords. In December, the new Beijing government commanded non-Zhili-clique warlords to attack Qi Xieyuan, and Qi Xieyuan was forced to relinquish power. As a result, Guo Bingwen lost his most important patron. Because of Guo's close relationship with Qi, the Anhui-clique warlords considered Guo as a follower of the Zhili-clique warlords and did not like him at all. To make things worse, the new rulers at Beijing government invited Sun Yat-sen to be counselor. Sun's secretary Yang Xingfo, the scholar who was forced to leave the Southeastern University by Guo Bingwen several months before, were able to reach the top politicians at this country, and he decided to seek justice for his unfairly treated colleagues at the Southeastern University. Yang Xingfo united the scholars discontented with Guo Bingwen and accused Guo of colluding

¹⁰⁷ For political situation during this period and the lives and careers of Yang Xingfo, see Bai, Shouyi, Wang Huilin, Guo Dajun, and Lu Zhenxiang, eds. *ZhongGuo TongShi DiEr Ban: Di ShiEr Juan, JinDai (The General History of China, Second Edition: Volume Twelve, Modern Period 1919-1949)*, Shanghai Renmin Press, 2013, No. 21

with Zhili-clique warlords to the Ministry of Education. Yang also recommended one of his closest friends, Hu Dunfu (胡敦复, 1886-1978, a mathematician and educationalist), to succeed Guo in the position of university president. Hu had not been involved into political affairs before. He had served as dean of Tsinghua College and taken charge of selecting Boxer students, was the founder and president of a private university at Shanghai, and was a chief leader of the Science Society of China. Yang believed that Hu would be acceptable for many people to succeed Guo in running the Southeastern University.

On January 6, 1925, the Ministry of Education signed an instruction to dismiss Guo Bingwen and appointed Hu Dunfu to take the position of president of the Southeastern University. This news surprised and upset part of the faculty and students at the Southeastern University. Despite Hu's non-political background and the political indifference of most scholars and students at the Southeastern University, some radical scholars considered Hu Dunfu and Yang Xingfo as representative of the Nationalist Party, which they heartily disliked. They broadcast public announcements, wrote to Guo Bingwen, and telegraphed the Ministry of Education (in the name of all faculty and students), trying to keep Guo as the university president. Radical students even forced Hu Dunfu to sign a declaration saying that he would never be president of the Southeastern University. There were well-known people outside the university who supported Guo, and they questioned the Ministry of Education's instruction as an abuse of political power over academic and educational autonomy. However, soon some other faculty stood out and accused Guo of being too involved in politics and hurting educational democracy

within the university. Conflicts between the two groups of faculty arose and worsened quickly. In February 1925, Guo decided to leave the Southeastern University permanently and set out for the United States and Europe. However, the strife triggered by his dismissal continued for nearly one year. Faculty and students with different ideas quarreled, debated, and conflicted violently with governmental officials sent by the Anhui-clique-warlord government. Situations worsened beyond most people's—including Yang Xingfo and Guo Bingwen's—expectation and the university was almost paralyzed. It was not until October 1925, when Sun Chuanfang (孙传芳), another Zhili-clique warlord, seized Nanjing that the Southeastern University got back to normal. Jiang Zhuzhuang (蒋竹庄), an educator and Buddhist scholar, became the university president and ran this university until 1927, when the Nationalist government completely controlled Nanjing and the nearby provinces.¹⁰⁸

During the strife of changing the university president, a large group of faculty left the Southeastern University—some left by their own initiative; some were forced to leave by their colleagues. For example, almost all leaders of the Science Society of China left and became presidents or deans of other Chinese universities such as the Yenching University in Beijing, Sichuan University in Chengdu, and Zhejiang University in Hangzhou. Most leading scientists at the department of physics moved to Tsinghua University, Beijing. As a result, Tsinghua replaced the Southeastern University as the pre-eminent center for physics in China. As for the section of agriculture, Zou Bingwen

¹⁰⁸ For details of the strife of changing university presidents, see Xu Xiaoqing, *ZhengJu Yu XueFu*, section 1.4 and chapter 2.

stayed until summer 1927, when the Nationalist Party replaced Sun Chuanfang to govern the Nanjing area, but almost half of the professors under him left in 1925 and 1926 due to endless personnel conflicts. Chen Zhen moved to Beijing and joined the department of biology at the Tsinghua University, while Guo Tanxian, Qian Chongshu, and Dai Fanglan stayed in Nanjing, but joined the University of Nanking (Jinling University, 金陵大学), the unquestioned top missionary university in China at that time. I will explore this missionary university run by American missionaries and intellectuals and the patriotic Chinese agriculturalists working there in the next chapter.

1.5 Summary

The so-called Warlord Era (1916-1928) was a very turbulent period in Chinese history. Chaotic and continuously changing political situation inevitably disturbed academic and scientific research and education. This era was also the period when the first-generation American scholars returned to China and endeavored to apply their knowledge to saving and serving China. The agricultural college in Beijing was the first attempt of higher agricultural education in modern sense, which introduced the Japanese and German traditions and largely popularized the ideology of saving and serving China through scientific approaches. But it gradually fell behind when American-trained scholars gathered in Nanjing and established an institution hybridizing the American model (education, research, and extension, three-in-one) with Chinese conditions. Scholars such as Guo Bingwen and Zou Bingwen succeeded in developing the National

Southeastern University into a center of agricultural science in China at that time.

Because of extremely complicated and turbulent political and personnel conflicts, both Guo and Zou were forced to leave this university. However, their efforts laid the foundation for the accomplishments of later national agricultural institutes, as I will explore in the later chapters.

Table 1. Surveys on Primary Agricultural Schools across the Country, by the Agricultural Section at the Nanjing Higher Normal School in 1919¹⁰⁹

-Numbers of faculty and students of primary agricultural schools

| | maximum | minimum | average |
|----------|---------|---------|---------|
| faculty | 13 | 3 | 6 |
| Students | 108 | 20 | 54 |

-Graduates from primary agricultural schools

| Graduate whereabouts | number | percentage |
|--|--------|------------|
| Secondary or higher agricultural schools | 257 | 15% |
| Governmental agricultural departments | 77 | 5% |
| Agricultural business | 917 | 55% |
| Other careers | 176 | 11% |
| unemployed | 234 | 14% |
| total | 1661 | 100% |

-Family background of students at primary agricultural schools

| | Number | percentage |
|----------------------|--------|------------|
| Peasant families | 1220 | 61% |
| Non-peasant families | 433 | 22% |
| unclear | 241 | 17% |
| total | 1994 | 100% |

-New students from 1916 to 1918

| Year | Numbers of students |
|------|---------------------|
| 1916 | 698 |
| 1917 | 688 |
| 1918 | 608 |

Table 2. Numbers of Faculty and Students of Primary Agricultural Schools, by the Ministry of Education in 1917¹¹⁰

| | |
|---------------------|------|
| Schools | 161 |
| Faculty | 774 |
| Faculty per school | 5 |
| Students | 6103 |
| Students per school | 38 |

¹⁰⁹ Zou Bingwen, pp. 11-12.

¹¹⁰ Zou Bingwen, p. 13.

Table 3. The Number and Distribution of Agricultural Schools in China in 1923¹¹¹

| | Agricultural Universities* | Agricultural Colleges* | Secondary Agricultural Schools | Primary Agricultural Schools |
|--------------|----------------------------|------------------------|--------------------------------|------------------------------|
| Jiangsu | 3 | | 5 | 20 |
| Zhejiang | | | 4 | 15 |
| Anhui | | | 7 | 7 |
| Jiangxi | | 1 | 5 | 3 |
| Hubei | | | 1 | 20 |
| Hunan | | | 6 | 7 |
| Sichuan | | 1 | 2 | 3 |
| Zhili | | 2 | 5 | 11 |
| Shandong | | 1 | 3 | 75 |
| Shanxi | | 1 | 12 | 28 |
| Henan | | 1 | 13 | 63 |
| Shaanxi | | | 2 | 21 |
| Gansu | | | 1 | 2 |
| Guangdong | 1 | 1** | 3 | 1 |
| Fujian | | | 3 | 1 |
| Guangxi | | | 1 | |
| Yunnan | | | 2 | 33 |
| Guizhou | | | 1 | 3 |
| Fengtian | | | 1 | 4 |
| Jilin | | | 1 | |
| Heilongjiang | | | 1 | 12 |
| Total | 4 | 8** | 76 | 329 |

* In this table “Agricultural Universities” (“农业大学” in Zou Bingwen’s original writings) refer to universities with agricultural school or departments. “Agricultural College” (“农业专门学校”) refers to schools or institutes specializing in agricultural training at college level.

** This college might be the Guangdong Public Agricultural College (广东公立农业专门学校), which reformed from a professional school into a full college during 1922-1924 under the administration of Deng Zhiyi (邓植仪). It seems that Zou Bingwen did not count this school as a college when writing the first chapter of his *Agricultural Education in China*, (Zou, p. 5).

¹¹¹ Zou Bingwen, “Present and Future of Agricultural Education in Our Country”, *Agricultural Education in China*, pp. 25-26.

Table 4. Agricultural Colleges in China, 1921¹¹²

| | Programs | Number of students | Number of faculty | Number of staffs | Annual funds ¹¹³ |
|--|---|--------------------|-------------------|------------------|-----------------------------|
| National Beijing Agricultural College (国立北京农业专门学校) | Agriculture, forestry | 189 | 33 | 25 | 100,080 |
| Zhili Public Agricultural College (直隶公立农业专门学校) | agriculture | 201 | 27 | 8 | 43,904 |
| Jiangxi Public Agricultural College (江西公立农业专门学校) | Agriculture, forestry | 128 | 16 | 9 | 19,245 |
| Shandong Public Agricultural College (山东公立农业专门学校) | Agriculture, forestry, sericulture | 188 | 21 | 24 | 42,518 |
| Henan Public Agricultural College (河南公立农业专门学校) | Agriculture, forestry | 100 | 13 | 13 | 32,734 |
| Shanxi Public Agricultural College (山西公立农业专门学校) | Agriculture, forestry, veterinary | 470 | 39 | 21 | 51,706 |
| Sichuan Public Agricultural College (四川公立农业专门学校) | Agriculture, forestry | 157 | 24 | 18 | 38,880 |
| Total | | 1433 | 173 | 118 | 329,067 |
| Comments | This table only includes seven colleges. Guangdong Agricultural School has not been listed. In addition, the agricultural section at the Southeastern University should be counted as a college of higher agricultural education. | | | | |

¹¹² Hu Heru, “How is Chinese Agricultural Education? How should it be?” “Table A: Checklist of Agricultural Colleges in China—based on the 1921 checklist of agricultural colleges by the Department of Special Education in the Ministry of Education”, 1922, See *The Compilation of Historical Archives of the Chinese Agricultural University, 1905-1949*, vol. 1, pp. 227-228. (胡鹤如, “中国的农业教育是怎样? 该怎样?” 表 A. 全国农业专门学校一览表——根据民国十年教育部专门教育司编印全国农业专门学校一览表, 1922 年, 见《中国农业大学史料汇编 1905-1949》上册, 第 227-228 页)

¹¹³ The unit should be silver dollar issued by the Beijing government—from 1912 to 1935, each province might have its own currency, and the exact currency value is not clear in Hu Heru’s article, so my numbers are estimates.

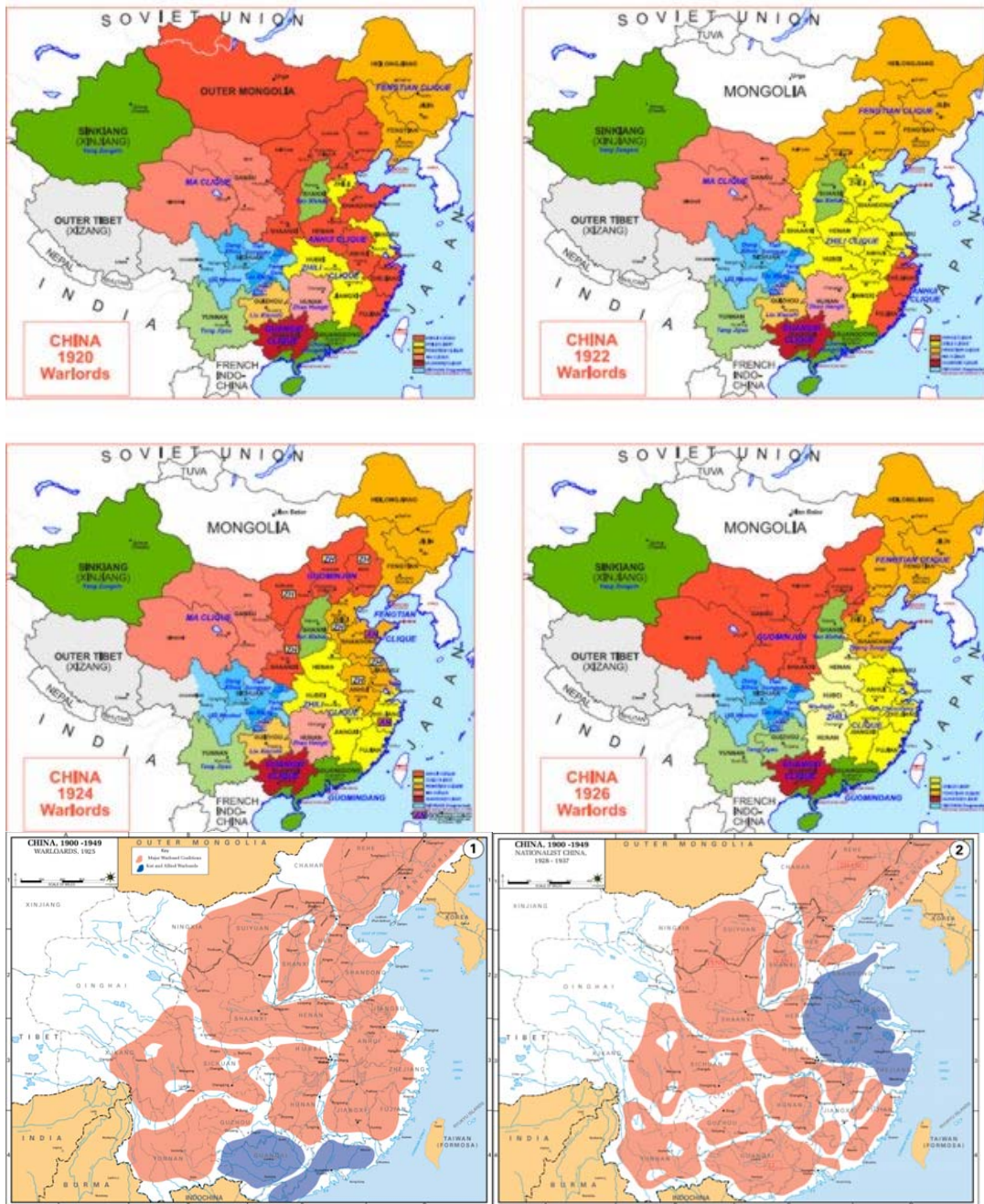


Figure 3 Maps of the political situation of China in the 1920s; painted by French mapmakers (EurAtlas, Historical Maps, HisAtlas, Historical and Political Maps of China, <http://www.euratlas.net/history/hisatlas/china/index.html>) and Atlases at the United States Military Academy (<http://www.usma.edu/history/SitePages/Our%20Atlases.aspx>). There were many mistakes in these maps, but we can still see how westerners understood China's political forces and how chaotic the situation was at that time.

COLLEGE OF AGRICULTURE
NATIONAL SOUTHEASTERN UNIVERSITY
NANKING, CHINA

June 1, 1925

To the Board of Trustees of the
 China Foundation for the Promotion
 of Education and Culture.

Gentlemen:

It is a considerable pleasure to the Chinese people to know that the Board of Trustees of the China Foundation for the Promotion of Education and Culture plans to invest the American indemnity fund in some enterprise that will benefit the Chinese public as a whole. It seems to us, who have specialized in agriculture and served in higher agricultural institutions for a number of years, that one of the most important enterprises to be undertaken in present-day China is the development of agriculture, since this is the occupation of three hundred million farmers, or about eighty percent of the total population. Our Central Government has long paid little attention to the promotion of this occupation. Even though it has done a little along this line, it has hardly acquired and practised a well-derived system; therefore no result can be specially mentioned. It is therefore our sincere hope that through your enthusiastic help and guidance to promote agricultural improvement in China fruitful results may follow a few years. This will not only in the end benefit the three hundred million farmers but will enlighten and lead all the national and provincial agricultural institutions in the right and progressive path of development. We therefore in the following paragraph outline the reasons and methods of developing Chinese agriculture and to this we wish to invite your sympathetic deliberation and assistance for the welfare of the majority of our Chinese people.

I. Reasons for devoting a portion of the American indemnity fund to the improvement of agriculture.—That a portion of the indemnity should be invested in agricultural enterprises is desired not only because agriculture is the occupation of three hundred million farmers but also because all the existing problems in China can be best solved by the development of her agriculture. The reasons are as follows:

(1) The poverty and distress of the farming classes have reached their climax. In good years their income is just enough to pay for their food and clothing; while in time of famines they suffer cold and hunger and very often death. According to the International Famine Relief Commission, usually several hundred thousand people need relief in a famine year and thousands die of cold and hunger. In order to save thousands of lives from the ravages of droughts and floods, mountains and river banks should be reforested and dry farming system should be practised. The economic conditions of the farmers should also be improved so that they may have some savings on which they may live in famine years.

(2) Soldiers have now become the chief factors in local disturbance and violence. Most of them were originally farmers who, because of cold and hunger due to too small an income from farming, preferred to enter the army. But if the living conditions of the farmers were so improved by the development of agriculture few rural people would choose to be soldiers and the militarists would lose their power and could easily be done away with. It is in this way that China can be brought to a peaceful condition.

(3) There is no better way to stop militarism and to eliminate the baneful practices of the selfish politicians than to give the majority of the farmers sufficient education to enable them to participate in political and social activities. But how can rural education be promoted unless agriculture is developed to increase the income of the tillers of the soil?

(4) About seventy percent of the educational expense in China are derived from land taxation. Therefore the source of large sums of money for promoting public education in the future must be the land. Should the productiveness of land be not improved and increased there will never come a day in which education would spread over the country.

Figure 4 Zou Bingwen's 1925 letter to the China Foundation

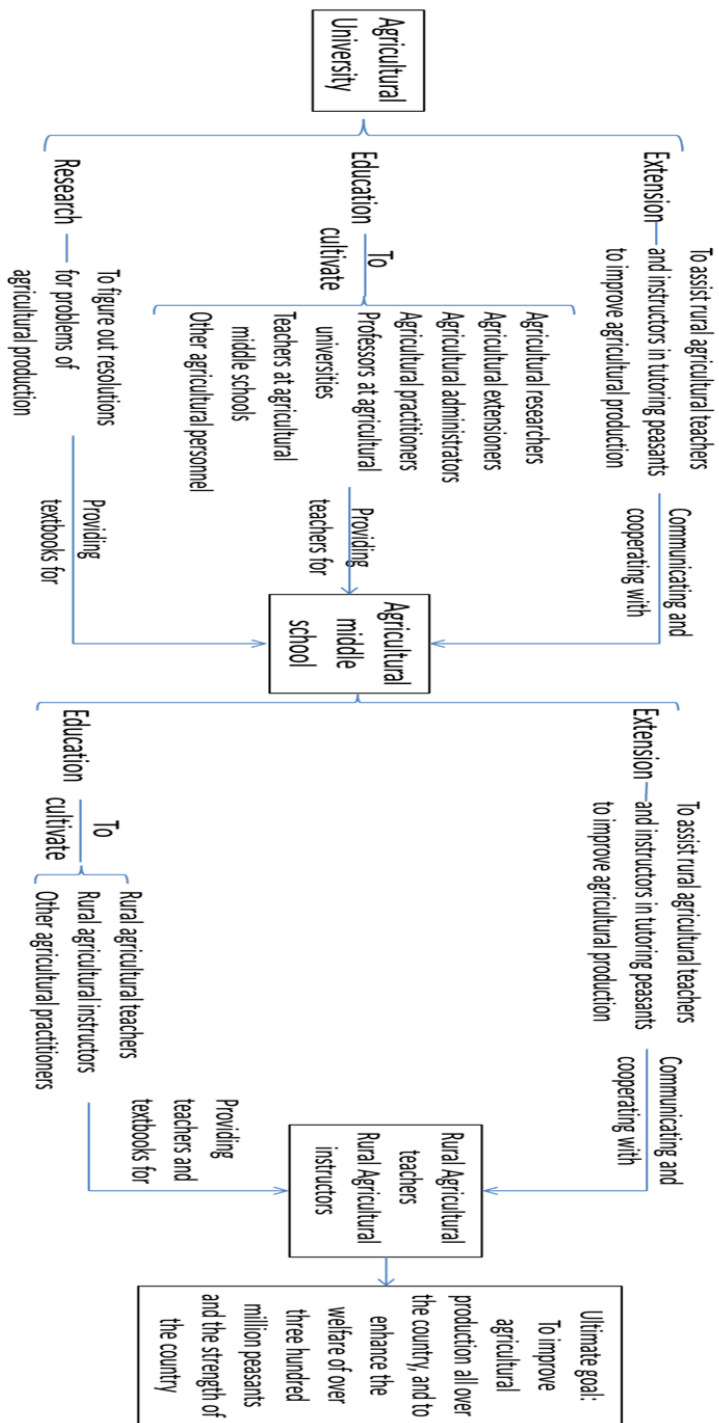


Figure 5 Zou Bingwen's scheme for agricultural schools in each province (Zou Bingwen, *Agricultural Education in China*, Shanghai: Commercial Press, 1923, pp. 42-43 & 57-58.)

Chapter 2 Agricultural Science in the Missionary University: The College of Agriculture and Forestry at University of Nanking, 1910s-1930s

As we have seen in the first chapter, the very chaotic and continuously changing political circumstances made it extremely difficult for agricultural scientists to have a stable working environment. Therefore the first-generation scientists could hardly concentrate on systematic scientific research, but usually had to change to industry, politics, or education. Over 80% of American-trained Chinese agriculturalists returning China in the 1910s left agriculture-related studies because they were not able to find a suitable position. During the warlord era, even top universities were inevitably involved in political conflicts and were not able to guarantee the scientists' long-term research. The only exception was missionary universities sponsored by western funding. Because of China's semi-colonial status in the first half of the twentieth century, westerners in China enjoyed priority in daily life and public security. Therefore missionary universities were less disturbed by the chaotic social environment than the Chinese universities and colleges. Moreover, when Chinese institutes such as the Southeastern University were always struggling for funding, financial support from western Christian organizations seemed much more reliable and continuable. Missionary universities could provide more guarantees for scientific research and education, and therefore could attract a considerable number of capable intellectuals to study and work there.

However, the advantages of missionary universities were largely based on the privilege of powerful western foreign countries in China. This type of school had been established in China since the late nineteenth century, when China lost in a series of wars with western powers. Missionaries from European and American countries got permission to establish schools based on privileges that foreigners gained through unequal treaties. The missionary schools were operated and funded by western people, outside the control of Chinese officials. Their initial purpose was usually to spread Christianity and to cultivate Chinese personnel for missionary activities. Since the early 1900s, when Chinese governmental powers were remarkably weakened and not able to support agriculture and medicine, the missionary educators, especially those in missionary colleges, changed their focus to practical knowledge such as agriculture and medicine, which could improve the welfare of Chinese people (and convince them of the advantages of western Christianity). Therefore scholars in missionary universities composed a significant part of the agricultural sciences in Republican China.

We have to keep in mind that, even though these missionary educators were enthusiastic and sincere in wanting to improve the lives and welfare of Chinese people, it was not easy to tell whether their ultimate goal was to make China stronger and more competitive among the powerful countries, or to make more Chinese people convert to Christianity, or both. In this sense, these missionary educators were fundamentally different from the American-trained Chinese scientists, who had a clear motivation to improve the lives of Chinese people and China's international status in the world with their knowledge. As a result, patriotic Chinese scholars working in missionary schools

were facing conditions different from scholars in national institutes, which meant that they had to take different strategies to fulfill the desire of serving China through agricultural science. Therefore I decided to devote a separate chapter here to exploring their careers. The patriotic Chinese scholars in missionary universities held strong love and loyalty for China as their mother country, which meant that these scholars shared similar goals as their colleagues in national institutes: serving China through science and knowledge. But as we will see, their strategies were different because of the missionary universities' closer connection with the westerners.

2.1 Missionary Schools in China, Rising National Identity, and Tension between the Foreign and the Chinese

After the 1911 revolution, especially after the New Culture Movement (1915-1920s), Chinese intellectuals had got rid of many of the restraints of traditional Confucian culture. A common national identity in a modern sense was becoming stronger and stronger among Chinese intellectuals. Missionary schools, which had helped to introduce western knowledge and ideas to the Chinese people, however, started to receive more and more criticism from Chinese people due to this national identity. Historians such as Jessie G. Lutz have described misunderstandings between missionary educators and Chinese people.¹¹⁴ Although it has been widely acknowledged that Christian missionary educators had brought to China benefits such as modern schools, public health service, agricultural extensions, and so on, most Chinese people were more inclined to notice the unequal

¹¹⁴ See Jessie G. Lutz, *China and the Christian Colleges, 1850-1950*, chapter VII, and *Chinese Politics and Christian Missions: The Anti-Christian Movements of 1920-1928*.

relationship between China and the western countries, allowing the foreign missionary people to take actions in China without following Chinese laws and customs. In spite of the practical benefits brought in by the missionaries, the implication of imperialism and superiority of westerners seemed more important for Chinese people in the 1920s. In addition, because of efforts of scholars such as Zou Bingwen, Guo Bingwen, and Hu Shi, modern educational institutions modeling American and European systems were gradually developing in China by the early 1920s, as rivals to the missionary schools. Chinese national universities such as the Southeastern University were catching up and gradually able to conduct serious and systematic research and education at that time. Missionary-run universities seemed no longer incomparable and irreplaceable in Chinese higher education.

Roughly from 1922 to the early 1930s, the Restoring Educational Rights Movement (收回教育权运动) spread in China, and it reached an upsurge during 1924-1927.¹¹⁵ The chief goals of this movement included: to diminish the separateness and autonomy of missionary schools, to strengthen Chinese people's control over missionary education, to limit Christian missionaries' religious training of Chinese children and youths, and to enhance the cultivation of a national identity in Chinese schools. At the very beginning, young students and intellectuals were the main participants in this movement, but political forces (for example, the Beijing government, the Nationalist Party, and the Chinese Communist Party) joined in quickly, because participating in this movement

¹¹⁵ Ibid.

could elevate one faction over another, and serve the interests of Chinese nationalism.

This was a serious challenge to the missionary colleges.¹¹⁶

In November 1925, the Beijing government issued a decree to regulate missionary schools founded by foreigners. However, it was very vague in how to supervise the missionary schools and how to punish schools for not following the regulations. The Nationalist Party had been making laws regulating and managing missionary schools since 1926, when it was still based in Guangdong province, and set more detailed rules about how to execute these laws. After moving to Nanjing and becoming the legitimate central government, it modified these laws and publicized them between 1927 and 1933 to reorganize missionary schools in most regions under its control.¹¹⁷ Some significant changes brought by these laws included: all private schools sponsored by foreigners must register with local and central Chinese governments; presidents of foreign-sponsored schools had to be Chinese people approved by either the local or central Chinese government, and foreigners could only be consultants or advisers; foreigners could not comprise more than one third of the administrative boards or committees of any school; religious courses and ceremonies could not be required in any schools (no matter public or private), and schools and educators were not allowed to induce students to participate in religious activities. Schools not fulfilling these regulations would not be recognized by

¹¹⁶ Ibid.

¹¹⁷ For example: “Registration Regulations for Private Universities and Colleges” and “Registration Regulations for Private Primary and Secondary Schools” publicized in December 1927, “Regulations for Private Schools” and “Regulations for Private School Boards” passed in January and publicized in February 1928, “Directive Rules for Private Schools” publicized in August 1929, and “Modifications of the Directive Rules for Private Schools” publicized in October 1933.

Chinese governments, and the diploma and educational level of their graduates would not be admitted by official Chinese organizations, thus barring the graduates from obtaining desirable employment. It is interesting that these regulations and rules did not mention “missionary” or “Christian” in their titles, but a great part of their important content was pointing to the missionary schools. Politically, this was a clever move; students “voted with their feet” rather than the missionary schools’ closure inciting an international political situation.

By 1927, when the Nationalist government set Nanjing as its national capital, there were in total thirteen missionary universities or colleges in China. At that time, the missionary universities and colleges were almost separate from the Chinese education system, despite the fact that the educators had maintained close connections with local Chinese people. More than half of these universities and colleges included agricultural and/or medical programs aiming to enhance local social services. During the entire warlord era, missionary universities were more like foreign schools located in China, rather than Chinese universities. It was after the Restoring Educational Rights Movement that these universities and colleges really became “Chinese” universities. By 1931, almost all¹¹⁸ missionary universities and colleges had registered at the Ministry of Education in Nanjing. The number of Chinese faculty and administrators increased significantly at these universities after the late 1920s, which opened up more jobs for American-trained Chinese scholars, and these universities had to intensify their communications and connections with China’s realities and necessities in order to stand

¹¹⁸ The St. John College at Shanghai did not complete its registration until 1947 because of disagreement from its American Christian sponsors.

firmly in this country. It is fair to say, although there were still remarkable distinctions between the missionary universities and national universities during the Nanjing Decade, it became possible to explore and compare the works of scientists at these universities within a similar framework because of these changes.

The Nationalist government's regulations were a challenge to the missionary universities. But this was also an opportunity and a positive impact for the western-trained Chinese agricultural scholars. They would build the "new" colleges, from the foundations of the old missionary schools. These would be unique hybrid institutions: "Chinese," and for the good of the country and its people; but built with western foundation and input. Communication became the new emphasis. The colleges still had to satisfy the American sponsors during this period; some funds were still coming from foreigners. But the colleges used this opportunity to make Chinese institutions that communicated in ways the American foundations could understand. They needed Chinese scholars who understood the American system to fulfill the task of communication. Therefore, American-trained Chinese scholars got much more working opportunities than before from these reformed missionary universities.

Two of these reformed missionary universities had the best agricultural schools in China at that time: the University of Nanking (金陵大学, *JinLing DaXue*) in Nanjing, and Lingnan University (岭南大学, *LingNan DaXue*) in Guangzhou, south China. In order to fit in their local environments, the two universities had developed different emphasis and strategies, and both of them had gained remarkable achievement during the warlord era. Lingnan University was located in the southernmost part of mainland China.

Guangzhou was a commercial center, but far away from the political capitals such as Beijing and Nanjing. The agricultural section of Lingnan University developed in a way suitable to its geographical and political status. For example, it put particular emphasis on sericulture, because silk production was a chief industry of the region around Guangzhou. Its agronomy program focused on rice, citrus, and sugarcane, because these were the main food economic crops in south China. Although American Presbyterian Church was the principal sponsor, local Chinese gentry, merchants, and governments shared stakes in this university from the very beginning. From the late 1910s to early 1920s, administrative and academic leaders of Lingnan University were mainly Chinese people, while most other missionary universities were still operated by westerners. This situation was largely because that Guangdong province was stronghold of the Nationalist Party, one of the most “revolutionary” political forces in China at that time. When the Nationalist government published its policies to regulate missionary schools in 1926, Lingnan University was the first Christian university to receive the reform. Because of its location, it was selected by the revolutionary politicians as a model of reforming missionary schools to become more Chinese (中国化). But when the Nationalist Party won the North Expedition and moved its capital to Nanjing in 1927, the University of Nanking in this new national capital replaced Lingnan University to exemplify the evolution of the missionary university in Chinese soil.

In the rest of this chapter, I will explore the history of the agricultural college at University of Nanking before 1937 and focus on the careers of Dai Fanglan and Shen Zonghan, two Chinese plant pathologists working at this college from 1927 to 1934.

2.2 Agricultural Programs at the University of Nanking (*Jinda*)

The University of Nanking¹¹⁹ grew out of the Nanking University (汇文书院, *HuiWen ShuYuan*), a missionary school founded by C.H. Foulmer in 1888 in Nanjing. This “university” had three divisions at the very beginning: liberal arts, divinity, and medicine, and it set up a division of secondary education in 1890. The first president was John Calvin Ferguson (1866-1945, his Chinese name was 福开森). In 1910, the Nanking University merged with the Union Christian College¹²⁰ (宏育书院), changed its name into the private University of Nanking (私立金陵大学, *JinLing DaXue*, abbreviated as “*Jinda*” according to its Chinese name), and was registered at the New York state Education Department. Graduates from *Jinda* would receive degrees of the New York University simultaneously. The University’s registering in the United States was partly because the Chinese government had not constructed rules and policies about degree awarding in higher education and the regulation of private and missionary colleges. On the other hand, such registration helped *Jinda* to maintain its educational standards close to American universities and to acquire international acknowledgement (especially from the United States).¹²¹

¹¹⁹ The University of Nanking has also been spelled as “Jinling University” or “Ginling University” according to the pronunciation of its Chinese name.

¹²⁰ The Union Christian College was formed in 1900 by the merger of the Christian College (基督书院) founded in 1891 and the Presbyterian College (益智书院) founded in 1894.

¹²¹ For the early history of the University of Nanking, see “A Brief History of the University of Nanking,” “General Situation of the Founding Period,” “Process of the Foundation,” “General Situation of the Growing Period,” and “Acknowledgement of the New York University,” *The*

After the 1911 Revolution, Nanjing and the nearby regions suffered a series of fierce battles. To make things worse, a severe flood happened in 1913. A lot of local residents became homeless. Joseph Bailie, a mathematics professor at Jinda, felt deep sympathy for these poor people. He appealed to the local government and gentries to unite and help these refugees and suggested that they start an agricultural organization and employ these homeless people as workers to plant trees at wastelands near Nanjing. This project would both help the refugees and improve local economics and environment. However, Bailie soon noticed the critical shortage of knowledgeable people in agriculture and forestry. To maintain the tree-planting project, he established a program of agriculture at *Jinda* in 1914 and a forestry program in 1915. Bailie invited J. H. Reisner, a new master's graduate from the agricultural school of Cornell University, to lecture about agriculture at these programs. Reisner majored in agronomy at Cornell with Professor Harry H. Love¹²² as his advisor. At that time, Reisner was the only agriculturalist in China with a graduate degree. In 1916, the two programs combined into a section of agriculture and forestry. It was a four-year college from the very beginning.¹²³ Considering that Peking University had already separated the agricultural college and that the Nanjing Higher Normal School had not yet established the agricultural section, at this time, *Jinda* was the only university

Centennial Records of Nanking University—Historical Materials of the University of Nanking, pp. 3-4, 6-7, 14-15, 17.

¹²² We will meet Professor Harry Love many times later in this dissertation. He had long-term close communications with many famous Chinese agriculturalists and educationalists, and was the most active American agricultural scientist and activist on behalf of Republican China.

¹²³ See "Foseph Bailie: Founder of the Agricultural School at Our University" and "General Introduction of the Agricultural School," *The Centennial Records of Nanking University—Historical Materials of the University of Nanking*, pp. 21 & 253.

in China with an agricultural section—although it was not registered as a Chinese university.

When Bailie left *Jinda* in the same year, some American directors suggested suspending the section of agriculture and forestry and concentrating on the education of liberal arts. Luckily, the Chinese directors and Reisner insisted that agriculture and forestry were the most important and necessary knowledge for China and therefore this section should be expanded rather than suspended. Finally the university board decided to continue this section and appointed Reisner as the director.¹²⁴ Although *Jinda* seemed more like an American university during the warlord era, its section of agriculture and forestry had a Chinese root from the very beginning. In 1920, when *Jinda* was only registered at New York state, its agricultural section registered at the Ministry of Education in Beijing as a Chinese agricultural college.¹²⁵

Because of efforts of Reisner and A. J. Bowen (university president from 1910 to 1926), by 1923 this section had received about seven hundred thousand U.S. dollars from American donations, which guaranteed the financial supply for its further development and enabled its advantage over the Chinese agricultural colleges and universities struggling for funding. In 1924, Reisner contacted Professor Harry H. Love, his master's advisor at Cornell University. The two cooperated and launched a cooperative crop breeding program between Cornell and *Jinda*. This crop breeding program was Cornell

¹²⁴ "Foundation of the Section of Agriculture and Forestry," based on J. H. Reisner's recollections in 1954, *The Centennial Records of Nanking University—Historical Materials of the University of Nanking*, p. 23.

¹²⁵ "General Introduction of the Agricultural School", *The Centennial Records of Nanking University—Historical Materials of the University of Nanking*, p. 253.

University's first international technical cooperation program and the first long-term scientific cooperation between Chinese academic institutes and western institutes. American scientists from Cornell, such as H. H. Love and Clyde H. Myers, had conducted breeding experiments in China during the 1920s because of this program. Several of the most influential American-trained agriculturalists in the Republican era, such as Shen Zonghan and Zhao Lianfang, started their academic work in this program after receiving their doctoral degrees from the U.S. Shen Zonghan's later comments disclosed that this cooperation embodied the ideology of combining education, research, and extension in agricultural science, which was obviously borrowed from the American model: "the most significant results of the Nanking-Cornell-International Education Board Program for Crop Improvement in China were: (1) training a group of Chinese plant breeders for carrying on a national program of crop improvement; (2) developing better varieties of wheat, barley, rice, kaoliang, millet and soybeans showing increased yields from 10 to 20 percent more than the native varieties; (3) stimulating the Chinese government to establish the National Agricultural Research Bureau of the Ministry of Industry in 1931 which made great improvements in agricultural production in China up to 1949 through scientific research and agricultural extension services."¹²⁶

In 1925, Reisner suggested the university board should appoint both American and Chinese directors for the section of agriculture and forestry—probably because of the social atmosphere of the Anti-Christianity Movement and the Regaining Education Rights Movement. It was the year of the strife of changing university president at the

¹²⁶ Love, Harry H., and J. H. Reisner, *The Cornell-Nanking Story*, 1964.
<http://ecommons.cornell.edu/handle/1813/29080>

Southeastern University (see section 1.4). Guo Tanxian (过探先, 1886-1929), the former vice director of the agricultural section at the Southeastern University, was pushed out in personnel conflicts and decided to join the University of Nanking. Guo Tanxian was a Boxer student. He studied agriculture at the University of Wisconsin and Cornell University, focusing on cotton science. After receiving a master's degree from Cornell, Guo Tanxian returned to China 1915. He was one of the founders of the Science Society of China, the Jiangsu Provincial First Agricultural School, and agricultural school of the Southeastern University. After joining the University of Nanking, Guo Tanxian was then appointed as the Chinese director of the section of agriculture and forestry, and he was the actual person in charge of this section from 1927 to 1929.¹²⁷

In March 1927, when the Nationalist Army of the North Expedition got close to Nanjing, violent riots occurred within and near the city. It seemed that the riots were caused by radical Chinese soldiers and workers aiming to exclude imperialism and foreigners.¹²⁸ J. E. Williams, a vice president of the University of Nanking, was killed in the riots. Almost all western people at *Jinda* were scared and fled back to their home countries. The remaining Chinese faculty and staff chose Guo Tanxin to take charge of university affairs temporarily. Fortunately, Guo Tanxian was a Nationalist Party member and had personal connections with high officials of the Nationalist Party.¹²⁹ He managed

¹²⁷ "General Introduction of the Agricultural School," *The Centennial Records of Nanking University—Historical Materials of the University of Nanking*, pp. 253-254.

¹²⁸ Later, Jiang Jieshi and his supporters within the Nationalist Party accused the Chinese Communist Party of plotting these riots, but the CCP claimed that Jiang was framing the CCP. This event finally caused rupture between the Nationalist Party and the CCP.

¹²⁹ This might be a reason for his leaving the Southeastern University—during the strife in 1925, Zou Bingwen (邹秉文), director of the agricultural section of the Southeastern University, stood

to protect *Jinda* from being closed or confiscated by radical anti-imperialist politicians.¹³⁰ Moreover, the Nationalist army's occupation of Nanjing retriggered the temporarily subsided personnel conflicts at the Southeastern University. Zou Bingwen, director of the agricultural section of the Southeastern University, could not fully trust the new Nationalist government and resigned. Guo Tanxian took this opportunity and succeeded in drawing away many of the agricultural scientists not feeling very comfortable in the personnel disputes within the section of agriculture and forestry at *Jinda* (such as Dai Fanglan).

In July 1927, the Nationalist government's regulations for missionary education came out, requiring that all missionary universities must have Chinese people to be the university president. Board members of the University of Nanking decided to appoint Chen Yuguang (陈裕光), an early *Jinda* graduate with a doctoral degree of chemistry from the Columbia University, to be the university president. Chen served at this position for twenty-four years, until 1952, when *Jinda* was merged with other universities under requirements of the Communist government.

Because almost all American leaders had left and did not come back to Nanjing until 1929, for almost two years, the University of Nanking was actually operated by Chinese scholars with American training backgrounds, such as Guo Tanxian and Chen Yuguang.

closely together with President Guo Bingwen, who was closer to the old warlord and disagreed with the Nationalist Party. Therefore, there must have been conflicts and disagreements between Zou Bingwen and Guo Tanxian. Then, it is easy to understand why Guo Tanxian decided to transfer to *Jinda*.

¹³⁰ See "Records of the 23th conference of the Board of University of Nanking," April 19 & 20, 1927, in *The Centennial Records of Nanking University—Historical Materials of the University of Nanking*, pp. 41-43.

During this period, the Chinese faculty strongly increased the Chinese identity of this missionary university. *Jinda* was shifted from an American university in China into a Chinese university with American sponsorship and connections. In 1928, *Jinda* officially registered at the University Academy (the governmental organization functioning as the Ministry of Education at that time) at the Nanjing Nationalist government as “Private University of Nanking.” It was the first missionary university registering with the Chinese government.¹³¹ The section of agriculture and forestry changed its name to the Agricultural School at University of Nanking. Despite its missionary roots, it was the most comprehensive and promising agricultural college in China at that time.

The new situations during the Nanjing Decade had multiple influences on agricultural scientists at the University of Nanking. First of all, it became a real Chinese university, which significantly strengthened the university scientists’ confidence and ability to realize their desire of serving China. Despite the strong foreign missionary tradition and sponsorship, Chinese people were able to take important positions and make critical decisions at this university officially, and the foreign and missionary forces had to function with restrictions. As for the school of agriculture, more and more Chinese people became leading scientists and department chairs after 1927. Faculty, staff, and students at *Jinda* were able to openly and officially include serving, constructing, or improving China into their studies and works. Without such changes, Dai Fanglan and Shen Zonghan would not have a chance to smoothly fulfill their desire to serve their country through scientific research at this university.

¹³¹ Chen Yuguang, “Acceding to the University President in the Unrest,” *The Centennial Records of Nanking University—Historical Materials of the University of Nanking*, pp. 44-45.

Secondly, the new situation encouraged scientists at *Jinda* to communicate and cooperate with more agricultural governmental and academic organizations. On the one hand, these scientists cooperated with more newly established agricultural institutes in China. They were able to work in diverse natural and social environments within this huge country, which was uncommon for scientists in other countries and for themselves in the past. Through the cases of Dai Fanglan and Shen Zonghan, two chief figures in this chapter, we can see that during this time period, leading Chinese scholars in missionary universities were able to develop new scientific knowledge through experiments and surveys, and were more efficient in improving agricultural production in certain places. On the other hand, because of its missionary background and American sponsorship, this university maintained its connections with western academic institutes. Scientists at *Jinda* were able to communicate with their western colleagues easily and spread the new scientific knowledge they developed on Chinese soil to the western scientific communities. Therefore they were making great achievements as scientists by creating and circulating scientific knowledge.

Meanwhile, after two decades of communication and exchange in science and education, by the late 1920s, some American scholars and foundations started to value the importance and improvement of Chinese science. An interesting case was attitudes of the Institute of Pacific Relations and the Rockefeller Foundation. The Institute of Pacific Relations was an NGO aiming to provide a forum to explore relations between the Pacific countries. It was based in the United States. China was considered as one of the founder countries because missionary organizations in China (such as the Y.M.C.A., 基督教青年

会) played active roles in organizing the first meetings. The University of Nanking was not among these founder organizations, but its faculty attended the bi-annual meetings as representatives of Chinese scholars. In 1927, a group of American agricultural economists of the Institute received a grant from the Rockefeller Foundation to conduct a survey of natural and economic conditions in rural China. These American researchers believed that their research would provide substantial data for the studies of agricultural economics and would benefit Chinese agriculture. However, their project was delayed because of political changes caused by the Nationalist Northern Expedition. When the situation got settled, the new Nationalist government declined American researchers' request of surveying rural Chinese, because this activity would hurt Chinese people's feelings of national esteem and might be dangerous for national security. The final compromise was that Professor John L. Buck and Professor Sun Wenyu (孙文郁) from the University of Nanking were jointly commissioned to conduct this survey. Buck was a Cornell graduate who had been working in China for fourteen years, and had settled in China. Sun received a master's degree in nutrition science from Stanford University. The American researchers trusted the academic ability of Buck and Sun, and the Chinese government trusted their loyalty. The survey project lasted from 1929 to 1936 and covered 168 counties in 22 provinces. Buck and Sun published a book *Zhongguo TuDi LiYong (Utilities of Chinese Land)* in 1937. The English version of this book was considered as one of the most classical works of Chinese agricultural economics by western scholars. However, this book received wide criticism from Chinese scholars during both the Republican era and post-1949 period. Critical Chinese scholars

commented that this book mechanically followed western theories but ignored remarkable difference between Chinese and western agriculture. In addition, there were also patriotic intellectuals claimed that investigating lands of agriculture was a typical colonial activity and that allowing foreigners to investigate Chinese rural land was a humiliation for Chinese people.¹³² The partnership of Professors Buck and Sun was not enough to overcome the ongoing Chinese-foreign tensions; although this strategy was successful in ensuring the completion of the agricultural survey and publication of the book.

From this case we can see that status of missionary university in Republican China was delicate and complicated. Actually, Chinese scholars in missionary universities were much closer to the Chinese-foreign tension than their colleagues in national universities. Most of these scholars I am exploring had expressed their love and loyalty for China, but their attitudes toward foreign scholars and foreign elements at missionary universities were very diverse, largely dependent on their personal experiences. Therefore the strategies they took seemed quite different. In this chapter, I will highlight the examples of Dai Fanglan and Shen Zonghan to illustrate the motivations, strategies, and achievements of the *Jinda* scientists during this period.

¹³² Zhang, Jing, “The Institute of Pacific Relations and Chinese Rural Survey, 1929-1937—Chinese Rural Land Survey at the University of Nanking,” *Min Guo Dang An*, February 2007. (张静, “太平洋国际学会与 1929-1937 年中国农村问题研究——以金陵大学中国土地调查为中心”, 《民国档案》, 2007.02) Also see Zhang Jing, *China Institute of Pacific Relations, 1925-1945*, Social Sciences Academic Press, October 2012. (张静, 《中国太平洋国际会议研究 1925-1945》, 社会科学文献出版社, 2012 年 10 月)

2.3 Dai Fanglan: Establishing Mycology for China

Dai Fanglan was born in Zhenhai, Zhejiang Province on May 3rd, 1893. He was the third son of a scholar-gentry family. His grandfather and father had been chief officials at several counties in Zhejiang Province. Sponsored by their uncle Dai Zhenchuo, Dai Fanglan and his elder brother were able to take western-style elementary and secondary education in Shanghai. They graduated from high school in 1910, the year when the Qing Government started the Boxer Indemnity Scholarship Program. After a one-year preparation, Dai Fanglan passed the exam and was admitted to Tsinghua College at the age of eighteen. He studied at this college for two years to prepare for college education in the United States.¹³³

According to the original agreement between the Qing Empire and the U.S. government, over 80% of the selected Boxer students had to major in applied knowledge such as engineering, agriculture, medicine, business and law. The Republican governments followed this rule. In actual practice, the Boxer students had the freedom to change their universities and majors. For example, Hu Shi (胡适), one of the first generation Boxer students, transferred from agriculture to philosophy at Cornell University. However, Hu Shi was an exceptional case. Most Boxer students stayed in the sciences and engineering. In his autobiography, Dai Fanglan explained the reason for his choosing agriculture as a major, in which a motivation of patriotism and scientific nationalism is apparent:

¹³³ Cheng Guangsheng, *Biography of Dai Fanglan*, pp. 5-10.

“...foreigners were continuously insulting our country. Youths at that era were all filled with righteous patriotism and wished our country to become stronger very soon. Most young people prefer to study practical knowledge rather than humanities in order to make China stronger. Therefore I chose agriculture as my major. I thought that the United States had advanced agricultural sciences. In addition, it was a democratic and advanced country and might be a model for our development.”¹³⁴

Nevertheless, just like most first-generation American-trained Chinese scientists, while acknowledging the democracy and advancement of the United States, Dai Fanglan did not forget the humiliations for China brought by this country and others from the west.

In 1914 Dai Fanglan entered the College of Agriculture in University of Wisconsin-Madison. It was the era when H. L. Russell and J. L. Ralph were building up the studies of microbiology and plant pathology in the United States. Dai Fanglan was the first Chinese student to study plant pathology in America. For two years, Dai Fanglan focused on mycology and agronomy at the University of Wisconsin. It was during this period that he joined the Science Society of China (SSC), the first Chinese scientific association established by his Tsinghua seniors at Cornell University in 1915. (The SSC was organized by a group of Chinese students at Cornell University in 1914.) The first issue of its monthly journal, *KeXue* (Science), was published in January 1915, which signified the formal establishment of the Science Society. Among the nine founders of the SSC,

¹³⁴ Cheng Guangsheng, pp. 10-11

seven were sponsored by the Boxer scholarship and were therefore Tsinghua alumni.¹³⁵

Dai Fanglan's Cornell colleagues encouraged him to introduce other Chinese students in Wisconsin into this society. Two years later, in fall 1916, Dai Fanglan transferred to the School of Agriculture in Cornell University, considered by some to be the best agricultural school in the United States.¹³⁶ He took mycology and plant pathology courses with George Francis Atkinson, Herbert Hice Whetzel¹³⁷, Harry Morton Fitzpatrick, Joseph Charles Arthur, and Charles David Chupp. Under the direction of Whetzel, Dai Fanglan got more field practice as an undergraduate student. He developed a strong interest in plant pathology and mycology during the two years in Cornell.

In 1918, Dai Fanglan entered the graduate school in Columbia University. His advisor was Professor Robert Almer Harper. Dai Fanglan's studies during the Columbia period were on cellular biology and taxonomy of fungi. He also developed a good relationship with Bernard Ogilvie Dodge, an American scientist from University of Wisconsin. After returning to China, Dai Fanglan kept in communication with Harper and Dodge for many years.¹³⁸

¹³⁵ Wang Zuoyue, "Saving China through Science: the Science Society of China, Scientific Nationalism, and Civil Society in Republican China," *Osiris*, 2nd Series, Vol. 17, Science and Civil Society (2002), pp. 291-322.

¹³⁶ Several Tsinghua students had already studied at Cornell before Dai Fanglan. For example, Bing Zhi (秉志, 1886-1965) studied there between 1909 and 1913 and later received a PhD degree from the department of biology; Guo Tanxian (过探先, 1886-1926) received a master's degree in 1915; Zou Bingwen (邹秉文, 1893-1985) received a bachelor's degree in 1915 and then studied plant pathology for one year before going back to China in 1916.

¹³⁷ Herbert H. Whetzel directed two other prominent Chinese agricultural scientists to finish their doctorate dissertations: Deng Shuqun in 1928 and Lin Chuanguang (林传光) in 1940.

¹³⁸ Cheng Guangsheng, p. 14 and p. 32.

Dai Fanglan's studies in Columbia proceeded smoothly. However, his father was unemployed in 1919, and the whole family was falling into a difficult situation. Dai Fanglan had to give up his study in America to go back home to earn a living for the family.¹³⁹ Dai Fanglan's early career in China demonstrates the political instability of the times. As mentioned before, the decade from the late 1910s to 1928 was a period of high warlordism. China was actually controlled by more than ten warlords competing with each other. Some of these warlords were receiving funding and support from foreign countries such as the United States, Japan, and USSR. Therefore, it was very hard for American-trained Chinese scientists and educators in China to fully concentrate on scientific works without interference from politics. They had to deal with such complicated political situations and to balance so many political forces—local and foreign—just to survive and maintain their lives, while their overseas experience sometimes made it impossible for them to stay away from political and interpersonal collisions.

From 1919 to 1925, Dai Fanglan had worked at several agricultural schools and farms in four provinces. He had no chance to conduct serious scientific research until joining the Southeastern University in 1923. Nevertheless, this good situation was soon interrupted by interpersonal conflicts. Guo Bingwen (郭秉文), the president and founder of the Southeast University, was dismissed in 1926 because of strife among different

¹³⁹ I would like to make a comparison between Dai Fanglan and Shen Zonghan, another great Chinese agricultural scientist and Cornell University alumnus. Shen Zonghan insisted on finishing his education despite the fact that his father strongly opposed this decision and that his family had been in heavy debt for decades. In this sense, Dai Fanglan was still following traditional Chinese ethics to fulfill his filial duty.

political factions (see chapter 1). Dai Fanglan was not a close friend of Guo Bingwen. However, as an American-trained scientist, he encountered hostility from some colleagues with different political concepts and was dismissed as well. During the following summer, Dai Fanglan got in touch with Guo Tanxian (过探先). (Guo Tanxian had studied at the University of Wisconsin and Cornell University as well, and was serving as director of the College of Agriculture and Forestry at University of Nanking.) With the help of Guo, Dai Fanglan joined the Jinda faculty in fall 1927.¹⁴⁰

After occupational uncertainty for almost eight years, Dai Fanglan settled down at the University of Nanking (*Jinda*). As a missionary university supported by American funding, *Jinda* was able to protect its faculty and students from the chaotic warlordism. Compared with the earlier farm and schools, *Jinda* provided Dai much more stable and superior conditions for both his life and research. From 1929 to 1934, he published twelve research articles in academic journals in China (with two coauthored with Wei Jingchao, and one coauthored with Zhou Jiachi). By 1933, he was appointed as professor and director of the program of plant pathology, and his monthly salary had reached 270 CND. He was among three of the highest paid professors at the College of Agriculture and Forestry in *Jinda* (the two others were Chen Rong, 陈嵘, and Shen Zonghan, 沈宗瀚).¹⁴¹

During his eight years at *Jinda*, Dai Fanglan made significant advances in research about plant pathology and mycology. When newly settled down at the program of plant

¹⁴⁰ Cheng Guangsheng, pp. 22-26.

¹⁴¹ Shen Zonghan, *Memoirs of the Middle Age*, p. 28.

pathology, Dai Fanglan focused his research on fungi related to crop and fruit diseases rather than the basic research of fungi classification and systematics. However, when continuing writing scientific popularization articles for the *Kexue* journal, he noticed that from the 1870s to the early twentieth century, all publications on fungi in China were published by foreigners.¹⁴² China only provided raw materials for the research of natural history, but could not really contribute to creating new scientific knowledge. Dai Fanglan's pride and the feeling of dual-identity of being both Chinese and a scientist made it hard for him to accept China's disadvantage in scientific research.

One of Dai's conflicts with Albert N. Steward, director of the program of plant pathology at *Jinda*, finally motivated him to work on fungi classification. Steward promised to facilitate Professor Roland Thaxter (an American scientist from Harvard University) to collect fungi specimens in Southwest China. Dai Fanglan insisted that *Jinda* should keep one copy of the fungus specimen and send another copy to Harvard, and that it should be Chinese scientists' duty and right to work on these fungi specimens. Steward was uncertain whether Chinese people were competent to carry out serious research on these fungi specimens, but he finally gave in to Dai Fanglan's persistence. The problem was that there had never been Chinese scientists working on fungi taxonomy before. The research focus of Dai Fanglan himself had been plant pathology research and anti-disease crop selecting. However, to break westerners' monopoly on

¹⁴² Dai Fanglan, "Collections of Fungi in China by Foreign Explorers," *Nanking Journal*, 1(2), 1932, pp. 537-548.

mycological research in China, he undertook the task of working on fungi specimens collected from Southwest China.¹⁴³

Dai Fanglan's 1930 article, "A new species of *Uncinula* on *Acer Trifidum* Hook and Arn,"¹⁴⁴ marked the establishment of Chinese mycology. After that, Dai Fanglan shifted his research emphasis from practical pathology partly to identifying and classifying fungi in China, which became the research focus all through his life and has made him the founder of mycology in China. He also organized and instructed Chinese scientists and students in his program such as Zhou Jiachi (周家炽), Yu Dafu (俞大绂), Chen Hongkui (陈鸿逵), Qiu Weifan (裘维蕃),¹⁴⁵ Wei Jingchao (魏景超), and Huang Liang to conduct research and surveys on fungi in East China. Dai Fanglan encouraged these younger researchers, stating that Chinese people should investigate and control national resources of their own and publish their findings as soon as possible to claim the achievements of Chinese scientists to the world.¹⁴⁶

As a first-generation American-trained Chinese scientist and peer of Zou Binwen (邹秉文), Dai Fanglan combined the desire to serve his country and scientific knowledge. He believed that contributing to science meant much more than pure scientific research. It also involved institution building such as establishing journals, civil societies, and

¹⁴³ Cheng Guangsheng, pp. 29-30. This was important work. Even today, only about 8% of fungal species around the world have been named, classified, and related to other fungi (the majority coming from Europe, China and the USA). Bryn Dentinger, personal communication, 29 April 2013.

¹⁴⁴ This article was published in English in Volume 6, Issue 1 of *Contributions from the Biological Laboratory of the Science Society of China: Botanical series*, Nanjing: the Science Society of China, 1930.

¹⁴⁵ These four scientists later joined the Tsinghua IOA and worked closely with Dai Fanglan in their later careers.

¹⁴⁶ Cheng Guangsheng, p. 31.

training younger researchers. Since the late 1920s, Dai Fanglan played active roles in all these activities. For example, in May 1929, he collaborated with his Cornell alumni friends, such as Zou Bingwen and Deng Shuqun, to establish the Chinese Society for Plant Pathology. Also in this year, they applied for a grant from the China Foundation to support Herbert H. Whetzel, their professor and advisor from Cornell University, to come to China and give lectures. In August 1933, Dai Fanglan participated in establishing the Chinese Society of Botany. In 1934, he took the position of editor for the *Chinese Journal of Botany*.¹⁴⁷ Dai Fanglan believed that these scientific journals, civil societies and lectures could help Chinese scientists communicate with international scientific communities on an equal basis.¹⁴⁸ His participation in these activities suggested that Dai Fanglan did not consider the desire to conduct pure scientific research as an issue separated from his “love for China” at all. In Dai’s career, pure scientific research, as well as practical research and institutional establishment, were closely connected to each other because they were all ways to create good science and to serve China. In other words, for scientists like Dai Fanglan, “being a scientist” meant a good way to “being a Chinese person” and to fulfilling one’s love for China.

However, Dai Fanglan had never felt fully comfortable at this university because of its missionary background. The academic achievements did not relieve his feelings of humiliation. He had been looking forward to finding somewhere more comfortable for him. In 1934, Dai was planning to leave Jinda and had arranged a two-year research trip

¹⁴⁷ The chief editor of this journal was Hu Xiansu (胡先驌, 1894-1968), a Harvard University botany Ph.D. and the first Chinese scientist working on taxonomy of plants in China. This journal stopped publication in 1937 because of the war.

¹⁴⁸ Cheng Guangsheng, pp. 29-31.

to New York Botanical Garden and Cornell University. At this time, he received an invitation from Tsinghua University to direct a group of plant pathology at the newly established institute of agriculture—the group where he spent the rest of his career.¹⁴⁹

Dai Fanglan's attitude towards *Jinda* (from 1927 to 1934) exemplified the complex feelings of “first generation” Chinese scientists trained abroad, who returned to work at American-sponsored institutions. Dai Fanglan commented on his experience at *Jinda* that:

“*Jinda* was a missionary university, which I did not like to join in.

However, I was unemployed at that time and not able to find anywhere else to settle down. ... I often conflicted with foreigners because of their offending Chinese people. ... Our living condition in *Jinda* was very comfortable and the research condition was also very satisfactory. However, I sincerely wished to move to some other place because of a sense of national pride. Therefore, when I received the invitation from Tsinghua, I accepted this opportunity at once.”¹⁵⁰

Dai Fanglan's displeasure at *Jinda* was mainly aimed at the ideas of imperialism and colonialism behind these missionary schools instead of at his American colleagues.¹⁵¹ He had always felt humiliated by the fact that foreign scientists enjoyed more privileges than Chinese scientists on the land of China. Dai Fanglan acknowledged that western researchers' works had significantly contributed to the development of science in China. He also had to admit that Chinese scientists had not been capable of conducting

¹⁴⁹ Cheng Guangsheng, pp. 27-32 and p. 37.

¹⁵⁰ Cheng Guangsheng, pp. 26-30.

¹⁵¹ For Chinese people's paradoxical attitude towards Christian schools, see Daniel H. Bays, *China's Christian Colleges: Cross-Cultural Connections, 1900-1950*, Stanford: Stanford University Press, 2009.

systematic scientific research in many fields. However, he felt ashamed of the fact that western scientists were unrestricted in using research resources in China while Chinese scientists were so non-competitive. To deal with his feelings about these tensions, Dai's strategy was to alter his field of expertise to become an internationally-renowned Chinese mycologist. Dai's strong feelings of the dual-identity of being both Chinese and a scientist, especially "Chinese pride" significantly influenced his choice of research topics, which I will explore further in Chapter 3 and Chapter 4.

2.4 Shen Zonghan: from University to Government

Unlike Zou Bingwen and Dai Fanglan, Shen Zonghan's early years in pursuing education were very hard. His father was an educated farmer with little property, always wishing him to find a job as early as possible rather than to stay in school. Shen had to go against his father and family to make money for education after graduating from elementary school at the age of eighteen. For ten years he moved among Hangzhou, Beijing, Hunan, Anhui, and Nanjing to look for the chance of making a living and studying. Shen Zonghan took college education at the Beijing Agricultural College, but was disappointed by the bureaucracy in Beijing. He failed in the entrance exam of Tsinghua University, and therefore could not get financial support from the Boxer scholarship as Dai Fanglan and Zhao Lianfang did. During the frustrating years in Beijing, Shen converted to Christianity. This experience might explain a remarkable difference between the later careers of Shen Zonghan and other scientists at his age such as Dai Fanglan and Zhao Lianfang. Dai Fanglan admitted that missionary organizations

were a temporary patron of Chinese scientists, even while he struggled with feelings of anger toward these foreign organizations. Dai had worked at the same missionary university (*Jinda*) as Shen Zonghan did. The missionary patronage guaranteed that Dai's research environment was much better than it would have been at a national university such as the Southeastern University. However, Dai considered the patronization as emblematic of foreigners' superiority over Chinese people and felt uncomfortable and "humiliated" by the attitudes of the American faculty. On the contrary, Shen Zonghan never expressed such a feeling of being humiliated. I think it was largely because of his unpleasant experiences at the Chinese provincial schools and national agricultural colleges, and because of his faith in Christianity (which fit well with the former missionary schools). Shen had little affection for the national universities or Tsinghua scholarship, but was more willing to cooperate with missionary organizations.

In 1923, Shen Zonghan traveled to America at his own expense. He spent one year at the Georgia state University, studying cotton breeding. After receiving a master's degree, Shen got sponsorship from his professor and friends and entered the agricultural college at Cornell University. Shen Zonghan took comprehensive training in crop breeding, genetics, and plant pathology under Professor Harry H. Love. Love was not only a famous crop breeding scientist and geneticist, but also had close connection with China. One of Love's early students, John H. Reisner, was the founder and director of the College of Agriculture and Forestry at the University of Nanking (金陵大学, Jinling University, abbreviated as *Jinda*). In 1925, Reisner and Love had launched a long term cooperative project between Cornell and *Jinda* in order to improve Chinese agriculture.

Each year a Cornell professor would visit China and conduct research, training, and extension works based at Jinda.¹⁵² Meanwhile, Zou Bingwen, who was directing the agricultural section of the Southeastern University at that time, also invited Love, his early instructor of plant pathology, to visit Nanjing and to give lectures. Love was interested in these projects. He travelled to China during the 1925-1926 academic year and arranged for Shen Zonghan to go to *Jinda* as a fellow of the cooperative project in the following year. Shen exhibited outstanding ability in teaching, surveying, and assisting the American scientists. Both Reisner and Zou Bingwen invited him to join their college after graduation. Shen finally chose *Jinda*, because he noticed the bad effects on the university community of being involved in political factional struggles at the Southeastern University (see chapter 1) and believed that *Jinda* was able to guarantee a more stable environment for his research.

Shen Zonhan formally joined *Jinda* in winter 1927, the period after the Northern Expedition Army seized Nanjing and all foreigners fled. For almost one year, Chinese faculty at *Jinda* took charge of this university and Shen Zonghan got chance to communicate with the new government. The Nationalist central government exhibited great enthusiasm—at least seemingly—in improving agricultural production. At the beginning of 1928, Shen Zonghan attended a conference held by the Ministry of Agriculture and Mines as a representative from academia to explore future development of China, and here he made an important early proposal for coordinated agricultural research, education, and extension. Shen proposed that the new government establish a

¹⁵² See Reisner and Love, *The Cornell-Nanking Story: The First International Agricultural Cooperation Program in Agriculture by Cornell*, 1962.

national agricultural research station to conduct agricultural research and coordinate the works of provincial agricultural programs. This proposal gained wide acceptance at the conference and was received by the government with sincere respect (although it disappeared for years after entering the Nationalist bureaucracy). Shen Zonghan was encouraged by the seeming intentions and actions of the Nationalist government. He expressed this feeling to H. H. Love: “The political situation of China at present is much better than 1925 when you were in China. The leaders in the Government highly appreciate importance of agricultural improvement.”¹⁵³

Despite these positive feelings toward the Nanjing Nationalist government, Shen did not consider governmental organizations good places to fulfill his desire to serve China. In March 1929, he refused an appointment from the Nationalist government as the Commissioner of Agriculture and Mining of Shanxi Province and chose to stay at the University of Nanking. Shen explained this decision as that “I could perhaps serve my country better by sticking to my present job.”¹⁵⁴ By “serving the country”, Shen Zonghan—similar to most of his peer Chinese agricultural scientists—meant to bring advanced knowledge and techniques into agricultural production and to increase crop yield. The ultimate goal was to improve the lives of Chinese people and to enrich the country, rather than enrich the national government. Therefore, “serving his country” meant to Shen a very strong notion of love and caring for his country and country people.

¹⁵³ Shen to Love, January 29, 1929, Harry H. Love Papers, Box 14, folder 35, Kroch Library, Division of Rare & Manuscript Collections, Cornell University, Ithaca, New York.

¹⁵⁴ Shen to Love, April 10, 1929, Harry H. Love Papers, Box 14, folder 35, Kroch Library, Division of Rare & Manuscript Collections, Cornell University, Ithaca, New York.

During the following five years, he endeavored in agricultural education, research, and extension at *Jinda* to fulfil his desire of serving China with agricultural improvement. He refused an appointment to be director of the College, but took the task to establish more cooperative stations in other provinces for crop research and extension (see Figure 6). These stations were built up and functioned by cooperating with local missionary schools such as Yenching University in Beiping and Chee-loo University in Jinan. Although Shen and some Chinese faculty at *Jinda* kept in close communication with scientists at the National Central University, the two universities at Nanjing did not cooperate much in establishing the experiment station networks. The NCU's cooperators were mostly governmental organizations and its development was more entangled with political changes. In contrast, *Jinda's* stations were fewer in number, but they were able to stay relatively independent from the turbulent political atmosphere and therefore they could maintain better continuity and consistency in their work of agricultural improvement and research (mainly breeding and extending crop varieties). The annual meeting of *Jinda's* experimental stations soon became an important scientific seminar in the early 1930s.¹⁵⁵

Shen's achievement at *Jinda* was so remarkable that he received more and more invitations for appointments from governments. His first serious cooperation with governmental organization started in 1930, with the Zhejiang provincial government. This cooperation was largely because of his personal networks rather than the attraction of working for government. Born and bred in Zhejiang, Shen Zonghan felt he had a duty

¹⁵⁵ *Reports of the Tenth Conference of the Experimental Stations of the College of Agriculture at the University of Nanking*, University of Nanking Press, Nanjing, 1935.

to lend his expertise. In April 1929, Shen was invited and received by Zhang Jingjiang (张静江), the Zhejiang Provincial President and one of the founders of the Nationalist Party. Zhang Jingjiang was planning to launch an agricultural improvement program for Zhejiang province. Considering Shen's achievements and his origin in Zhejiang, President Zhang wanted to appoint Shen to take charge of this program. He tried to convince Shen that the situation of agricultural extension in Zhejiang was very stable by saying that "unless the communists get control of the Central Government the provincial government of Chekiang would not be greatly changed even though the Central Government changed hands"¹⁵⁶ and that "if Zhejiang were unsafe, Nanjing must be even more chaotic, and you would not be able to continue research at *Jinda* either."¹⁵⁷ It was the time when the Central Plains War was about to break out among several chief warlords including Jiang Jieshi, and it seemed doubtful whether Jiang Jieshi and his Nationalist central government would continue be "central" after the war. However, Zhejiang province was not involved in this war. In addition, President Zhang Jingjiang was an elder statesman of Republican China with a high reputation in both politics and economics. Both Shen and Zhang himself were confident that Zhejiang province was more capable than the central government to guarantee a relatively stable environment for agricultural extension. Shen was largely convinced by President Zhang. Although he eventually declined this appointment, Shen Zonghan recommended Qian Tianhe (钱天鹤, 1893-1972), another agricultural scientist born in Zhejiang with a master's degree from

¹⁵⁶ Shen to Love, July 4, 1930, Harry H. Love Papers, Box 14, folder 35, Kroch Library, Division of Rare & Manuscript Collections, Cornell University, Ithaca, New York.

¹⁵⁷ Shen Zonghan, Zhonghan, *Shen Zonghan's Memoirs: Memoir of the Middle Age*, p.153.

Cornell, to serve as director for this provincial agricultural program. Moreover, he helped to persuade Professor Harry H. Love from Cornell University to serve as chief technician for three years to provide scientific instruction. Since Love was not able to arrive in China until March 1931, Shen took over the chief technician job for several months in order to make preparations for Love's arrival.¹⁵⁸

At this time, Shen believed that his cooperation with the Zhejiang government was temporary. He confirmed this point to Love, his advisor and friend, by saying "I have not yet changed my decision for research and instruction."¹⁵⁹ His plan was to continue his normal works in Nanjing, and spend several days every month at Hangzhou, where the Zhejiang agricultural program was located, to take care of the startup affairs and prepare for Love's arrival. However, an unexpected situation changed his plan irresistably: Shen Zonghan fell in love with and married Shen Liying (沈骊英, 1897-1941), a woman agricultural scientist. Shen Liying worked at the Zhejiang provincial agricultural program in Hangzhou, so they made their home at Hangzhou for about one year. During this period, Shen's contact with Qian Tianhe and the governmental program was much more frequent than his expectation, which foreshadowed his later collaboration with Qian and the National Agricultural Bureau.

Shen Zonghan's research work in Hangzhou lasted for about one year, during which he took charge of testing and extending wheat varieties from all over the world in Zhejiang province. In addition to the over fifty thousand wheat varieties collected by him

¹⁵⁸ Shen to Love, July 4, 1930, Harry H. Love Papers, Box 14, folder 35, Kroch Library, Division of Rare & Manuscript Collections, Cornell University, Ithaca, New York..

¹⁵⁹ Shen to Love, June 27, 1930, Harry H. Love Papers, Box 14, folder 35, Kroch Library, Division of Rare & Manuscript Collections, Cornell University, Ithaca, New York..

and his Jinda assistants, Shen got permission from the National Central University to test over four thousand wheat varieties collected and bred by the NCU. He also tested 591 American wheat varieties from Jinda's collections and 135 experimental varieties of the Jinda faculty.¹⁶⁰

However, Shen was not able to finish the wheat tests in Zhejiang. After winning the Central Plains War, Jiang Jieshi started infighting within the Nationalist Party and dismissed Zhang Jingjiang, whom he had formerly respected as an elder. Zhang lost his control over Zhejiang Province in early 1931, and most of his followers in the provincial government were forced to leave. The agricultural program persevered, but was reformed and renamed as the Zhejiang Agricultural Improvement Station. Qian Tianhe quit and returned to Nanjing. Shi Ying (石瑛), the following director of the station, was a senior politician and was honored as the most honest and upright official in Republican China, but he did not understand field experiments of agricultural science. Therefore Shi Ying was less effective as a leader for agricultural research and extension in spite of his incorruptibility. When noticing that more than half of the varieties of Shen Zonghan's wheat screening tests performed no better than the local wheat, Shi Ying worried that Shen's works might be a waste of public money. Shi also thought that it was not necessary to employ American scientists (such as Harry Love) at a high salary, because he could not see agricultural improvement from the scientific works of Shen and his colleagues. Shen Zonghan had endeavored to persuade Shi Ying of the importance of scientific research in agricultural extension, but he finally decided not to continue his

¹⁶⁰ Shen, Zhonghan, *Shen Zonghan's Memoirs: Memoir of the Middle Age*, pp.153-154.

work in Hangzhou after this incident. Luckily, Zou Bingwen's bank promised to continue to sponsor Harry Love's work in China even though the Zhejiang provincial government intended to dismiss this program. In August 1931, Shen Zonghan quit this provincial program and moved back to *Jinda* along with his wife. Harry H. Love had arrived in April and took over the position of chief technician after Shen left.¹⁶¹ During changes in early 1931, Tian Tianhe left the Zhejiang provincial government and moved to Nanjing. Qian was soon appointed as vice chair of the preparatory committee of the National Agricultural Research Bureau. After July 1933, he became vice director and the one really taking charge of the operation of this bureau (the director was only nominal). Qian finally managed to persuade Love and Shen Zonghan to join the Bureau. But in 1931, even if the misunderstanding between Shen Zonghan and Shi Ying did not fundamentally change Shen's attitude towards the government and its affiliated academic institutes all at once, this incident did remind him of the uncertainty of governmental organizations and problems inherent in working for agencies directed by non-scientists.

From 1931 to 1934, Shen Zonghan returned to education, research, and extension at *Jinda*. His most influential students, Ma Baozhi (马保之) and Jiangyanshi (蒋彦士), studied at *Jinda* under Shen's instruction around 1930 and travelled to America for graduate education in famous agricultural colleges such as Cornell University and the University of Minnesota. With his recommendation, younger agriculturalists in Nanjing and Zhejiang, such as Jin Shanbao (金善宝), Feng Zefang (冯泽芳), and Lu Shougeng (卢守耕)—got the chance to study at Cornell. His wheat breeding had significant

¹⁶¹ Shen, Zhonghan, *Shen Zonghan's Memoirs: Memoir of the Middle Age*, pp. 153-154.

improvement with his wife Shen Liying's assistance. They achieved a wheat variety with very outstanding qualities through pure line selection and named it as *Nanking 2905* (金大 2905, pronounced as *Jinda 2905*). This variety was early-maturing, resistant to most common wheat diseases along the Yangtze River, resistant to lodging (falling down in the field), and would increase the yield for 25%-30%. *Nanking 2905* was the first and best wheat variety bred by a Chinese agronomist. It was tested by *Jinda* faculty and students near Nanjing in 1933 and quickly became very popular among local farmers.¹⁶² In addition to the breeding research, Shen Zonghan conducted genetic hybridization experiments of wheat and rice in order to make plans for further improvement of crop varieties. His experiments were repeated at *Jinda*'s cooperative stations. Although Shen did not have a chance to put his data into practical breeding tests, his experiments did enrich scientific knowledge on crops in China.

The results of these hybridization experiments were published in English in journals and presented at conferences such as the Fifth Pacific Science Congress. This is an excellent example of how American-trained Chinese scientists created not just physical hybridizations of crops such as new wheat varieties, but also new ideas and techniques. These techniques arose from both their American and Chinese experiences. They subsequently contributed to global circulations of scientific knowledge about crop breeding and genetics. The scientific knowledge was not a simple introduction or application of western science, but was hybridized and created in Chinese local

¹⁶² During the war, Shen Zonghan and his colleague found that the *Nanking 2905* performed equally excellent in Southwest China. Before Jin Shanbao's NCU 2419, *Nanking 2905* was the most popular and widely-planted wheat variety developed by Chinese scientists.

environments. Then the newly-created local Chinese scientific knowledge returned to the West through publication in journals. Through this process, Shen Zonghan was fulfilling his love for China by carrying out the duty of a scientist, satisfying the “dual-identity” and creating knowledge that both contributed to international science and improved the lives of Chinese people.

In May 1933, Shen Zonghan attended the Fifth Pacific Science Congress at Vancouver and presented three articles of his recent research works. He took this chance to visit the United States and Europe to observe and study wheat breeding. Through his visits to agricultural institutes and stations in different states and countries, Shen was impressed by how the agricultural scientists managed to cooperate with non-scientists and to fit into their natural, historical, and economic environments in order to solve problems in agricultural production and increase crop yield. Shen had gradually changed his understanding on how to serve his country with agricultural science. He realized that it was impossible for several universities to build up an agricultural extension system for a country as huge as China.¹⁶³ Such a task required a powerful national government’s coordination, but there was no such nationwide government stability in China at that time. Shortly after returning to Nanjing in September 1933, and sensitized to the possibilities, Shen Zonghan met with a chance to develop agricultural extension and research at the national level.

The years between 1932 and 1937 were relatively peaceful, and the Nationalist central government was finally able to concentrate on economic construction rather than

¹⁶³ Shen, Zhonghan, *Shen Zonghan’s Memoirs: Memoir of the Middle Age*, pp.155-160.

internal struggles. In 1934—six years after Shen’s 1928 proposal for a coordinated system of agricultural research, education, and extension—the National Agricultural Bureau (中央农业实验所 the Central Agricultural Experimental Institute) started functioning. Chen Gongbo (陈公博), the Minister of Industry, served concurrently as the director of this bureau (although he had little time to devote to the job). Qian Tianhe, Shen Zonghan’s friend and fellow Cornell alumnus was appointed as vice director and actually administrated all affairs of the Bureau. Mrs. Shen Liying joined this bureau and served as a technician (the Chinese title was “技正”, but it actually meant research scientist). Qian also invited Shen Zonghan with hearty enthusiasm. In fall 1934, Shen Zonghan decided to partly give up his research at *Jinda* and to join the National Agricultural Research Bureau. This decision surprised everyone, since Shen had always preferred research at the university. He later described this change as “the first significant shifting point” in his career. In his memoir, Shen Zonghan explained the reason of his decision:

“I did feel deeply that a private university might be capable in education and training, but not able to improve agriculture for the whole country.¹⁶⁴ ... As a newly established governmental organization, the Bureau was less stable and guaranteed considering the changeful personnel and funding. ... I am an honest person believing in God and science, but I have neither political tact nor factional support. It would be hard for me to maintain a position in such a governmental institute. ... However, I believe that the Central Government must have a well-

¹⁶⁴ Shen, Zhonghan, *Shen Zonghan’s Memoirs: Memoir of the Middle Age*, p. 162.

established central agricultural bureau based on scientific research in order to improve agriculture in the entire country. Therefore I should join this bureau.”¹⁶⁵

However, Shen confessed to Love in private correspondence another reason for his transfer—which I believe was a more important reason compared with the public one—personnel conflicts at *Jinda*.

“It has been my great effort to cooperate with Mr. Heh¹⁶⁶ in our crop improvement work during my last eight years. His action and sharp conversation in some cases hurt me so much as to lose my appetite and sleep. ... As long as Mr. Heh is in our department of agronomy, I will resign my headship but will do my wheat breeding and instruction as before if he does not interfere [with] it. If he will still interfere [with] my research and instruction, then I have to leave the college entirely with great disappointment from our deans. I fear that [if] my research work will be interfered [with] by him, I can do instruction only. ... ”¹⁶⁷

Clearly, Shen Zonghan’s moving to the National Agricultural Bureau was not only because of a belief in the KMT central government’s advantage in serving the country,

¹⁶⁵ Shen, Zhonghan, *Shen Zonghan’s Memoirs: Memoir of the Middle Age*, pp.164-165.

¹⁶⁶ Hao Qinming (郝钦铭, C.M. Heh, 1896-1943) was one of the earliest cotton breeding scientists in China. He received bachelor’s degree from the University of Nanking in 1923 and then worked and taught there for almost twenty years. He became the director of agronomy in 1927 and helped the College go through the big crisis of Chinization and de-Christianization in 1927 and 1928. However, Heh did not get along well with many American-trained scientists, such as Zhao Lianfang (the “tiger professor” and “rice king,” who left and joined the National Central University, see section 3.4). When Heh visited Cornell in 1932 and 1933 to take graduate education, Shen Zonghan took the position of director of agronomy, which might be a trigger for the conflicts between Shen and Heh.

¹⁶⁷ Shen Zonghan’s letter to Love, August 10, 1934, Harry H. Love Papers, Box 14, folder 35, Kroch Library, Division of Rare & Manuscript Collections, Cornell University, Ithaca, New York.

but also because of a desire to persist in his research without being interrupted by personnel conflicts. The government position happened to be a place that would allow him to escape from meaningless struggles.

In practice, the Bureau was a better place than *Jinda* for Shen Zonghan concentrate on research. In addition to a better personnel environment, Shen obtained more opportunities to meet high officials in the Nationalist government and had more facilities in applying his own thoughts in research and extension works and in receiving financial support.¹⁶⁸ After a meeting with Jiang Jieshi in summer 1934, Shen Zonghan wrote to Love that “everyone recognizes the importance of centralization and coordination in agricultural endeavor. General Chiang [Jiang Jieshi] and his followers ... appreciate the importance of our Bureau in cooperating with the provincial experiment stations. ... The Bureau is receiving favorable attention from various sources, and it seems that it will be easier for us to get money than good personnel to carry on the work.”¹⁶⁹

As for personnel, Shen Zonghan’s title at the Bureau was “chief technician (总技正)” and he actually served as leading scientist of the section of crop improvement, which was independent from other sections such as animal husbandry, agricultural economics, and fertilizer science. Director Qian Tianhe gave Shen a great deal of freedom to choose his research topics and colleagues. Shen set up cooperation between the Bureau and *Jinda*’s experimental stations with little difficulty and therefore continued his breeding

¹⁶⁸ The College of Agriculture and Forestry at *Jinda* suffered financial difficulties in 1935. If staying at *Jinda*, Shen could hardly have enough funding for his research as at the Bureau. Shen to Love, April 2, 1935, Harry H. Love Papers, Box 14, folder 35, Kroch Library, Division of Rare & Manuscript Collections, Cornell University, Ithaca, New York.

¹⁶⁹ Shen to Love, November 13, 1934, Harry H. Love Papers, Box 14, folder 35, Kroch Library, Division of Rare & Manuscript Collections, Cornell University, Ithaca, New York.

research started at *Jinda*. In addition to Shen Liying, Shen Zonghan recruited several other *Jinda* or Cornell graduates¹⁷⁰ to his team, therefore he need not make any change in his usual way of working. He was satisfied with the new situation: “I only change the location of my laboratory and office, but have even more time concentrating on my research.”¹⁷¹ Actually, an important part of the extension of Nanking 2905 was finished in the Bureau. The Shen couple and their colleagues also bred a series of new wheat varieties on the basis of Nanking 2905, which were numbered and named as the Bureau (中农, Zhongnong) varieties, such as the Zhongnong 28, Zhongnong 166, and Zhongnong 62 hybrid wheat. Through the breeding of these hybrids, Shen Zonghan was able to apply his achievements from the genetic experiments completed during his *Jinda* years.

In addition to research and extension, Shen Zonghan took advantage of his personal network and the position of governmental scientist in promoting scientific communication between China and the West. For example, he invited western scholars to make touring lectures in China. In addition to Harry H. Love, two scientists with international reputation took long trips in China in 1935 and 1936: bio-statistician John Wishart from the University of Cambridge had taught statistics at the Bureau for six months, and crop breeding scientist H. K. Hayes from University of Minnesota spent ten months visiting the *Jinda* cooperative stations with Shen and his assistants at the Bureau and held short-term training seminars at these stations. The Bureau had almost established an academic exchange program with several British institutes. Unfortunately

¹⁷⁰ Including Ma Baozhi, Guan Jiaji, Jiang Yanshi, and Lu Shougeng.

¹⁷¹ Shen to Love, November 13, 1934, Harry H. Love Papers, Box 14, folder 35, Kroch Library, Division of Rare & Manuscript Collections, Cornell University, Ithaca, New York.

the war in 1937 broke off these communications. In his correspondence to Harry Love, Shen confessed that he believed that these foreign scholars would benefit his Chinese students by presenting diverse approaches to conduct scientific research (rather than simply introducing advanced knowledge). In other words, Shen Zonghan thought that agricultural sciences in China, or at least in Nanjing, was much more advanced than before, and agricultural scientists had surpassed the step of simply studying from the westerners. Shen encouraged younger scientists at the Bureau to refer to ideas and methods of the famous western scientists, but to develop Chinese agricultural sciences based on local natural and social conditions.

In his spare time, Shen Zonghan wrote some bulletins in English to introduce the works of his colleagues at the Bureau and *Jinda* as well as the progress of the agricultural sciences in China. These bulletins were published by the Bureau and sent to American agricultural colleges and stations by Shen's Cornell professors and friends. Therefore by the early 1940s, the name of leading Chinese agricultural scientists—such as Zhao Lianfang, Shen Liying, and Dai Fanglan—were well known in American scientific communities. He also wrote bulletins in Chinese to introduce important agricultural knowledge and progress in western agricultural sciences. These bulletins were spread in China through the extension programs of the Bureau and *Jinda*, and some of them were used as textbooks in the Bureau's programs training middle level agricultural technicians.

From his time at Cornell in the 1920s to the outbreak of war in 1937, Shen Zonghan was in frequent contact with his Cornell professor Harry H. Love. In their correspondence, Shen's underlying goal as a Chinese scientist is clearly articulated. By

1937, his desire to serve his country through agricultural research and education remained constant, although he moved from university to the government and adjusted his working pattern accordingly. We can see that the application that was central to Shen's desire to "serve his country" was always to improve crop yield by applying advanced agricultural knowledge and techniques. While working for the government, however, Shen gradually became aware of the limitation of this idea. In the 1930s, the economic structure of rural China usually played roles more important than pure production of crops in improving the lives of Chinese people. Agricultural science could not solve these larger economic problems. Therefore, after the war broke out, when Shen succeeded Qian Tianhe as vice-director of the Bureau, he chose a different strategy: he changed the emphasis of his work from scientific research to the coordination of agricultural scientists and the non-scientists in agriculture. I will explore this shift in Chapter 4.

2.5 Summary

Missionary universities provided patronage for Chinese agricultural scientists in the very chaotic warlord era, but these advantages also embodied foreigners' privilege over Chinese people and highlighted the crucial tension between the Chinese and the foreign in Republican China. When nationalism gradually grew and Chinese intellectuals became more aware about their national identity, missionary universities faced a very complicated situation. They had to reform themselves and stressed their Chinese identity in order to remain attractive for patriotic Chinese intellectuals. Chinese scholars might

take advantage of missionary universities' superiority in stable funding and international communication. Their love and loyalty for China as their mother country was similar, which meant that these scholars shared similar goals as their colleagues in national institutes: serving China through science and knowledge. But their strategies were different because of missionary universities' closer connections with the westerners. When the scholars at the Southeastern University were struggling and negotiating among diverse political forces, Dai Fanglan was able to conduct high level fundamental scientific research such as establishing a new discipline in order to establish China's status in the international community. When critics were debating whether Chinese people should allow foreign programs to survey Chinese land, Shen Zonghan and his colleagues were able to critically evaluate western scientific knowledge, developed new knowledge from Chinese circumstances, published in English, and increased the reputation of Chinese scientists among western scholars. The history of missionary universities is usually seen as independent from the history of higher education in China, because missionary schools were usually operating or sponsored by foreigners and were not directly administered by the Chinese government. However, in my opinion, at least for the studies of agricultural scientists in Republican China, those in missionary and national universities could contrast with and complement each other, because they illustrated and exemplified how patriotic Chinese scientists with similar motivations and goals took very distinct but effective strategies to realize the goal of serving China through agricultural sciences.

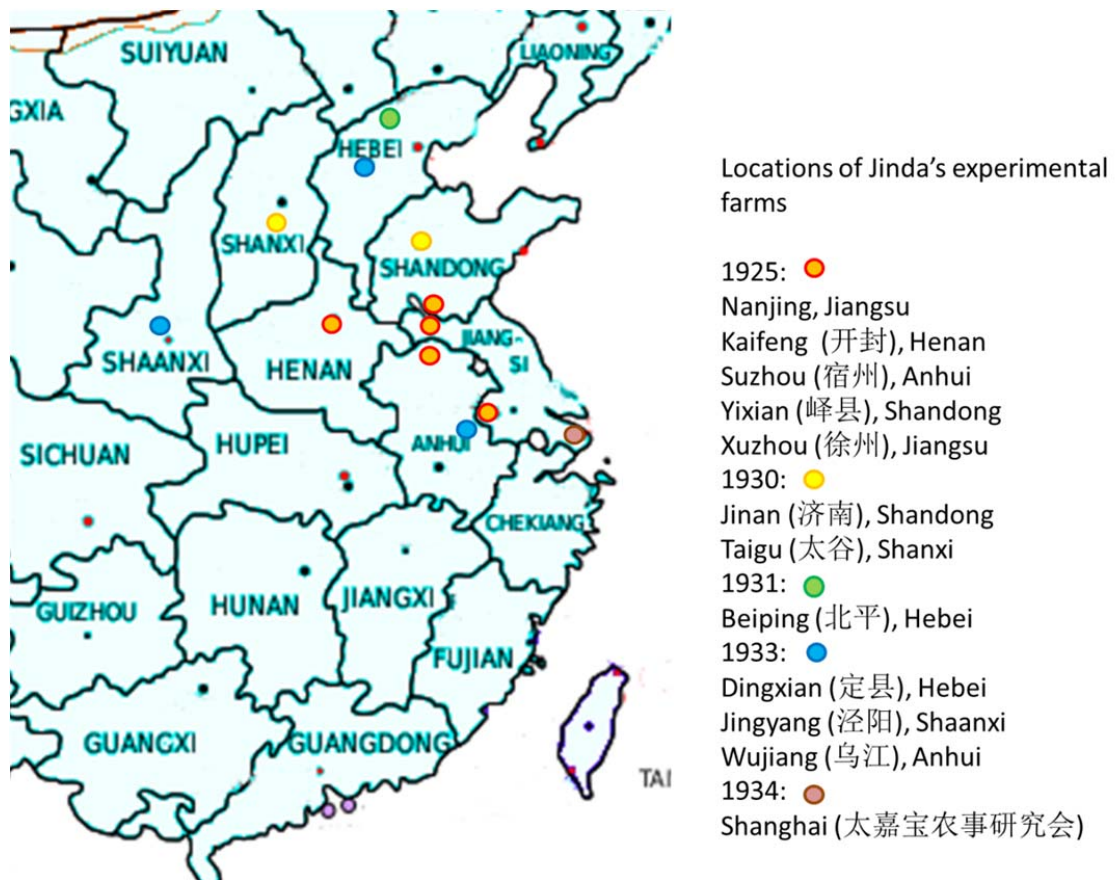


Figure 6 Locations of Agricultural Experimental Stations of *Jinda*. All of them were established and run by cooperating with local missionary schools.

Chapter 3 The Nanjing Decade: Rise of Agricultural Science in National Universities and Institutes, 1927-1937

By 1926, the Nationalist Party had effectively controlled the entire Guangdong province, organized its own military force—the Nationalist Revolutionary Army, and found several allies from the other warlords and the Communists. From May 1926 to summer 1928, the Nationalist Party and its allies launched a Northern Expedition aiming to unify China. The Northern Expedition army captured Nanjing in March 1927, and established this city as its national capital. By December 1928, all the remaining warlords in the northeastern, southwestern, and northwestern China claimed to be subordinate to the Nationalist government in Nanjing. Therefore, it seemed that China had finished its disintegrated status and reached unification after chaos of almost two decades—but only in form.¹⁷² Because of the location of the new national capital, the ten years between 1927 and 1937 (sometimes counted from 1928, the year when the Nationalist government replaced the Beijing government to be the legitimate government of China) was usually called the “Nanjing Decade.”¹⁷³ It was also considered as the “Golden Age” or “Golden Decade” of Republican China, especially for the urban bourgeoisie.

During the ten years when Nanjing was the national capital, the Nationalist central government took a series of reforms, for instance: gradually replacing the stratocracy led

¹⁷² Some historians of modern China commented that the Northern Expedition was merely some new warlords replacing the old warlords. See Bai Shouyi, *ZhongGuo TongShi*, volume 12.

¹⁷³ Some historians claim that the Nanjing Decade started in 1928, when the Nationalist Party unified China in form. Considering the development and change of agricultural science, I prefer April 1927 as the beginning time.

by military forces with a single-party-state politics with a larger portion of intellectual politicians involved, unifying currency and weights and measures to make convenience for the development of business and industry and to improve domestic and international communication in these fields, unifying taxation systems within the eastern provinces under its domination, initiating infrastructure projects such as building railways, launching a New Life Movement to enhance civilization of Chinese society, constructing elaborate and operable regulations for education, and starting a Rural Revival Movement to improve critical problems in rural China—especially the problems related to agricultural production.

However, to what extent these reforms actually changed China remained a question. The Nanjing decade was an era of fragmented decentralization, foreign threats, and a tendency of unification and nationalism. The country suffered continuous civil wars—between the Nationalist Party and the remaining warlords, between the Nationalist Party and the communists, and among the warlords who were beyond the control of the Nanjing government—in almost all areas except for the region near Nanjing. The Japanese had effectively occupied the northeastern provinces (Manchuria) and were beginning to poke around in the areas near Beijing and Shanghai. Most of rural China was beyond the influence of the Nationalist government, even in the eastern area. Historians have noticed the inconsistencies of this era. Some earlier historians of sciences and modern China, Peter Buck and James Reardon-Anderson, for example, are inclined to focus on stability and unification the Nationalist Nanjing government had brought to

China.¹⁷⁴ Reardon-Anderson admits the tensions but argues that “the Nanking government provided to the coastal, urban, and privileged sectors of China a degree of stability, security, and direction that had been unknown in that country for more than a generation.”¹⁷⁵

While I agree with these historians’ argument that the social environment for the development of science and higher education in this decade was better than that in the warlord era, I would like to stress in this chapter some aspects of tensions rather than simply analyzing positive changes brought by the new “strong central authority” (as Reardon-Anderson describes). My case studies can exemplify development of sciences in the historical transition brought out by the Nanjing government’s reforms, but more important, they would excellently illustrate that, even within the coastal and urban regions, security and unification was not stable at all. Tensions between the foreign and the Chinese, between the local and the central, and between the scholars and the state were always playing significant roles in the development of sciences and scientific education.

Compared with scientists from other disciplines and places, agricultural scientists at national universities in Nanjing and Beijing (Beiping) are very good case studies to exemplify the tensions I have mentioned. On the one hand, both cities were centers of culture and education throughout the Republican period and both held an important

¹⁷⁴ See Buck, Peter, *American Science and Modern China, 1876-1936*, Cambridge University Press, 1980; and Reardon-Anderson, James, *The Study of Change: Chemistry in China, 1840-1949*, Cambridge: Cambridge University Press, 1991.

¹⁷⁵ Reardon-Anderson, *The Study of Change: Chemistry in China, 1840-1949*, Cambridge: Cambridge University Press, 1991, p. 174.

position in the development of science, but their positions as political center/periphery exchanged because of the Nationalist government choosing Nanjing as its capital. Beijing had formerly been the center of political and cultural activity; but now it was replaced by Nanjing. The quickly shifting political positions highlighted a different social atmosphere of political centers and peripheries as well as how the scientists would adapt to their local environment and deal with the outside tensions, while trying to conduct high-level scientific research and education and apply their achievements in science to improving their country. On the other hand, agriculture related sciences were usually expected to be practical and beneficial for the country and the people. However, the state and the scientists' understanding about what was "practical" and "profitable" might be somewhat different, and this could cause tension.

Meanwhile, the second generation of scientists with western training backgrounds were gradually succeeding their predecessors and taking important positions in scientific institutes and organizations. Here I would like to consider the Chinese scientists completing American education and returning to China during the 1910s and early 1920s as the first-generation American-trained Chinese scientists, and those returning after the late 1920s as the second generation. The numbers of second-generation scientists were much larger than the first generation. Compared with the earlier returnees such as Zou Bingwen, Guo Tanxian, and Dai Fanglan (whom I introduced in chapters 1 and 2), the second generation usually had better educational backgrounds and higher degrees, which implied that according to western academic evaluation standards, they might be more capable and reliable in creating high-level scientific knowledge. The second-generation

scientists also had better research environments. In the early twentieth century, there were very few scientific institutes and organizations in China. The most critical task for the first-generation of American-trained Chinese scientists was to establish institutions for scientific research, education, extension, and domestic and international communication. During the Nanjing Decade, when more and more high-level universities and scientific institutes and societies had been established in China, the second-generation scientists were able to work in professional environments that were much better-established than that of the first generation. They were more capable of creating and circulating more advanced scientific knowledge to help China, of becoming important in international science, and sometimes (but not always) of applying their achievements to agricultural and industrial production to improve China's strength.

In this chapter, I explore case studies from the National Central University in Nanjing and Tsinghua University in Beiping (Beijing). These cases exemplified the motivations and strategies taken by Chinese scholars with American training to improve China during the Nanjing Decade. All the Chinese scholars in this chapter exhibited profound love for their country in their careers, and their activities suggested that all of them were endeavoring to improve their country—by elevating China's status in the international scientific community, increasing agricultural production in order to enhance people's lives, and strengthening the country's ability to compete with other countries in all aspects—through creating and circulating scientific knowledge. These scholars worked in Beijing (named as Beiping during this period) and Nanjing (the national capital during this decade), which were two cultural and academic centers of China at

that era. However, because of the unstable and chaotic political situation as well as regional differences caused by geography and history, working environments at these two locations were very different and kept changing. Beijing declined from being the capital to the political periphery, while Nanjing became the new national capital and received more support (as well as more restrictions) from the Nationalist central government. Patriotic scholars at these two cultural and academic centers needed to take different strategies to improve China through agricultural science. Some of these strategies fit in the new situation, some did not. Although their strategies had limited effects in improving the life of Chinese people and increasing agricultural production in all of China, during the Nanjing decade, agricultural sciences in Chinese universities and institutes flourished and quickly got closer to western scientific communities.

3.1 Decline of Beijing and Rise of Nanjing: the Unsuccessful Test of the University District System

From 1927 to 1929, the Nanjing Nationalist government appointed Cai Yuanpei to take charge of education. Cai tried a trial implementation to reform the Chinese educational system, which was named the “University District System” (大学区制).¹⁷⁶ Under this system, the Ministry of Education and provincial departments of education were abolished. Education would be regulated by “University Academy” at the central

¹⁷⁶ Bai, Shouyi, *ZhongGuo TongShi DiEr Ban: Di ShiEr Juan, JinDai (The General History of China, Second Edition: Volume Twelve, Modern Period 1919-1949)*, Shanghai Renmin Press, 2013, No. 21, pp. 143-144. (白寿彝, 《中国通史·第二版: 第十二卷, 近代》, 上海人民出版社, 2013年, 第21册, 143-144页)

government level and the leading university in each “university district”. (The ultimate goal was to only have one university in each university district.) Presidents of universities would take charge of all educational administrative affairs—from primary to higher education—within the university districts. This was only put into practice in Jiangsu, Zhejiang, and the Beiping-Tianjin area, and only lasted for up to two years. Therefore it did not change Chinese higher education significantly. However, the university district system did bring positive alterations to China’s academics and sciences. For example, it catalyzed the establishment of the Academia Sinica (the National Central Academy) and the National Academy of Peiping, which later functioned as the highest academic research and administration organizations in Republican China.¹⁷⁷ Moreover, I believe that this trial reform had reflected a series of problems of the educational, political, and social situations in Republican China, especially tensions between the central and the local and between inflexible western ideas and local Chinese realities. Therefore, it would be helpful to briefly introduce this reform before exploring the work of agricultural scientists in universities around China.

After settling down in Nanjing in April 1927, the Nationalist government appointed Cai Yuanpei¹⁷⁸ to administer educational affairs of the country. On June 7 1927, Cai

¹⁷⁷ After 1949, the two academies were merged into the Chinese Academy of Sciences (CAS).

¹⁷⁸ We have met Cai Yuanpei in chapter 1 when discussing the Peking University. Cai was the most well-known, most influential, and most respectable educationalist in Republican China. During the strife of changing university president at the Southeastern University, when president Guo Bingwen was expelled, even Guo’s enemies had to admit that Guo was not too bad—“we can hardly find a more satisfactory president within the entire China, except for CAI YUANPEI. But Mr. Cai would not accept this position.” This was evidence of Cai’s position as the leading educationalist in China. Moreover, Cai was also a politician and one of the founding fathers of the Nationalist Party. After Sun Yat-sen’s passing away, Cai supported Jiang Jieshi to be the new

Yuanpei submitted a proposal to the Nationalist central government and requested reforms for the Chinese educational system. He believed that the uneven development of education in China during the warlord era was largely because of the bad administrative system and a chaotic political environment that greatly interfered with education. Cai had always been stressing the importance of academic research in university education since his years at Peking University, and at this time, he was trying to separate education from political interference and to improve Chinese educational autonomy by introducing this French system of “University districts:”

“The proper way is to model the French system to set the university district as the unit of educational administration. All educational affairs within the district should be taken care of by the university presidents, and all the colleges should collaborate to resolve difficult problems, so that all the educational implements have their basis in academics.”¹⁷⁹

In addition, Cai Yuanpei suggested that University Academy should replace the Ministry of Education in the Central government: “I believed that the Ministry of Education had been too bureaucratic during the recent years... The best way to change bureaucratic to academic is to change the Ministry of Education into the University Academy.” The University Academy’s duty was to take charge of educational affairs beyond the duty of each university district, to regulate the relations between different

leader. After taking control, Jiang Jieshi supported Cai’s reforms in education and academics in return.

¹⁷⁹ Cai Yuanpei, “Proposal of Reforming the Educational Administrative System”, June 7 1927, *The Complete Works of Cai Yuanpei*, Vol. 5, Beijing: China Press, 1988, pp. 134-135. (蔡元培, “请变更教育行政制度呈”, 1927年6月7日, 《蔡元培全集·第五卷》, 中华书局, 1988年, 134-135页)

university districts, and to found and administrate national academic organizations such as the Academia Sinica and the national museum and library.¹⁸⁰ The purpose of Cai's proposal was to guarantee the independence of education in China by putting academics in control rather than politicians; and to make the educators pay more attention to research and cultivating younger personnel rather than being too distracted by the political and social environment. However, the later development of this reform was totally contrary to Cai's expectation. Some problems of Cai's system were reflected in the conflicts between the National Central University and Jiangsu Province as well as resistance from the universities in Beijing, including tensions between the central and the local and competitions among diverse political forces.

Jiang Jieshi and the Nationalist Government in Nanjing quickly passed Cai's proposal, and decided to set Jiangsu and Zhejiang provinces as the first two university districts on June 28, 1927. Jiangsu province was required to form the Fourth Sun Yat-sen University District, because the Nationalist party had controlled the Southeastern University and renamed it as the Fourth Sun Yat-sen University in order to memorialize their former party leader.¹⁸¹ When this university changed its name yet again into the

¹⁸⁰ Cai Yuanpei, "Proposal of Establishing the University Academy" & "Constituent Instrument of the University Academy," *The Complete Works of Cai Yuanpei*, Vol. 5, pp. 138-140. (蔡元培, "提议设立大学院案"、"大学院组织法", 《蔡元培全集·第五卷》)

¹⁸¹ In 1924, the Nationalist government established a national university in Guangzhou and named it as Sun Yat-sen, founder and leader of the Nationalist Party. Sun passed away in 1925 before the Nationalist Revolution succeeded. To memorialize Sun Yat-sen, whenever conquered a government-supported university or college during the Northern Expedition, the Nationalist Party would rename it as Sun Yat-sen University. The one in Guangzhou was the first one. Then Wuhan University, Zhejiang University, the Southeastern University, and the National Henan University were renamed as the second, third, fourth, and fifth Sun Yat-sen universities. But both politicians and scholars noticed how troublesome this way of naming would be, so later in 1927,

National Central University in May 1928, the university district was renamed as the central university district correspondingly. This university district existed for about two and half years from July 1927 to the end of 1929, and from the very beginning, it received continuous criticism and complaints from all interest groups involved: the university itself, the Nationalist central government, the Jiangsu provincial government, and elementary and secondary educators within Jiangsu province.

The most crucial issue for the Fourth Sun Yat-sen University/National Central University and its university district was about funding. During the warlord era, it was the Jiangsu provincial government taking on the chief sponsorship of the Nanjing Higher Normal School/Southeastern University. In return, the university gave more consideration to the benefit and need of Jiangsu province than of other places. This pattern could work when Nanjing was politically peripheral. After 1927, however, the Nationalist central government decided to transform the Southeastern University into its capital university and to build it as a model of China's higher education, which implied that the transformed university should not give so much preference to Jiangsu province as before. However, the Nationalist central government continued requiring the Jiangsu provincial government to fund this university—largely because the Nanjing Nationalist government was still fighting with other warlords and was in a financial shortage at this time. To make things worse, Jiangsu province had set certain revenues from commercial taxations as special funds for education during the warlord era. The new Nationalist

the second, third, and fifth Sun Yat-sen universities returned to their original names, and the fourth one finally changed its name into the National Central University. It was a “revolutionary” era full of all types of endeavors to reform China, and we can see so many successful and unsuccessful explorations just within the scope of higher education!

government decided that these revenues should be taxed by the central government directly, rather than the provincial governments. As compensation, the Jiangsu province could keep farming taxes for educational funding. The problem was: farming taxes were largely impacted by natural conditions and were much less stable than commercial taxation. As a result, the actual income of Jiangsu provincial government decreased during 1927-1932 compared with the years before 1927. As a result, the discontented provincial government started to default on educational funding.¹⁸²

However, from the position of the university, the transformation from the Southeastern University to the National Central University did improve the development of the university remarkably. From 1926 to 1930, the annual budget for this university increased from about eight hundred thousand *Yuan* to 1,920,000 *Yuan*.¹⁸³ By comparison, Peking University's annual budget in 1930 was 900,000 *Yuan*. By 1929, the National Central University had set eight schools including liberal arts, sciences, laws, education, agriculture, engineering, business, and medicine, while other national universities usually only had three to five schools (for example, Peking University had three schools of liberal arts, sciences, and laws). The total number of students at the Central University was 1731, almost twice of that of the Peking University (966). During 1927 and 1928, because of the turbulent social and political situations in north China, many students and

¹⁸² See Xu Xiaoqing, *ZhengJu Yu XueFu: Cong DongNan DaXue Dao ZhongYang DaXue 1919-1937 (Politics and Universities: From the Southeastern University to the Central University, 1919-1937)*, Beijing: China Social Sciences Press, 2009, and ChengPuXiongWei YangYangDaFeng: *ZhongYang DaXue XiaoZhang Luo JiaLun (Biography of Luo Jialun, President of the Central University)*, Shandong Education Press, 2012.

¹⁸³ In practice, the university usually could get only two thirds to three fourths of the budget from the governments. See Xu Xiaoqing, chapter 3.

scholars transferred to the Central University from other universities in the North (especially from Peking University, the old capital university), which greatly enhanced the educational and academic strength of the Central University.¹⁸⁴

Unfortunately, the university administration paid too much attention to maintaining its scale and superiority as the new capital university and model of China's higher education, while it relatively neglected its duty of administrating all educational affairs within the university district—especially those of primary and secondary education. The effect of this unfair treatment was very noticeable when the Jiangsu provincial government was defaulting on its educational allocation and all schools had to face financial shortages. In June 1928, the association of middle schools in the Central University District submitted a petition to the University Academy at the Nanjing government to accuse the Central University of ignoring primary and secondary education in Jiangsu province. This petition also commented sharply that:

“The Central University was the center of this country's academics. Then its funding should be afforded by the central government. We primary and middle schools in Jiangsu province should not be under the direct regulation of the central government, and our funding should not be allocated together with the university. ... Since the educational administration system within this country has not been unified, it is too luxurious to imitate the French system at

¹⁸⁴ See Xu Xiaoqing, *ZhengJu Yu XueFu: Cong DongNan DaXue Dao ZhongYang DaXue 1919-1937*, chapter 3, and Chen Pingyuan, *DaXue You Jingshen*.

this time. Cutting our feet to fit the shoes will inevitably bring out bad results.”¹⁸⁵

The situation was even more complicated and chaotic in North China. When the Nationalist government believed that they had controlled Beijing, the earlier political and cultural center, it changed the name of this city into Beiping¹⁸⁶ in June 1928, and announced a series of instructions of educational reforms in August, the most noticeable of which was to integrate nine universities in Beiping and Tianjin into a new “Beiping University” for the Beiping university district. However, most universities in this area had a much longer history than national universities in the South, and the students and scholars were proud of their distinct histories and traditions. They were severely upset by the Nanjing government’s instruction to combine them. From November 1928 to June 1929, students from Peking University, Peking Normal University at Beiping, and the Beiyang University at Tianjin launched marches and strikes to preserve their universities and resist the Beiping university district. For more than half a year, higher education at Beiping—the educational, academic, and former political center of the country—was almost paralyzed.¹⁸⁷

¹⁸⁵ “Petition from the Association of Middle Schools in the Central University District,” June 1928, pp. 7-8, in Cai Yuanpei, *The Complete Works of Cai Yuanpei*, Vol. 5, Beijing: China Press, 1988 (蔡元培, 《蔡元培全集·第五卷》, 中华书局, 1988年).

¹⁸⁶ In Chinese, “京 (Jing)” means the capital of a country. Beijing (or Peking, 北京) means the north capital, while Nanjing (or Nanking, 南京) means the south capital. Beiping (or Peiping, 北平) was an old name of this city and was only used for several decades during the 14th and 15th centuries. Local residents had considered this city as a capital for over thousand years. Therefore, when the KMT government prohibited the name “Beijing,” it irritated many local people, especially university students and scholars.

¹⁸⁷ For trials in Beiping during this period, see Wang, Xuezheng, *Beijing Da Xue Ji Shi, 1898-1997* (*Peking University Chronicle, 1898-1997*), Beijing: Peking University Press, 1998, volume 1 (王

Even within the Nanjing central government, there were more and more higher officials opposing the university district system. The Nationalist Party used to encourage and rely on student and mass activism to overthrow the warlord governments, but once becoming the legitimate central government, it had to turn to emphasizing disciplines and social stability and putting more control over the thoughts and behaviors of university students. Therefore, Cai Yuanpei's idea of keeping education independent from politics seemed more and more inappropriate. In October 1928, after calls for impeachment from his party members, Cai had to resign his position at the University Academy and transferred to take charge of the Academia Sinica. Within the same month, the Nationalist central government ceased the University Academy and resumed the Ministry of Education. In July 1929, the Ministry of Education officially abolished the university district system and resumed Department of Education in each provincial government. The Central University was required to continue administrating educational affairs in Jiangsu province until the end of 1929, in order to maintain stability in regions around Nanjing, the national capital.¹⁸⁸

The two-year trial of the university district system shows that mechanically introducing western institutions without adapting them to local realities would not help

学珍, 《北京大学纪事, 1898-1997》, 北京: 北京大学出版社, 1998年, 上册), and Xiao, Caoren, *Beijing Da Xue Yu Jin Xian Dai Zhongguo (Peking University and Modern China)*, Beijing: China Social Sciences Press, 2005 (萧超然, 《北京大学与近现代中国》, 北京: 中国社会科学出版社).

¹⁸⁸ Xu Xiaoqing, *ZhengJu Yu XueFu: Cong DongNan DaXue Dao ZhongYang DaXue 1919-1937 (Politics and Universities: From the Southeastern University to the Central University, 1919-1937)*, Beijing: China Social Sciences Press, 2009, and *ChengPuXiongWei YangYangDaFeng: ZhongYang DaXue XiaoZhang Luo JiaLun (Biography of Luo Jialun, President of the Central University)*, Shandong Education Press, 2012.

China at all. In most cases, it was beyond the ability of university administrators and scholars to deal with the governments and local public at the same time. This system could run well in France because a strong central authority was able to guarantee the education system's independence from local political interference. In Republican China, the central government was not capable of effectively controlling the local forces, and therefore not capable of providing support and protection for education—either in funding or in administration. Although unsuccessful, the trial of the university district system demonstrates that when introducing western institutions and approaches, it was important and critical to be flexible and pay close attention to local Chinese conditions. Cai failed, even though he was Chinese and a powerful official with high social reputation, because he failed to adapt the French “university district” system to the situation in China. By comparison, American-trained scientists were more accomplished in introducing agricultural sciences and education in universities, because they were more successful in adapting the foreign ideas to specific local political, social, and economic situations.

3.2 Chinization of Tsinghua: From Tsinghua School to National Tsinghua University

When Peking University was fading from the history of agricultural sciences in China in the late 1920s, another university dominated by American-trained scholars rapidly ascended at Beijing: the Tsinghua University. It is necessary to briefly introduce

the establishment of Tsinghua University before exploring its agricultural studies. As I have mentioned in the Introduction, the Boxer Indeminty started to select and prepare Chinese students to study in the United States. in 1909, and in April, 1911 Tsinghua College was opened as a preparatory school for these selected students. At first, this school provided education at the level of secondary school and the first two years of college. Students at Tsinghua College received education to prepare for further studies abroad. However, during the late 1910s and the early 1920s, scholars at Tsinghua decided that, if they were contented with the status of a preparatory school, Tsinghua would lose its roots in Chinese culture. Although early graduates from Tsinghua often stressed the humiliation of China, they were also actually trained western-style and relatively weakly in Chinese knowledge, even though the students themselves did not mean to be that way. As a preparatory school, Tsinghua was more like a secondary school or junior college at first. Its students were only prepared to go to an American university rather than to work or study in China directly. Students and scholars from other national universities often laughed at Tsinghua students for their poor knowledge and skill as Chinese people. In addition, the school was completely dependent on the refund of American Boxer indemnity. If this situation continued, whenever the Boxer Scholarship finished, Tsinghua School would be finished.¹⁸⁹ To avoid such a fate, in 1925 Tsinghua set up its college department to provide full college education. About two thirds of the annual fee from the Boxer Scholarship was used to support the college. The newly-established college was able to get the best faculty in China because its alumni who had received

¹⁸⁹ *Historical Materials of Tsinghua University*, Vol. 1, pp. 276-277.

graduate degrees from the United States were likely to come back and work at Tsinghua. In addition, Tsinghua's financial support was much more stable than other famous universities supported by Chinese governments, which made it very attractive for students.

Although transforming into a full-time university, by the middle 1920s, Tsinghua seemed more like the western universities rather than other Chinese universities. In addition to its administration under the Ministry of Foreign Affairs (rather than under the Ministry of Education), for many times, it was inclined to get closer to the westerners rather than its Chinese countrymen when making important decisions. For example, in April 1922, when the Anti-Christianity Movement was rising in both Shanghai and Beijing, Tsinghua School still provided its campus to the World's Student Christian Federation for the eleventh conference of this federation, which received fierce criticism from Chinese scholars. In 1926, when preparing to establish its first agricultural department, Tsinghua University chose to cooperate with the missionary Yenching University sponsored by American Christian organizations, rather than the Beijing Agricultural University. It was not until 1928, when the Nationalist Government took over Tsinghua, that Tsinghua really became a university of China.

As a school with a strong foreign background, Tsinghua experienced a remarkable shift of "Chinization" in its institution and administration after 1928. In June 1928, military powers in North China reached a compromise with the Nanjing Nationalist Government. They acknowledge the Nanjing Government as the central government of China (only formally). The Nationalist government became the new legitimate Chinese

government with international recognition, while local military forces remained powerful in regions far away from the reach of the Nanjing central government. As already described for Tsinghua, during the Warlord Era (from 1916 to February 1928), it was always at the national capital, ranked as the best school in China, and because of its relations with the United States, it was under the administration of the Ministry of Foreign Affairs. In contrast, from 1928 to 1948 (the Nanjing decade and the Sino-Japanese War), Tsinghua was always at a place outside of the political center—first in Beijing, later in exile in Kunming during the war. This means that local support was important for the development of this school. Tsinghua suffered another big change: it was transferred from the Ministry of Foreign Affairs to the Ministry of Education of the Nanjing central government. This meant increased scrutiny by the Nationalist Party. Tsinghua scholars and students had to deal with new situations and to find a proper balance between the central and local political forces for its further development.

In August 1928, the Nationalist government changed Tsinghua's name into the "National Tsinghua University" and put it under the joint-administration of the ministries of foreign affairs and education. In September 1928, Luo Jialun (罗家伦) assumed the presidency of Tsinghua with the appointment of the Nanjing government. Luo Jialun (罗家伦, also named Luo Zhixi, 罗志希, 1897-1969) was a historian, educationalist, diplomat, and political activist in Republican China. He studied at Peking University from 1917 to 1920, and was a very outstanding figure in the May Fourth Movement in 1919. Then he conducted research studies in history and philosophy at Princeton, Columbia, and universities in London, Berlin, and Paris for seven years. During this

period, he wrote and translated several academic books to compare Chinese and western cultures and history, which later became influential among Chinese scholars.

When appointed as the president of Tsinghua, Luo Jialun publically claimed that his chief purpose was to make Tsinghua a university to improve China's own academics by saying "the only purpose of my taking charge of Tsinghua was develop the independence of Chinese academia (我去办理清华, 除谋中国的学术独立外, 他无目的)." He proposed three principal concerns for Tsinghua's future development: first, the sciences China needed; second, Tsinghua's existing basis; and third, local conditions of Peiping.¹⁹⁰ Luo's reforms were carried out mainly in four aspects. Firstly, Luo moved the administration of Tsinghua to the Ministry of Education of the Nanjing Nationalist government completely. From then on, Tsinghua was to be under the management of the Chinese government—at least in form.¹⁹¹ Secondly, Luo moved the administration of the "Tsinghua fund" from the minister of foreign affairs to directors of the "China Foundation for the Promotion of Education and Culture" ("China Foundation" for short). These directors were non-governmental famous people from both China and the United States. This move was in part calculated to reduce corruption and mismanagement of funds. Thirdly and fourthly, he re-organized the departments and re-allocated funds. Luo Jialun increased inputs in purchasing academic books and scientific research equipment

¹⁹⁰ Luo Jialun, "Reports and Plans for Reforming University Affairs (整理校务之经过及计划)," November 23, 1928, *Historical Materials of Tsinghua University*, Vol. 2 (1), p. 5.

¹⁹¹ In practice, part of the Tsinghua scholars and students did not accept this fact heartily. In addition, some times the leaders of Tsinghua also stressed their American background in order to claim more benefit. For details about these scholars and students' thoughts, see Liu Yun, *GuFan YuanYing: Chen DaiSun's 1900-1952*, and Liu Chao, *XueFu Yu ZhengFu: QingHua DaXue Yu GuoMin ZhengFu De ChongTu Yu HeZuo*.

and materials expanded the library, set up more buildings for research and education, and, correspondingly, cut off some programs he believed to be redundant—including the program of agriculture. This program had an important history in the early development of Tsinghua School, and scholars have not paid much attention to it (indeed no published history exists).

From 1928 to 1930, Luo Jialun made a series of reforms aimed at rebuilding Tsinghua into a university to serve the Chinese people and setting up a foundation to develop Tsinghua into a comprehensive research university. One of Luo's most unpopular reforms was to apply military regulations to the students, which aimed to improve the students' discipline and patriotism. Luo's reforms were based on his outstanding ability, decisive personality, as well as the support of the Nationalist central government, while the Tsinghua scholars and students, no matter how patriotic they were, had got used to the autonomy and freedom brought by its unique background (under the looser control of the Ministry of Foreign Affairs, not Education). Therefore, although the Tsinghua students admitted that Luo was capable and had done a lot of good things for Tsinghua, they disliked Luo's reforms. Moreover, many Tsinghua people preferred other political forces to the Nationalist government. As a result, Luo was expelled by the Tsinghua student union in 1930.¹⁹² In the following paragraphs, I will briefly introduce Luo's reforms and how the thoughts and careers of Tsinghua agricultural scientists would be influenced by these events.

¹⁹² Li Jingqing, "Storms at Tsinghua," September 1930, *Historical Materials of Tsinghua University*, Vol. 2(1), pp. 82-86. (李景清, "清华学潮的前后", 1930年9月, 《清华大学史料选编》, 二(上), 82-86页).

At the very beginning of its establishment in the early 1910s, Tsinghua had a mandate to build up an agriculture program. Its college students organized an association of agriculture to prepare for further study in agricultural sciences in the United States. In 1921, Yu Zhenyong (虞振镛), a Tsinghua College graduate with an M.S. degree in animal husbandry from Cornell University, organized a program of agriculture and provided optional courses such as crop science, horticultural science and animal husbandry for college students at the Tsinghua College. This program was changed into a department in 1926, with Yu Zhenyong as the director. Yu Zhenyong continued teaching optional courses for college students and did not enroll students for the agricultural program. In 1928, when Tsinghua was reformed into the National Tsinghua University, this department had only one faculty member (Yu Zhenyong) and no full-time students. Tsinghua President Luo Jialun believed that this program was not running well and therefore closed it. Yu Zhenyong continued agricultural activities by collaborating with other organizations, such as the National Association of Mass Education Movements led by Yan Yangchu (晏阳初, Y. C. James Yen) and the Yenching University.¹⁹³ Together they established an experimental farm to conduct research on livestock breeding. At the same time, in 1928, they started an agricultural school to provide training for practical farming technicians and literate peasants. The experimental farm and the school did not run well either and was finally suspended in 1930 when Yenching University decided to give up. At the request of Yenching University, the University of Nanking (*Jinda*) took

¹⁹³ Yenching University was the best missionary university in North China and its campus neighbored Tsinghua's campus. The University of Nanking (*Jinda*) was the best missionary university in Nanjing and had the best agricultural school in China at that time.

over the experimental farm. Researchers from the School of Agriculture in the University of Nanking kept this farm for their studies in plant breeding. Yu Zhenyong left and joined the School of Agriculture in the National Peiping University.¹⁹⁴

Meanwhile, Luo's reorganizations received both positive and negative comments, while his militarization program irritated both students and faculty at Tsinghua. Because of its background, Tsinghua had high autonomy and strong democratic atmosphere before 1928. It also had a unique tradition of "professors managing the school" ("教授治校")—when facing important events, the professors would get together and vote to make important decisions. Luo's strong and arbitrary personality enabled him to make the reforms quickly and efficiently, but also challenged Tsinghua's democratic tradition significantly. He was tolerated by Tsinghua people for almost two years mainly because of two reasons: firstly, some of his reforms really benefited Tsinghua; and secondly, he was supported by the Nationalist central government. But this situation did not last long.

In spring 1930, the "Central Plains War" broke out. It was a civil war between the forces of the Nanjing Nationalist government and a coalition of three warlords: Feng

¹⁹⁴ For the agricultural program of Yu Zhenyong, see Liu Chao *XueFu Yu ZhengFu: QingHua DaXue Yu GuoMin ZhengFu De ChongTu Yu HeZuo (University and Government: Conflicts and Cooperations between Tsinghua University and the Nationalist Government, 1928-1935)*, Tianjin Renmin Press, 2015; Liu Yun, *GuFan YuanYing: Chen DaiSun's 1900-1952 (The Lonely Traveler: Biography of Chen Daisun, 1900-1952)*, Beijing: Tsinghua University Press, 2011; and Xu Xiaoqing, *ChengPuXiongWei YangYangDaFeng: ZhongYang DaXue XiaoZhang Luo JiaLun (Biography of Luo Jialun, President of the Central University)*, Shandong Education Press, 2012. Also see "The Agriculture Department's Effort in China's Agricultural Improvement and Education," by Zhu Junpeng from the Tsinghua University Archives ("注重中国农业改良的农业学系", 朱俊鹏, 清华大学档案馆) <http://xs.tsinghua.edu.cn/docinfo/board/boarddetail.jsp?columnId=00401&parentColumnId=004&itemSeq=5352>. For how the University of Nanking took over the farm, see Shen Zonghan's memoir, volume 2.

Yuxiang (冯玉祥) controlling Shaanxi, Gansu, Henan, and part of Inner Mongolia; Yan Xishan (阎锡山) controlling Shanxi province; and Li Zongren (李宗仁) controlling Guangxi province in south China. This war involved more than ten provinces and lasted for about six months. The Nationalist government lost its control over Peiping during the summer. As a result, Luo Jialun lost his political support. On May 20, 1930, some radical students took advantage of the situation and launched an “Expelling Luo Movement (倒罗运动),” supported by the student union. Luo Jialun was forced to resign and went back to Nanjing.¹⁹⁵

Although Luo Jialun was forced to leave Tsinghua and Beiping, he still had gained approval and sympathy from a considerable number of scholars and students at Tsinghua and from the Nationalist government. Chen Yinke (陈寅恪), professor of both Tsinghua and PKU and the most prominent historian in China at that time, characterized Luo Jialun this way: “Zhixi (Luo Jialun) had huge merits and virtues at Tsinghua. He built Tsinghua into a real national university. Regardless of this achievement, Zhixi is still an unparalleled president in the history of Tsinghua. ... When Tsinghua was under the Ministry of Education... the presidents were usually familiar with administration but unprofessional in academics. ... There was never a Tsinghua president so acquainted with both traditional and western knowledge as Zhixi was—I’m afraid that there would not be in future!” Jiang Jieshi, leader of the Nanjing Nationalist government, also praised Luo Jialun in 1931 that “President Luo had remarkable achievement in running Tsinghua,

¹⁹⁵ Liu, Chao, *XueFu Yu ZhengFu*, chapter 3.

not only in the university affairs, but also in transmitting the ideals of our Nationalist Party and the policies of the central government.”¹⁹⁶ These comments indicated that scholars and politicians had different expectation for the president of a top university and that Luo Jialun was an uncommon person able to fulfill the expectation of both sides. However, he was also a victim of the disordered historical context.

The student union and the faculty soon noticed that the radical students expelling Luo Jialun were not thinking about Tsinghua’s benefit and development at all but were followers of Yan Xishan, the warlord controlling Peiping at that time. They refused to accept the president arranged by this warlord, but they did not like the presidents nominated by the Nanjing government either. The conflict between Tsinghua and the governments lasted for over a year and finally got resolved in October 1931, when Mei Yiqi (梅贻琦) became the new president. Mei was the one acceptable candidate for both Tsinghua and the Nanjing government. He was among the first Boxer students studying at Tsinghua School, received a bachelor’s degree in electrical engineering from Worcester Polytechnic Institute in Massachusetts in 1914, and had worked as the university dean for years in the 1920s, but happened to be visiting the United States from 1928 to 1930, and therefore was not involved in the strife. He was very familiar with Tsinghua’s traditions and knew how to handle the strong feeling of the Tsinghua faculty and students. In addition, he had worked in the Nationalist government and knew how to deal with the politicians. From 1931, Mei Yiqi was Tsinghua president for over 17 years and he was considered as the most successful president (although many of his actions

¹⁹⁶ Xu, Xiaoqing, *ZhengJu Yu XueFu*, pp. 263-264.

were following the ways designed by Luo Jialun). After struggling between the desire to maintain democratic autonomy and the desire to be the school of the Chinese people for several years, Tsinghua staff and students finally found a balance and compromise under Mei, and the Tsinghua scientists were able to settle down and apply their knowledge to serve China.¹⁹⁷

3.3 Establishment of the Tsinghua IOA

In the early 1930s, after winning the “Central Plains War” and stabilizing the political situation in North China, the Nanjing Nationalist government started the “Rural Revival Movement” in order to promote agricultural production and the living standard of Chinese peasants. Considering its limited control over the country, the Nanjing government had to enlist support from people outside the Nationalist party. Patriotic intellectuals were the people most likely to support the Nanjing government’s reforms, and therefore, agricultural education became an important part of this movement. In May 1933, the Nationalist government set up a special “Rural Revival Committee” to administrate the “Rural Revival Movement.” As a response to this movement, in June 1933, The Ministry of Education in Nanjing issued Instruction Number 5825, which required Tsinghua to establish a school of agriculture in order to investigate important issues of agricultural production in North China and to train agricultural researchers.¹⁹⁸

¹⁹⁷ Liu, Chao, *XueFu Yu ZhengFu*, chapter 3 and chapter 4.

¹⁹⁸ Tsinghua University Archives, file 1-2-1-162, p. 1.

Because of the unsuccessful experience of the earlier agricultural department and schools, the Tsinghua University was not very enthusiastic about establishing this new school. The University committee believed that Tsinghua should focus on developing liberal arts, sciences, and engineering, rather than including too many programs. In addition, there were already other agricultural colleges in North China. In Beiping, the Beijing Agricultural College was battered during the reform of University Academy, but it was still running. The Shandong University had already set up a school of agriculture in Qingdao with departments of agronomy, forestry, and sericulture, which seemed able to conduct investigation and research of agriculture in North and East China. Therefore Tsinghua claimed that it was not necessary to build up a new agricultural school in Beiping, and was inclined to decline the instruction from Ministry of Education with this reason.¹⁹⁹

Another problem (not as openly discussed) was about funding. The Tsinghua University committee was short of income at that time. Tsinghua's financing came from the China Foundation for the Promotion of Education and Culture (the China Foundation) which relied on the returning fund of the Boxer Indemnity. However, payment stopped in 1932 and was in arrears in 1933. Tsinghua had just established a new engineering school with three departments at the beginning of 1932 and was not prepared for this suspension. Although Tsinghua finally went through this crisis with one million Chinese dollars (CND) in interim funds from Ministry of Finance in the nationalist government and three hundred thousand CND in bank loans, construction of the engineering school had been

¹⁹⁹ Tsinghua University Archives, file 1-2-1-162, pp. 2-6, and Cheng Guangsheng, p. 37.

largely delayed and the university could hardly afford a new school. In March 1932, the university committee had publicly announced that faculty and students should not apply to establish new programs or departments.²⁰⁰

However, Wang Shijie (王世杰), the Minister of Education, implied that the Ministry of Education would require the China Foundation to move part of the Tsinghua fund to support the National Wuhan University to establish an agricultural school in Central China if Tsinghua refused to create a school of agriculture.²⁰¹ Considering the possibility of a major funding reduction, the Tsinghua university committee finally decided to establish an agricultural research institute as a compromise so that they could

²⁰⁰ Since its establishment in 1924, the China Foundation started to manage funds returned by the US from the Boxer Indemnity. The Chinese central government paid the Boxer Indemnity to the United States government, which then allocated the surplus portion to the China Foundation. Then the China Foundation earmarked the fund to programs related to culture and education in China. Because of Luo Jialun's efforts, the running of Tsinghua funds was moved to the China Foundation in 1928. Due to the worldwide economic crisis, in 1932 the Nationalist government could hardly pay the Boxer Indemnity to its creditor nations and had to ask for extension of the payment. The United States therefore diminished support to the China Foundation. As a result, the Tsinghua University could not receive funds from the China Foundation that year. See *Journal of the National Tsinghua University*, No. 379, March 9th, 1932 (《国立清华大学校刊》第 379 期). Also see Yang Tsui-hua, *Patronage of Sciences: The China Foundation for the Promotion of Education and Culture*, Taipei, Institute of Modern History, Academia Sinica, 1991, pp. 61-68 (杨翠华, 《中基会对科学的赞助》, 台北, 中央研究院近代史研究所专刊 65, 1991 年, 第 61-68 页) and Qiu Huafei, "China and the United States' negotiation on extending payment of the Boxer Indemnity in 1933," *Archives of the Republic of China*, 2005 Issue 2, pp. 75-79 (仇华飞, "1933 年中美延期偿还庚款问题之交涉", 《民国档案》2005 年第 2 期, 第 75-79 页).

²⁰¹ Cheng Guangsheng, *Biography of Dai Fanglan*, the Institute of Microbiology, Chinese Academy of Sciences, 2008, p. 37. (程光胜, 《戴芳澜传》, 中国科学院微生物所, 第 37 页。) The minister Wang Shijie (1891-1981) was a British-and-French-trained jurist and educationist. He had been founder and the first president of the National Wuhan University. As a successful politician and lawyer, he asked to inscribe on his gravestone only one title—"the former president of the National Wuhan University".

still keep all their funds from the China Foundation. This institute was to focus on the most necessary and beneficial research topics for a future expanded agricultural school.

From December 1933 to September 1934, Mei Yiqi, president of the Tsinghua University, appointed three professors from the department of biology—Chen Zhen (陈桢), Li Jidong (李继侗), and Dai Lisheng (戴立生)²⁰²—to organize the new Institute of Agriculture. The university committee set several operating principles. Firstly, considering the tight budget, this institute should be as frugal as possible; the university would only allocate an annual income of twenty thousand Chinese dollars for three years. Secondly, the institute should have no more than two disciplines. Thirdly, the new institute should take full advantage of existing researchers and equipment. And fourthly, leading researchers of the new institute should be Chinese scientists with substantial experience in independent research and with good scientific reputations internationally.²⁰³

At this time, Tsinghua had competition in the agricultural research and education areas. Since 1927, Nanjing had become the center of agricultural science and education in China. The University of Nanking was definitely the most outstanding in agriculture

²⁰² All the three biology professors were American-trained agricultural scientists. Chen Zhen (1894-1957) received a bachelor's degree from the School of Agriculture in the University of Nanking before he got sponsorship from the Tsinghua College in 1919. He studied at the department of agronomy in Cornell University for two years; he then transferred to Columbia University in 1920 and studied in the group of T. H. Morgan. After returning China, Chen Zhen had worked at the Department of Biology in Tsinghua University for twenty-six years (1926-1952). Li Jidong (1897-1961) majored in forestry in the University of Nanking and entered the school of forestry in Yale University with Tsinghua sponsorship in 1921. He was the first Chinese scientist to receive a doctoral degree in forestry in the United States. Dai Lisheng (1898-1968) received a doctoral degree from the Stanford University and had been the founder of vertebrate zoology in China.

²⁰³ For preparation and establishment of this institute, see Tsinghua University Archives, file 1-2-1-200.

science. It was the first university in China to set up a school of agriculture. By the 1930s, the University of Nanking (*Jinda*) College of Agriculture and Forestry had established eight departments and a group engaged in agricultural science extension.²⁰⁴ All the leading agricultural scientists in *Jinda* were American specialists or American-trained Chinese scientists. American agricultural experts such as Harry H. Love and Clyder Myers had arranged long-term cooperation with the University of Nanking and conducted their research in China for over five years.²⁰⁵ Strong research teams along with sufficient and stable funding made the School of Agriculture in *Jinda* unrivalled in contemporary China. Also in Nanjing, the National Central University was sponsored by the central and local governments, the Rockefeller Foundation, and the China Foundation. It had six programs: agronomy, horticulture, husbandry, sericulture, biology, and plant pathology.²⁰⁶ However, except for Shen Zonghan's plant breeding studies in *Jinda*, most agricultural research in Nanjing was based on the natural conditions in East China, which were quite different from those in North China (where Tsinghua was located).

In South China, the School of Agriculture in Lingnan University, another famous missionary university in Guangzhou, had four departments: agronomy, horticulture, husbandry, and sericulture. This school put particular emphasis on sericulture because

²⁰⁴ *The Centennial Records of Nanking University: Historical Materials of the University of Nanking*, pp. 253-256.

²⁰⁵ See *The Stubborn Earth* and *Shen Zonghan's Memoirs*.

²⁰⁶ "Statistics of the Programs in Each School, 1933," *The Centennial Records of Nanking University: Historical Materials of the National Central University*, p. 313.

silk production was a mainstay of industry in Guangdong Province.²⁰⁷ National Sun Yat-Sen University's agriculture school emphasized rice breeding as well as economic plants research in south China.²⁰⁸ Since the cooperative agricultural program of Tsinghua and Yenching University terminated in 1930, by 1933 the only comprehensive university in North China with an agricultural school was the National Shandong University, which concentrated on forestry and sericulture.

Considering the specialties of other universities and the principles suggested by the Tsinghua University committee (as mentioned above), the three organizers decided to set plant pathology and entomology as major disciplines for the new agricultural institute. These foci might avoid redundant scientific construction in North China and set up Tsinghua's own advantage in competition with other agricultural programs, especially the ones in the National Shandong University. Meanwhile, it was possible for Tsinghua to invite agricultural experts from other universities to join the new agricultural institute.

In March 1934, Dai Lisheng, Chen Zhen, and Li Jidong reported to President Mei Yiqi their suggestions on the new institute. This institute would be named as the Institute of Agriculture in Tsinghua University (清华大学农业研究所, Tsinghua IOA) and would include two independent research groups: the Division of Pathology, and the Division of Entomology. Each group would engage one professor, one or two research assistants, and several staff members. Tsinghua University provided 10,000 Chinese dollars (CND) as

²⁰⁷ Chen Guojin and Yuan Zheng, *Momentary Splendor: Sixty-four years of Lingnan University*, Guangdong Renmin Press, 2008, pp. 50-51 & 83-84 (陈国钦, 袁征, 《瞬逝的辉煌: 岭南大学六十四年》, 广东人民出版社, 2008, 页 50-51,83-84). Also see Yang Tsuihua, p. 155.

²⁰⁸ Yang Tsuihua, pp. 153-156.

starting funds to purchase equipment. In the following three years, the institute could receive 20,000 CND every year,²⁰⁹ with 11,600 CND as salary, 6,400 CND for academic publications, and 2,000 for research trips. The three biology professors also listed five scientists as professor candidates: Dai Fanglan (戴芳澜, one of the two scientists featured above), Deng Shuqun (邓叔群),²¹⁰ and Tu Zhi (涂治)²¹¹ for pathology; Yang Weiyi (杨惟义)²¹² and Liu Chongle (刘崇乐) for entomology. Four of the five candidates—Dai Fanglan, Deng Shuqun, Tu Zhi, and Liu Chongle—were Tsinghua College alumni and had received postgraduate degrees in American Universities with the aid of Tsinghua

²⁰⁹ Tsinghua's annual expenditure for the entire university in the early 1930s was 1,200,000 CND. See Mei Yiqi, "General Report of Tsinghua's University Affairs during the Past Year", in *Historical Materials of Tsinghua University*, volume 2, Beijing: Tsinghua University Press, 1990, pp. 21-39. Originally published in *Qinghua Fu Kan*, volume 39, No. 7, April 29, 1933.

²¹⁰ Deng Shuqun (1902-1970), was a scientist of mycology, plant pathology, and forestry. He started the studies of forests in Northwest China and higher fungi in China. Deng Shuqun graduated from the Tsinghua College in 1923 and finished his studies at the agricultural school at Cornell University in 1928 (double majoring in forestry and plant pathology). After returning to China, he had worked at Lingnan University, Jinda, the National Central University, and the Academia Sinica. He was elected as the Academia Sinica academician in 1948 and CAS academician in 1955. His younger brother Deng Tuo (邓拓) was a famous CCP journalist and one of the first intellectuals sacrificed in the Cultural Revolution. Deng Shuqun was persecuted to death in 1970.

²¹¹ Tu Zhi (1901-1976) graduated from Tsinghua in 1924 and received his doctoral degree in plant pathology from the University of Minnesota in 1929. From 1929 to 1938, Tu Zhi worked at Lingnan University, Sun Yat-sen University, Wuhan University and Henan University as professor. He supported Marxism and the CCP and had been imprisoned by the nationalist government for this reason. During the war, Tu Zhi took the position of president of the Northwestern Agricultural School and explored agriculture, forestry and graziery in Xinjiang. After 1950, he took charge of translating foreign agricultural publications from English, French, German, and Russian into Chinese. Tu Zhi was selected as CAS academician in 1955.

²¹² Yang Weiyi (1897-1972) was a European-trained entomologist. He had been the first scientist to work on Hemiptera in China and the first to provide a systematic way to describe the regional distribution of insects in China.

(Boxer) scholarships. Finally, Tsinghua decided to invite Dai Fanglan and Liu Chongle to join this institute.²¹³

When receiving invitations from Tsinghua, both Dai Fanglan and Liu Chongle were willing to join the institute in their Alma Mater. However, both of them had already planned research trips to the United States. Bernard O. Dodge²¹⁴ had already arranged a two-year visiting research trip to the New York Botanical Garden for Dai Fanglan and the China Foundation had awarded a grant of 7,500 CND per year to support this research trip. Liu Chongle also applied for support from the China Foundation in 1934 and planned research travel through the United States and Europe between October 1934 and April 1936.

In July 1934, Tsinghua reached an agreement with the two professors: Dai Fanglan and Liu Chongle accepted their appointments and abbreviated their research trips to one year. Tsinghua would count their absences as sabbatical. During the 1934-1935 academic year, research assistants in the two groups would undertake some surveys and make preparation for research under the two professors. Li Jidong from the department of biology would provide advice for the assistants when necessary. After returning to Tsinghua, Dai Fanglan and Liu Chongle were expected to focus on research and popularization of agricultural sciences rather than teaching. Tsinghua attempted to

²¹³ Tsinghua University Archives, file 1-2:1-200, pp. 6-10.

²¹⁴ It seems that Dai Fanglan had been deeply influenced by Dodge in his fungi studies. According to the memoirs of Shen Shanjiang, a younger scientist at Tsinghua IOA, Dai Fanglan had recommended his students interested in microbial genetics to read Dodge and Carl C. Lindgren's works on *Neurospora*. See Shen Shanjiang, "Opportunities: Memoirs of Shen Shanjiang," in *Memoirs of Prominent Academicians*, edited by Han Cunzhi, volume 1, Shanghai: Shanghai Science Technology and Education Press, 2003, p. 388. (沈善炯, "机遇", 《资深院士回忆录》, 韩存志主编, 第一卷, 上海: 上海科技教育出版社, 2003年, 第388页).

appoint Dai Fanglan as the chair of the Tsinghua IOA. However, Dai Fanglan had little interest in taking administrative positions all through his life²¹⁵ and declined determinedly. Liu Chongle was even more indifferent to this position. Therefore, the Tsinghua IOA at this time had two independent divisions but no chief leader.²¹⁶ Despite this peculiar formation, Dai Fanglan and Liu Chongle maintained their two research groups through the remaining of their careers, even when these groups moved among many different research institutes.²¹⁷

²¹⁵ I would like to say: Dai Fanglan's indifferent attitude triggered some troubles later. In 1949, the CCP government required agricultural schools in Tsinghua and Peking University to integrate with the agricultural division from the North China University to establish the Beijing Agricultural University (BAU). Again, Dai Fanglan firmly refused to be president of the BAU. However, he was the only person acceptable for scientists from both Tsinghua and Peking University. As a result, no scientist could take this position, and Le Tianyu (乐天宇, 1901-1984), a USSR-trained communist agriculturalist, actually started to take charge of the BAU. Le Tianyu insisted on replacing American sciences with Lysenkoism, which resulted in severe conflicts among faculty members and finally caused reorganization of the BAU and some American-trained scientists' leaving. Conflicts at the BAU remind me of another institute: Shanghai Institute of Biochemistry in Chinese Academy of Sciences. In the 1950s and 1960s, CCP also attempted to reform western-trained scientists in this institute. Fortunately, Wang Yinglai (王应睐, 1907-2001), chair of the institute and a British-trained biochemist, negotiated and compromised with the CCP and pacified the western-trained scientists. The Institute of Biochemistry survived plenty of political movements without severe destruction. It even won fame as the "Little Cambridge" during the Cultural Revolution. For scientists and scientific organization in a turbulent era, sometimes it was very significant to be tactful. However, to deal with administrative and interpersonal affairs, scientists usually had to sacrifice their research.

²¹⁶ Cheng Guangsheng, pp. 37-38.

²¹⁷ At the beginning of the Anti-Japanese War, Tsinghua had to suspend the Institute of Agriculture and these two divisions had to merge with the department of biology in the National Changsha Temporary University. In summer 1938 Tsinghua restored the Institute of Agriculture, so Dai Fanglan and Liu Chongle returned to their original positions. In 1947 this institute was formed into a school of agriculture and the research groups became departments in the new school. In September 1949, the agricultural schools in Tsinghua and Peking University (along with the North China Agricultural University from communist area) integrated into the Beijing Agricultural University (BAU); therefore Dai and Liu's groups joined the departments of pathology and entomology in BAU. In 1952 and 1953, after series of political and interpersonal conflicts, the Chinese Academy of Sciences (CAS) got agreements with the BAU to reorganize several research groups in BAU—including Dai and Liu's groups—into CAS. Dai Fanglan and Liu

After meeting with President Mei Yiqi and other professors in July 1934, Dai Fanglan invited his student, Zhou Jiachi (周家炽), to be a research assistant in the division of plant pathology. Zhou Jiachi was Dai Fanglan's student at the School of Agriculture in Jinda and had been working as a research assistant at Lingnan University for one year. The division of entomology invited Mao Yingdou (毛应斗), a new graduate from the department of biology in Yenching University, to be a lecturer. Due to the limited research resources, by the summer of 1935, the lecturer and research assistant mainly conducted surveys and collections near Peiping.

Besides engaging researchers, President Mei Yiqi continued negotiating with the Ministry of Education and the local government in Peiping for some suitable places as experimental fields for the Institute of Agriculture. Mei Yiqi's original objective was the ruins of Yuan Ming Yuan (圆明园, the Old Summer Palace destroyed by French and British troops in 1860 during the Second Opium War). The Yuan Ming Yuan ruins covered an area of 3.5 square kilometers and it was next to the northwest corner of the Tsinghua campus, which was very convenient for Tsinghua IOA researchers to conduct field experiments. Mei Yiqi proposed his application to Minister Wang Shijie in a letter on July 8, 1933. However, Mei underestimated an important factor: since the destruction of the palace buildings in the 1860s, local peasants had gradually moved into this site for farming and residence, and local officials could not control them.

Chongle spent the rest of their lives in CAS. Their research groups finally become the Institute of Microbiology and the Institute of Zoology in CAS.

Chaotic political circumstances since the late Qing Dynasty had created entangled property claims related to the Yuan Ming Yuan ruins. In the early 1930s, the Peiping local government was managing the property. Concerned about income, the Peiping government did not want to give this site to Tsinghua. It was only a few years after the nationalist government's unifying China, and the Peiping government was not fully subordinate to the central government. As mentioned before, the central government was still powerless in many parts of China and was unwilling to displease the local government for Tsinghua's sake. Therefore, the Ministry of Education suggested that Tsinghua negotiate with the Peiping local government directly. Tsinghua spent more than half a year and took some tactful means to solve this difficulty. For example, President Mei Yiqi had written several times to Shen Pengfei (沈鹏飞), an early Tsinghua School graduate who was working as director of the Department of Higher Education at the Nanjing government, to ask for help. However, the local officials were not the root of the problem. Peasants living on this site over decades believed that Tsinghua was looting their land and resolutely resisted Tsinghua's taking over. They wrote to President Mei with angry questions,²¹⁸ and accused Tsinghua of bullying and oppressing poor peasants at Yuan Ming Yuan to the peasants' union of Peiping Nationalist party headquarters (see Figure 7). Tsinghua's higher intellectuals with an American-training background could

²¹⁸ Tsinghua University Archives, file 1-2-1-162, pp. 66-70. This might be an interesting case. The original letter was written in very literary classical Chinese, with very beautiful hand script. It highlights the class differences between the local peasant farmers and the bourgeois scientists, and ends with death threats against University officials. The general idea of this letter was: the noble elite Tsinghua scholars were lying to the Nanjing government; Tsinghua was not promoting agriculture at all, but just wanted to rob the poor peasants to take profits for themselves; the poor peasants could only make their lives by farming and would die if losing their lands, so, if they had to die, they might kill someone who had caused the misfortune for revenge

hardly expect to be trusted by the local Chinese peasants (who were suspicious of both higher education and foreign influences). As a result, Tsinghua IOA was never able to use this convenient land during its entire existence from 1934 to 1947. Moreover, the Tsinghua officials learned to carefully consider the desires of the local people.²¹⁹

The episode of the Yuan Ming Yuan land, along with some later conflicts between the Tsinghua IOA and local peasants in Peiping or southwest China, suggested an unpleasant fact to most American-trained Chinese agricultural scientists: no matter how “Chinese” they considered themselves and how enthusiastic they were to serve China, their identity as “American-trained scientists” determined that Chinese peasant farmers would consider them as outsiders and were inclined to keep distance from them. Although these scientists were able to fluently communicate with high politicians and famous international scientists, most (not all) of them lacked the skill to closely communicate with and gain the trust of the peasants, who were directly working on agricultural production in China. This character implied that these scientists often were not able to directly apply their knowledge and had to cooperate with the governments or other agricultural activists. This episode is also an example of how difficult it was for the scientists to find research facilities in such chaotic times (and this was the so-called “golden age!”).

When Dai Fanglan returned from his sabbatical in August 1935, Tsinghua IOA still had no experimental fields. Researchers borrowed three rooms from the department of biology as a laboratory—one bigger room for the division of entomology and two smaller

²¹⁹ Tsinghua University Archives, file 1-2:1-162-1.

rooms for the division of plant pathology. At the request of Dai Fanglan, Tsinghua gave the IOA 0.06 square kilometers of land on campus for research. As for equipment, Tsinghua IOA managed to borrow books and laboratory supplies from other biological institutes such as the department of biology in Tsinghua and the Fan Memorial Institute of Biology. But they had to subscribe to agricultural journals themselves, and 6400 CND per year was far from enough. Generally speaking, Tsinghua IOA started its research program under very limited economic conditions.²²⁰

From 1934 to the summer of 1937, research by the Tsinghua IOA staff was generally based on the North China area and its particular agricultural problems. The Division of Entomology conducted surveys on insect pests, beneficial insect breeding, and life history of insects. It also collaborated with the department of chemistry for insecticide research. In addition to Mao Yingdou, this division engaged Zhu Bao (朱宝, later changed his name into Zhu Hongfu 朱弘复 in December 1939) and Fan Xinrun (范新润) as research assistants in 1935 and Guo Haifeng (郭海峰) in 1936. All the three research assistants were Tsinghua graduates—Zhu Hongfu (1910-2002) and Guo Haifeng from the department of biology while Fan Xinrun was from the department of chemistry. The division of entomology published thirteen academic articles and some popular science pamphlets (such as *An Elementary Introduction to Insects*, 《昆虫浅说》), see

²²⁰ Yan Wanying, “The Institute of Agriculture in Tsinghua University during Wartime”, in *Tsinghua University and Science and Technology in modern China*, edited by Yang Jian and Dai Wusan, Beijing: Tsinghua University Press, 2006, pp. 211-222. Originally published on *Historical Materials of Chinese Science and Technology*, No. 4, 1987. (闫万英, “抗战时期的清华大学农业研究所”, 《清华大学与中国近现代科学技术》, 杨舰, 戴吾三编著, 北京: 清华大学出版社, 2006年, 页 211-222。原载《中国科技史料》1987年第四期)。

Figure 8) during the prewar period. Scientists at the division of plant pathology conducted surveys on plant diseases and fungi in North China. Zhou Jiachi cooperated with Professor Li Jidong at the department of biology and kept contact with Qiu Weifan and Wei Jingchao at Jinda for his survey research when Dai Fanglan was in the U.S. After Dai Fanglan returned, this division increased with two research assistants—Shi Lei (石磊) and Wang Qinghe (王清和). Dai Fanglan led and instructed these younger scientists to identify pathogens of diseases of millets, white pear, sorghum, wheat, and barley, which were crops and fruits widely planted in North China at that time. Meanwhile, they continued a fungi taxonomy project which Dai Fanglan had started at *Jinda* by collecting and identifying fungi in North China.²²¹

In this way, Tsinghua IOA started its work with American-trained scientists who had to negotiate between the central government and local conditions. They quickly adapted their research projects to the local fungi, insects, crops, and fruits. They were good at working with limited research resources. Compared with its rivals in Nanjing (such as the agricultural programs at the University of Nanking or the National Central University), the Tsinghua IOA received less governmental interference and the faculty had a fair amount of autonomy in designing their research and education. Although this was a new agricultural institute in the mid-1930s, it was positioned to succeed over the next twenty years because of the strong academic background support from Tsinghua and its politically marginal location among Chinese universities, which allowed it to be flexible and able to thrive in chaotic circumstances and adapt to local conditions.

²²¹ Tsinghua University Archives, file 1-2:1-200, pp. 17-26.

3.4 The National Central University: to be “Central” via Research and Education

When the Northern Expedition Army reached Nanjing in 1927, Zou Bingwen was forced to leave the Southeastern University because his political attitude was very different from the Nationalist Party. Wang Shanquan (王善全, a University of Georgia graduate and cotton scientist) became the head of the Agricultural School of the Southeastern University. Continual change of the top management of this university caused remarkable shake-ups of the faculty members. The Southeastern University was reorganized and renamed for several times within the following three months, and it finally transformed into the National Central University (NCU).

Although transformed from the Southeastern University, the National Central University had qualities quite distinct from its predecessor. While the Southeastern University had put more emphasis on balancing the conservative and the revolutionary, and maintaining academic and educational autonomy, the Central University, as a capital university at the new political center, had to pursue a way to be a leading model for national universities in China, which meant more scrutiny, less flexibility, and a more conservative approach. Once it was selected by the Nationalist government to be the “central” university, this pursuing became inevitable for both the university people and the outsiders. New political and social conditions proposed big challenges for the NCU. As the capital university of the Nanjing Nationalist government, it received more support

from the Nationalist central government than other national universities (in both materials and policies, as I described in earlier part of this chapter). Meanwhile, it had to take on more duty for the state—although the state was not powerful enough to effectively operate in the entire country. The university scientists had to take proper strategies to relieve tensions different from those before 1927, when the Southeastern University was at the political periphery. The years between 1927 and 1932 may be considered as a transition for NCU from peripheral to central. American-trained scientists still counted for more than half of the faculty of the agricultural school. They made significant progress in education and research—for example, Zhao Lianfang's (赵连芳) educational reform and rice research, Feng Zhaochuan's (冯肇传) cotton projects, and Deng Shuqun's (邓叔群) plant pathology research and forestry survey. As for extension programs, because of wars and the turbulent social environment, the agricultural scientists were not able to expand their works in practice. Their extension and experimental research remained near Nanjing in the extension station established by Zou Bingwen. But their surveys accumulated experience and knowledge about problems of agricultural extension in rural China, and after Luo Jialun took the position of university president in 1932, the NCU got a great boom in agricultural extension. Luo helped to solve funding problems and relieved tension between the NCU and the Nationalist government. He inspired in students and scholars a sense of responsibility to the country and to realize the love for country through creating, circulating and applying knowledge for China at a leading level. In addition, he took proper strategies to communicate with

different people and organizations and expand extension programs to over ten provinces in China.

But in the years leading up to Luo Jialun's presidency, efforts to bring western ideas, seeds, and practices were not very successful in extension as the scientists hoped. The case study of Zhao Lianfang (赵连芳, 1894-1968) will best illustrate the strategies and achievements of American-trained scientists at NCU during this transition period. Zhao Lianfang was born into a rural-gentry family²²² in Henan province in 1894, the year when China was crushingly defeated in the first Sino-Japanese War. Zhao recalled that the humiliation of 1894 had stimulated him to love his country and people all through his life ("after the Sino-Japanese War, China lost its army, navy, and huge area of lands...[the] fate of the country is so miserable that people feel deeply righteous indignation. That's the origin of my love for the country and country people all through my life," 中日一战, 丧师失地...国运多蹇, 民情鼎沸, 此毕生爱国忧民之由来也).²²³ The Qing government's reforms in education in the 1900s (see chapter 1) enabled Zhao to enter modern-style primary school and to learn world geography and enlightenment ideas. As a teenager, Zhao gradually formed the conclusion that China was extremely undeveloped in comparison to western countries (especially Japan). When the 1911 revolution broke out, he decided to participate in the revolutionary army, to overthrow the Qing government, and to establish a new China. Two years later, however, Zhao became disillusioned. He realized that serving in the army meant nothing but being involved in the warlords'

²²² His family believed that they were grand-grand-sons of the Song emperors.

²²³ Zhao Lianfang, *Zhao LianFang BoShi HuiYiLu*, Taipei: Zhao Zhang Xiao Song, 1970, p. 1.

fights, which was far from accomplishing his desire to serve his country. In July 1913, he decided to leave the army and to devote his future to the study of scientific knowledge abroad. To be more specific, he made a plan to pursue agricultural science, because “our country has huge territory and population. Agriculture is the foundation to establish the country, but agricultural science is still underdeveloped. We should conduct more study in agricultural science in order to enrich the country, to benefit the people, to improve the production, and to prosper the rural area (以我国地广人稠，农业为立国之本，而农业科学未发达，为富国利民，应特别从事农业科学之研究，以促进生产，繁荣农村),”²²⁴ This is Zhao Lianfang’s understanding of how to serve the country and people. Similar to the agricultural scientists I have introduced, Zhao considered benefits of Chinese people as the key of his love for China, and believed that improvement in agricultural science would ultimately benefit the people and country.

Zhao then spent three years on lessons of secondary schools and practiced English at a missionary school (博文书院, Wesley College) in Wuchang (武昌). Then he traveled to Beijing and was admitted by the Tsinghua College after very competitive exams.²²⁵ During the years at Tsinghua, he was active in student movements, and launched an agriculture club (农社) to prepare for studying agricultural sciences in the U.S. In 1922, Zhao finished his education at Tsinghua and travelled to America for college and graduate studies. At that time, earlier Boxer students had returned to China and brought

²²⁴ Zhao Lianfang, *Zhao LianFang BoShi HuiYiLu*, p. 8.

²²⁵ Zhao was admitted by both Peking University and Tsinghua, but PKU only allowed him to enter the section of Liberal Arts, which was quite different from Zhao’s interest. In addition, Zhao believed that PKU was too bureaucratic at that time. Therefore he chose Tsinghua. See Zhao Lianfang, *Zhao LianFang BoShi HuiYiLu*, pp.11-12.

back information on American universities. Zhao Lianfang consulted some senior Tsinghua alumna and decided to enter the Iowa state University for undergraduate and the University of Wisconsin for graduate studies.

At the University of Wisconsin-Madison, Zhao Lianfang studied crop breeding and genetics under Professor Leon Jacob Cole and Professor Royal Alexander Brink. He was very interested in Mendelian genetics and its application. With a strong desire to learn how to enrich China and benefit Chinese people, Zhao chose rice breeding and genetics as his research topic, because he believed that rice was the most important food crop for the lives of Chinese people. Wisconsin was not a rice-production area, so Zhao had to conduct experiments in the greenhouse. It was the time when genetics was growing quickly in the United States. Considering the state of the field, Zhao Lianfang paid more attention to genetic experiments rather than field studies. He published a series of articles in the journal *Genetics* in 1927 and 1928, including “Linkage Studies in Rice,” “Disturbing effect of the glutinous gene in rice on a Mendelian ratio,” and “Cytological Studies in Rice.” In these articles, Zhao conducted hybridization experiments of eight rice varieties, explored twelve traits, and identified twenty-five genes of three linkage groups. He was the first in the world to map rice genes. In addition to the courses and research, Zhao paid close attention to the educational systems of American universities, which he borrowed for his later career in Chinese universities.

Zhao Lianfang returned to China via Europe in 1928. When newly arrived in Nanjing, he received invitations from both Zou Bingwen (邹秉文), who was serving as a special advisor to General Feng Yuxiang (a warlord in North China, and one of the chief

power in the Central-Plain War, as I mentioned early in this chapter), and Guo Tanxian (过探先), who was director at the agricultural school of the University of Nanking (*Jinda*).²²⁶ Zhao was not willing to be involved in political struggles at his time, so he chose to be a professor at *Jinda*, with a hope to conduct academic studies to serve his country and people. However, to continue the research started in the U.S., he needed too much funding, equipment, research lab, and assistants, which *Jinda* was not able to provide.²²⁷ Therefore, after one-semester's teaching work, Zhao left *Jinda* and answered invitations from Zou Bingwen. In January 1929, with the help of Zou, Zhao Lianfang became an agricultural expert in the Guangxi provincial government. Unfortunately, wars broke out very soon between the Nanjing Nationalist government and the Guangxi warlords, and the provincial agricultural scientists could not continue their work at all. In June 1929, Zhao had to resign and returned to Nanjing. At this time, Wang Shanquan visited him and suggested that he join the NCU. Considering that NCU was a "national" university, Zhao believed that this was the place where he would be able to fulfill the aspiration of "enriching the country and benefiting the people." He accepted this position and was appointed as director of the department of agronomy, teaching genetics and crop breeding.

Zhao Lianfang quickly noticed that the situation at the NCU was not positive. Both faculty and students were disturbed by the unstable political situation and could hardly

²²⁶ We have met these two Cornell graduates in chapter 1. They were both working at the Southeastern University before 1927.

²²⁷ As I have introduced, at this time, *Jinda* was facing a tricky situation and needed to balance between the new Chinese government and the American missionary sponsors. It was not a good time to apply for funding to start new projects.

concentrate on studies. Zhao described NCU as: “Situation of the university was not ideal. Both inside and outside environments were often insecure. There was little atmosphere of scientific research. The students were not enthusiastic in studying. Considering the country was newly unified and the central government was newly established, such situation was understandable. The faculty members were not interested in their works as well. ... I recollected the vigor and vitality of famous American universities, and felt that we were too inferior in enthusiasm and persistence of scientific research.”²²⁸ Moreover, although educational funds for NCU increased in form, it was usually delayed in actuality (see part of the University Academy and tensions between Jiangsu province and the Nanjing government), and allocation for the agricultural school was not stable. Zhao Lianfang was facing shortages of both people and funding.

Zhao took advantage of his position of department director at once. He succeeded in applying for an appropriation from the Boxer Scholarship program (the China Foundation) to improve cotton, wheat, and rice. This stable outside fund enabled his department to conduct continuous research on these plants. Although his own research interest was rice, Zhao paid attention to research and extension of wheat, cotton, and soybeans as well. The experience of this period endowed him with a comprehensive understanding on agriculture in China, and enabled him to work as a governmental leader in his later career.

Zhao’s American training experience was reflected in his works at the NCU. For instance, he insisted on lecturing in both Chinese Mandarin and English. This was tough

²²⁸ Zhao, *Zhao LianFang BoShi HuiYiLu*, pp. 39-40.

for students with less English background.²²⁹ Zhao spent a lot of time after class on answering the students' questions and translated English references into Chinese to help these students. He believed that the students would benefit from such stringent learning and would be more capable of handling advanced scientific knowledge from the West. Another example was his emphasis on field practice. When studying at the Iowa State University and the University of Wisconsin-Madison, Zhao was deeply impressed by American agricultural schools' stressing practice and field experiments. In China, practice was not highlighted for agricultural college students. Actually Zou Bingwen had pointed out in his 1922 book *Agricultural Education in China* that the lack of field practice was a crucial problem for Chinese agricultural colleges (see Chapter 1). But years later, when Zhao entered the NCU, this problem still remained. Zhao required all students in his department, no matter girls or boys, to conduct field practice in their junior and senior years. In addition, he required all faculty members to hold posts as technicians, so they needed to finish field surveys and research to fulfil their position. Zhao received heavy complaints during the first year. But the study atmosphere of the department became much better. Agriculture graduates from the NCU quickly became very popular in the job market and exceeded those from Jinda in both quality and quantity. Zhao's famous students of this period included Tang Wentong (汤文通), founder of rice and soybean studies in Taiwan; Ye Changfeng (叶常丰), leader of rice breeding and extension in Zhejiang and founder of seed science in China; and Guan

²²⁹ He was given a nickname "Zhao Tiger (赵老虎)" by some students.

Xianghuan (管相桓), the most outstanding geneticist of rice in China during the 1940s.²³⁰ Interestingly, Guan Xiangheng established and taught at the Sichuan Agricultural College after 1949, and had deep influence on Yuan Longping (袁隆平), the most well-known rice scientist in China after the Cultural Revolution. Yuan had recalled many times how Guan's genetics helped him to find a direction in studies of hybridizing rice, and the first hybridized rice variety he achieved was derived from two varieties Zhao Lianfang developed in the 1930s. In this sense, Zhao's efforts in research and education have made significantly positive contributions to agricultural science in mainland China until the end of the twentieth century, even though he himself had moved to Taiwan after 1949. This example is very important. Yuan Longping has been characterized as an example of a true Chinese scientist—domestically trained and contributing to an authentically “native” Chinese science. However, the fact that Zhao Lianfang's genetics influenced Yuan Longping to this great degree demonstrates that the current “native” Chinese agricultural science is, in fact, a hybrid involving American elements brought by American-trained Chinese scholars during the Republican era.²³¹

²³⁰ Zhao, *Zhao LianFang BoShi HuiYiLu*, pp. 40-42. Also see Xia Rubing, *ZhongGuo JinDai ShuiDao YuZhong KeJi FaZhan YanJiu (Science and Technology of Rice Breeding in Modern China)*, Beijing: ZhongGuo SanXia Press, 2009, chapter 3.

²³¹ Zhao, Hanmo, “GuoMin KeXueJia: Yuan LongPing Yu 1960-2013 De GuoJia XuShi (People's Scientist: Yuan Longping and National Affairs, 1960-2013),” *RenWu (People)*, Beijing: Renmin Press, August 2013, volume. (赵涵漠, “国民科学家——袁隆平与 1960-2013 的国家叙事”, 《人物》, 2013 年 8 月号). Yuan Longping is considered as a national hero and known by almost every Chinese people because of his achievement of cultivating high-yield rice helps resolve food problem of Chinese people. Yuan took all his school education in Communist China. In her 2012 HSS presentation, Sigrid Schmalzer considered Yuan Longping as an example of “native” and “local” to contrast with scientists returned from America. “Transnational Science and Knowledge in Transit: The Movement of Agricultural Knowledge within and between China

Although his major interest was academic studies, Zhao Lianfang kept an eye on extension and governmental policy on agriculture as well. For Zhao, agricultural extension meant propagating and spreading new strains of crop plants to farmers. His earlier experience at the Guangxi provincial program made him more aware about the importance of land ownership, marketing, and capability of farming people than many scholars who remained in academia. He supervised research on rice, wheat, and cotton at several experimental farms of NCU, and cooperated with local governments at Kunshan (昆山, Jiangsu province) and Zhengzhou (郑州, Henan province) to establish farms for further extension. Limited by funding and personnel, Zhao did not achieve a lot in extending the new strains they developed during his years at the NCU. But he investigated the conditions of agricultural education and extension in China and explored its major problems:

“In foreign countries, when introducing a new crop strain, the government would consider it as a scientific project and set up special programs operated by scientific experts. While in our country, such programs are managed (unprofessionally) by missionaries, Japanese merchants, Chinese merchants, or philanthropists. Some governmental organizations claim to promote and spread American cottons. But they are actually just transporting (the seeds) for the farmers and were not really doing (the extension [work of training and marketing]). ... There are mainly four problems: 1) the introduced strains have

and the U.S., 1940s – 1980s,” History of Science Society Annual Meeting, 16 November 2012, San Diego, California.

not been screened; 2) some of the seeds purchased (abroad) are not purebred; 3) once introduced, there is no domestication step [such as scientists identifying and helping new varieties to adapt to the local environment] before extension; 4) after the introduction, there is no further step to screen and select seeds, so the introduced strains gradually deteriorate. ...”²³²

Zhao’s comments were from the standpoint of a scientist and did not touch on other essential issues such as the land ownership and the non-cooperation of peasants. He realized that in such a chaotic era, it was impossible for the university scientists to succeed in agricultural extension without governmental facilitation. Although he had previously considered academics as the best way for him to fulfill the desire to enrich the country and benefit the people, after 1933, he gradually shifted the emphasis of his works to governmental affairs. It was the year when the Nationalist central government launched the “Rural Revival Movement” and the Central Agricultural Experimental Institute (the National Agricultural Bureau) started to function. As a famous agricultural scientist and department director at the National Central University, Zhao was frequently invited to governmental conferences and consulted for advice. Finally, in summer 1934, he left NCU and took the position of chief of the agricultural department of the National Economy Commission (全国经济委员会农业处). He believed that at this stage, he could

²³² Zhao Lianfang, “Future Plan for Cotton Breeding in Our Country,” speech at the Conference of Chinese Cotton Improvement in 1931, pp. 10-12. (赵连芳, “今后我国棉作育种应取之方针”, 中国棉产改进统计会议专刊, 演讲页 10、12, 1931 年。《中国现代农业史资料·第三卷》, 929 页)

be more effective by supervising agricultural development more broadly rather than focusing on specific research and education problems.

Before Zhao Lianfang's departure, the year 1932 marked an important crisis and turning point in the history of the NCU. A severe flood hit provinces in East China in 1931, resulting in large-scale crop failures and famine (the National Economy Commission was established partly because of this disaster). Jiangsu was one of these provinces, and its farming tax income significantly decreased by almost one third. As a result, the NCU only received about 10% of its annual budget from the Jiangsu provincial government in 1932. Scholars could hardly continue their work under such difficult conditions. Many famous scientists, including Feng Zhaochuan and Deng Shuqun, left the NCU at this time. To make things worse, the Japanese troops occupied the Northeastern provinces in 1931 and attacked Shanghai in early 1932. College students at Nanjing, the capital city, were upset by these events and were very dissatisfied by the government's weakness. The NCU students struck to denounce the Japanese and to condemn the Nationalist government. The university president at that time was expelled by the students. Defaulted faculty would not help, and the situation at the university became out of control. By summer 1932, the Nationalist government was considering closing their National Central University. It was not until October 1932, when Luo Jialun, whom we have met in the section about Tsinghua IOA, took up the position of president of the NCU, that the tensions got relieved. Students and faculty were able to calm down and return to their routine studies.

Luo Jialun was not the most typical American-trained Chinese scholar. After finishing college education, he won sponsorship from Peking University to travel abroad. From 1921 to 1926, Luo spent six years on studies of history and philosophy at five famous universities in four countries, but did not take degrees. Luo's later political and academic activities demonstrated that he had been influenced by different diverse western traditions and endeavored to hybridize Chinese reality with what he had learnt from the west. For example, in his most well-known academic book, *Science and Metaphysics*, he compared traditional Chinese culture and ideology with western science and philosophy, and examples of science were mainly from American cases. After returning to China in 1926, Luo taught at the Southeastern University. Because of his early experience in the New Culture Movement and the May Fourth Movement, his academic achievement in historical studies, and his political preference to the Nationalist Party, he was appointed by Jiang Jieshi to taking charge of the Central Political School, where Luo borrowed French political institutions to train Nationalist officials for China. When taking charge of Tsinghua, he proposed to build Tsinghua into a university of Chinese people with an academic level as high as Princeton University. And after becoming president of the National Central University, Luo adopted the model of the University of Berlin to stimulate faculty and students at NCU. With all these western models he borrowed, Luo Jialun was expressing a similar ideology that Chinese intellectuals should struggle to benefit China and the Chinese people, and the tools should be rational and academic knowledge rather than radical political activities.²³³

²³³ About Luo Jialun's experience and thoughts, see Xu Xiaoqing, *ChengPuXiongWei*

Ironically, the reforms Luo made at the Central University seemed similar to those he had brought to Tsinghua in principle: to solve financial difficulties, to stress the importance of improving Chinese academia, and to establish an ideology of serving China through academic knowledge. While he was expelled from Tsinghua, he became the most successful president in the history of the Central University. I think the huge contrast was largely because Tsinghua was located at the political periphery, with more emphasis on adapting to local conditions and keeping its independence. This context was quite different from that of the Central University, located in the nation's political center.

When Luo Jialun started to serve as the university president at the Central University in October 1932, it was just one year after the September 18 Incident and the Japanese had controlled all the Northeastern provinces and started to deploy military forces near Shanghai and Beijing. Most Chinese intellectuals became aware that a great war between Japan and China would be inevitable. In this situation, scholars and students at the National Central University could hardly concentrate on their studies. A shortage of funding significantly disturbed regular education. More and more young students felt unsatisfied with staying in school and wished to contribute to protect the country in a more direct way, so more and more students were involved in marches and propaganda. Luo Jialun believed that resisting the Japanese meant much more than military action; China required high-level sciences and academics to be a nation able to rival Japan comprehensively. In order to prepare for the war, China had an urgent necessity of cultivating capable people to strengthen the country—including intellectuals. As the

YangYangDaFeng: ZhongYang DaXue XiaoZhang Luo JiaLun (Biography of Luo Jialun, President of the Central University), Shandong Education Press, 2012.

national capital university, NCU's primary responsibility for the country should be closely connected with the country's necessity. Luo wrote:²³⁴

“To resist the Japanese, are our students at the Central University able to compete with students at the Tokyo Imperial University? Are professors at the Central University comparable with professors at the Tokyo Imperial University? Does the Central University rival the Tokyo or Kyoto Imperial University?...

To resist our enemy, we must figure out the real targets. We should see whether we can rival the Tokyo Imperial University. We need not pay attention to outsiders' rumors about our university—we just need to work harder. Our program of aviation aims to train personnel to manufacture planes, but we cannot make it public; our school of medicine aims to heal the wounded and rescue the dying during the war, but we cannot make it public; our program of animal husbandry aims to raise warhorses and to explore the northwestern area, but we cannot make it public either. ... At this time, loving the country means not only marches and public propaganda, but also research and discussion to figure out resolutions. Now the most important necessities are funding, capable people, and international communication. I believe that the Central University should be a base to give advice and directions for resisting the Japanese, rather than base of marches and propaganda. Everyone is able to conduct marches

²³⁴ Xu, Xiaoqing, *ZhengJu Yu XueFu*, p. 293.

and propaganda. ... We should be a base able to produce all types of capable personnel.”²³⁵

He stressed the responsibility of the National Central University “to be the base of giving advice for the reviving of the country/nation (民族复兴的参谋本部)” and believed that this was the only effective way of being a “central” university.²³⁶ In this way, Luo was able to comfort and calm down the indignant students. Before Luo, other scholars and politicians had appealed to ideas of serving the country with science or knowledge. For example, Zhu Jiahua (朱家骅), the president taking charge of NCU before Luo Jialun, had published essays about “studying to save China (读书救国).”²³⁷ However, Luo was the first to effectively convince young Chinese intellectuals with the idea of serving China through science and knowledge. President Luo Jialun’s speeches suggested a way different from political activism to express and realize the love for their country: endeavoring to create, circulate, and apply knowledge for China.

In the 1930s, the National Central University was so superior in recruiting outstanding students that other universities in the area controlled by the Nationalist government could never match it. According to Zhu Kezhen (竺可桢), president of the

²³⁵ Luo Jialun, “Establishing the Central University a Base for Reviving the Nation and Resisting the Japanese” on January 6, 1936, *Selected Works of Mr. Luo Jialun, Volume 5: Speeches*, pp. 454-455.

²³⁶ Luo Jialun, “Responsibility of the Central University,” speech on October 17, 1932, *The Centennial Records of Nanking University—Historical Materials of the University of Nanking*, Nanjing University Press, 2002, volume 1, pp. 296-301.

²³⁷ Xu, Xiaoqing, *ZhengJu Yu XueFu*, pp. 193-194.

National Zhejiang University in Hangzhou, when the best universities²³⁸ recruited students, two thirds of the most excellent students preferred the NCU. Considering that Luo Jialun had served as university president successfully for almost ten years, these thoughts should have been a common view of the mainstream of students and faculty at the National Central University. And when these elite students graduated, they would be members of the powerful elite in Chinese society. Had the Anti-Japanese War and the Communist Revolution not happened, Luo Jialun's thoughts of serving the country with science and knowledge might have shaped the future of China.

In addition to the ideology of serving China through knowledge and science, Luo Jialun significantly improved funding, the scale, and academic communications of NCU. The agricultural school was the most remarkable example. Luo Jialun reorganized the programs, re-employed faculty for the six new-established departments, and encouraged and facilitated NCU scholars to communicate and cooperate with their western colleagues and other academic institutes in China at that time, such as the Academia Sinica and the Science Society of China. Although Zou Bingwen and Guo Bingwen started the agricultural school with four departments and one extension station, annual funding for this school did not have a stable guarantee, and it did not expand for ten years. After persuading the Nationalist government to increase allocation for the NCU from the central government budget, Luo started to build a new site for the agricultural

²³⁸ In his diary, Zhu Kezhen only recorded several universities in South and East China. Beiping was not effectively controlled by the Nanjing government, and Tsinghua and Peking University were recruiting independently from those universities in the South.

school at once.²³⁹ At this time, Tsinghua IOA only had three offices and experiment rooms borrowing from the department of biology; the Beijing Agricultural College fell in a series of political battles in Beijing and could hardly continue normal education; the National Sun Yat-sen University in Guangzhou also enjoyed support from the Nationalist government, but its studies were highly local-centered because of its natural environment and location in the most southern part of mainland China. Therefore the College of Agriculture at NCU had an overwhelming advantage among national agricultural colleges. A noticeable fact about Luo's achievement was that, during the pre-war years Luo served as president, NCU quickly established extension stations in ten provinces (see figure 14) by cooperating with local governments, while before 1932 the extension sites were limited to an area near Nanjing.

More importantly, Luo's efforts were remarkable because they promoted the study of animal husbandry, and therefore changed the structure of agricultural studies in China. By the time when Luo Jialun started to take charge of NCU, the most well-known Chinese agriculturalists (such as Zou Bingwen, Shen Zonghan, Dai Fanglan, and Zhao Lianfang) were mainly focusing on plant pathology and agronomy, but attempts to improve animal husbandry usually suffered frustrations (for example, Yu Zhenyong and the agricultural program at Tsinghua and Yenching University).²⁴⁰ This was largely

²³⁹ Luo Jialun, *ZhongYang DaXue Zhi ZuiJin SanNian (The Recent Three Years of the National Central University)*, ZhongYang DaXue, 1935.

²⁴⁰ The only well-known example was the hybridization of the Dingxian pig (定县猪), sponsored by the Mass Education Movement. But even for this successful case, the pig existed in only one county (Dingxian, base of the Mass Education Movement), and it had little influence on the larger part of China. See Sigrid Schmalzer, "Breeding a Better China: Pigs, Practices, and Place in a Chinese County, 1929-1937," *The Geographical Review*, 92(1): 1-22, January 2002.

because of the extremely underdeveloped circumstances for the agricultural sciences in China. Studies such as plant pathology and agronomy required relatively less cost in funding, time, and material investment, and therefore were easier than the studies of animal husbandry. Luo Jialun took charge of NCU's unique advantage in financial and political sponsorship, and designed a long-term all-around development plan for the agricultural sciences, including an emphasis in animal husbandry. The department of husbandry was assigned an independent farm on the new campus near Nanjing. Scientists at this department introduced quality livestock varieties from foreign countries, including cattle from California and Holland, horses from Australia, pigs from Britain, and turkeys and chickens from America.²⁴¹ Studies of domesticating and extending the livestock varieties were disturbed by the war starting in summer, 1937, but not suspended. Aware of the danger of the coming war, Luo Jialun started searching for a new campus in the Southwest of China and making preparation for a timely retreat. NCU agriculturalists shipped their research varieties (seeds and animals) and equipment to Chongqing, the wartime capital. During the following eight years, NCU was the only college with serious studies of animal husbandry in unoccupied areas. These studies not only supported the necessities of the army, as Luo Jialun proposed in his pre-war speeches, but also provided consultancy for the food industry in Sichuan province. Although Luo himself was not an agriculturalist, his efforts guaranteed the superiority of NCU in the Chinese agricultural sciences, which even influenced the Nanjing Agricultural College after 1949.

²⁴¹ Luo Jialun, *ZhongYang DaXue Zhi ZuiJin SanNian*; also see Liu Yun, *GuFan YuanYing: Chen Daisun's 1900-1952*, p. 182.

3.5 Summary

In the history of modern China, the period from 1927 to 1937 was usually named as the “Nanjing Decade.” This decade was considered as the “golden age” of the Chinese bourgeoisie and nationalist intellectuals. It was a relatively peaceful period in Republican China. Despite continuous civil wars and threaten of the coming invasion from Japan, Chinese intellectuals in chief cultural centers, such as universities and institutes in Nanjing and Beiping, were able to conduct serious and systematic academic work. The central government took some action to promote agriculture, as Zou Bingwen and his colleagues had expected, since the Warlord Era. Institution of agricultural science and education gradually took shape. National agricultural colleges and institutes operated by Chinese people quickly grew during this decade. More and more agricultural scientists, both foreign- and domestic-trained, could concentrate on agricultural science rather than struggling for an academic career or being distracted by non-academic circumstances. Long-term research and successful extension programs seemed possible during this period, and the new circumstances provided new stimulation for intellectuals devoting themselves to China and agricultural sciences.

The existing patterns of Western colonialism shifted during this period, as well. With the end of the Boxer funds, western economic influence waned. Missionary colleges and schools were forced to re-organize under the Nationalist government. As a school with a strong foreign background, Tsinghua experienced a remarkable shift of “Chinization” in its institution and administration after 1928. Western faculty and staff members were replaced by Chinese personnel, and programs were re-oriented toward

local priorities. Yet in the case of the agricultural sciences, American ideas and practices had already been incorporated into Chinese science. Indeed, Chinese agricultural science was, and is, a hybrid involving American elements brought by American-trained Chinese scholars during the Republican era. American-trained Chinese scientists succeeded in introducing and maintaining their vision for agricultural scientific research and education in universities because they adapted foreign ideas to specific local political, social, and economic situations.

We can also see in this period a younger generation of scientists who shared more common professional characteristics with their western colleagues, such as being more devoted to academic research rather than focusing on establishing new institutions or on political activities, as the first generation did. This shift of western-trained Chinese scientists was largely because of changes in their professional environment. During the decade after 1928, when more and more high-level universities and research institutes had been established in China, the second-generation scientists were able to work in more established professional environments than had the first generation—but as the number of scientists increased significantly, they also needed to demonstrate much higher scientific research ability to compete for a chance to work in this better environment. They were more capable of creating more advanced scientific knowledge to help China, of becoming important in international science, and sometimes (but not always) of applying their achievements to agricultural and industrial production to improve China's strength. The younger-generation of scientists' self-identity of being Chinese and the love for their

country were as strong as that of their precursors. They just expressed this love in some different ways.

Chinese scholars such as Cai Yuanpei, Dai Fanglan, Liu Chongle, Zhao Lianfang, and Luo Jialun had tried diverse strategies to improve their country and science. Their efforts and exploration did not always succeed during this decade, but had built up a foundation for the next stage of the development of Chinese agricultural science. During the following years, Chinese agricultural scientists retreated to the Southwest, some to the new political center, and some to the periphery. In the desperation of wartime exile, they made astonishing contributions in both serving China and their academic studies, as I will explore in Chapter 4.

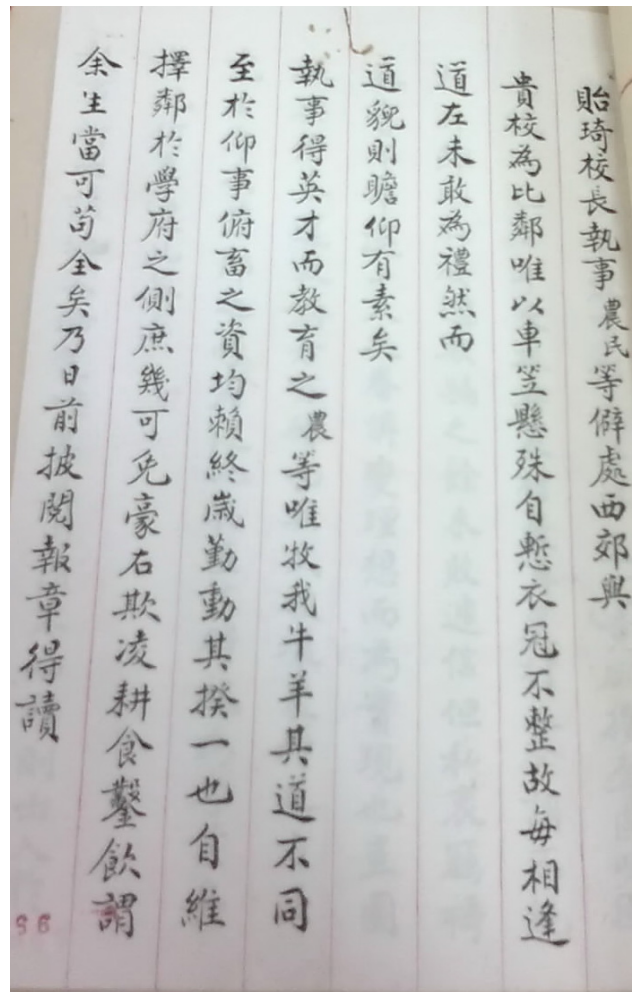


Figure 7. In 1934, Tsinghua scientists attempted to rent former government lands for a research station. Unfortunately, peasants already lived there under rental agreements with the previous governments. This photo shows the first page of a letter from some Yuan Ming Yuan peasants to President Mei Yiqi in 1934. The original letter was written in very literary classical Chinese, with very beautiful hand script (the peasants, poor and uneducated, must have engaged an old-school intellectual to write this letter). The general idea of this letter was: the noble elite Tsinghua scholars were lying to the Nanjing government; Tsinghua was not promoting agriculture at all, but just wanted to rob the poor peasants to take profits for themselves; the poor peasants could only make their living by farming and would die if losing their lands, so, if they had to die, they might kill someone who had caused the misfortune for revenge. This is an example of how difficult it was for the scientists to find research facilities in such chaotic times. (Tsinghua University Archives, file 1-2-1-162, p. 66)



Figure 8. This is the cover page of the first volume of *Brief Introduction of Insects* (*Kunchong Qian Shuo*, 《昆虫浅说》), a four-volume serial popular science booklet published by the Division of Entomology at Tsinghua IOA in 1935, aiming to introduce important pests and beneficial insects in North China to local peasants. These publications included the basic biology of the insects, including life cycles, and were intended to be educational. (Tsinghua University archives, file 1-2-1-200, p. 29)



Figure 9. Scientists of the Tsinghua IOA. Taken in 1937, Peiping. (*Tsinghua Annual Journal, 1937*)

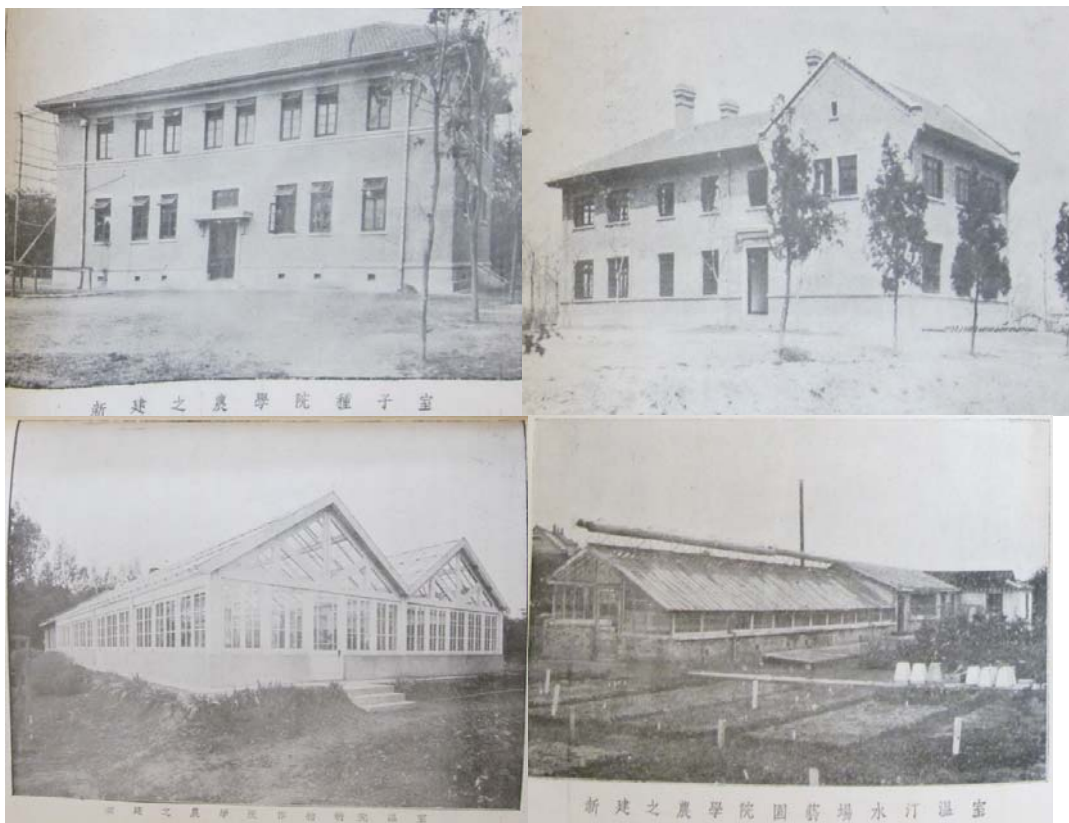


Figure 10. Buildings, equipment, and cattle of Agricultural College at the National Central University, 1935 (Luo Jialun, *ZhongYang DaXue Zhi ZuiJin SanNian, 1935*)

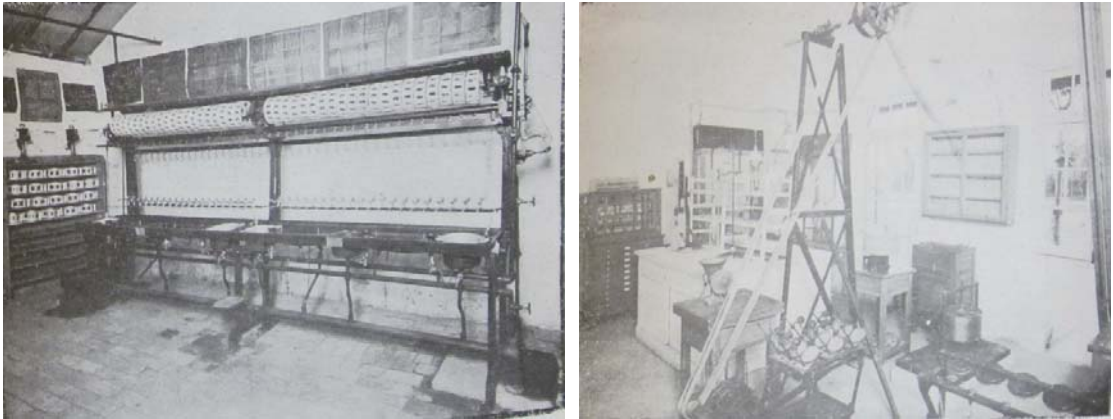


Figure 12. Devices for silk (left) and soil chemistry (right) research (Luo Jialun, *ZhongYang DaXue Zhi ZuiJin SanNian*, 1935)



Figure 11. Dairy Cattle introduced from Holland (Luo Jialun, *ZhongYang DaXue Zhi ZuiJin SanNian*, 1935)



Figure 12. Farmers expressing their appreciation to the NCU agriculturalists, in spring 1933 (Luo Jialun, *ZhongYang DaXue Zhi ZuiJin SanNian*, 1935)

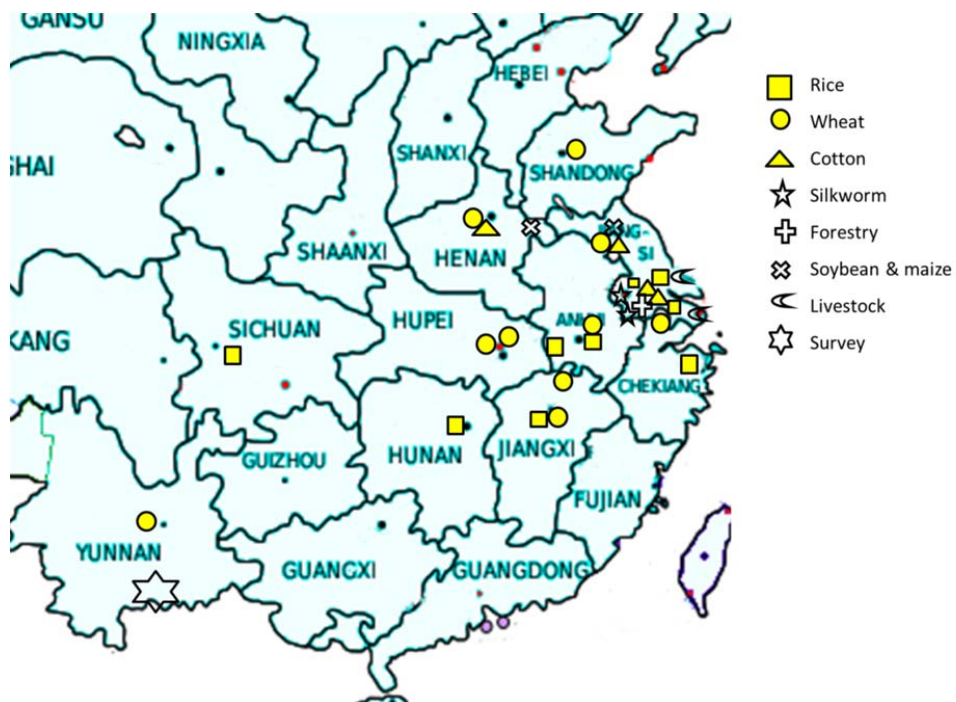


Figure 13. NCU extension stations built between 1932 and 1937

Chapter 4 The Wartime: Surviving and Thriving in Conflicts and Displacement, 1937-1946

Serious military conflicts between China and Japan started in 1931, when the Chinese government and army lost Manchuria after the September 18 incident. Then in 1932 and 1935, China and Japan fought regional battles in East and North China respectively, near Shanghai and Tianjin. After 1935, the Nanjing Nationalist government had actually given up its military control of the provinces near Beiping in North China, which were not its traditional sphere of influence. In 1937, the July 7 Incident and August 13 Incident signaled a coordinated Japanese campaign: the Japanese army and navy started to attack Beiping, Tianjin, and Shanghai. Thus began the second Sino-Japanese War. In China, the eight years from 1937 to 1945 were usually called the Anti-Japanese War or the War of Resistance (抗日战争). Among the tensions I have discussed in earlier chapters, the tension between “Chinese” and “the foreign” was doubtless the most important during this period. Foreign invasion caused tremendous difficulties and dramatically altered the conditions under which Chinese intellectuals functioned; but it also had an unintended consequence. Pressure from the foreign (especially the Japanese) could effectively stimulate intellectuals’ love for their country and desire to serve the country through their efforts—and encourage them to do some of their best work despite the terrible conditions.

With the Chinese people's nationalism stimulated by pressure from outside enemies and the danger of national subjugation, the prestige and authority of the Nationalist Government quickly increased. In spite of their diverse political attitudes, Chinese scholars with profound love for their country considered the Nationalist government as a symbol of China, because it was the only legitimate political power to represent the entirety China. There were still warlords disagreeing with the Nationalist government remaining in unoccupied China, such as Long Yun (龙云) in Yunnan, Li Zongren (李宗仁) and Bai Chongxi (白崇禧) in Guangxi, and Sheng Shicai (盛世才) in Xinjiang. They continued subtly resisting some decisions from the Nationalist government to conserve their own forces, as I will explore in the section about Tsinghua IOA. However, they also gave up their military and part of their political autonomy in order to unite and fight against the Japanese. As a result, the Nationalist central government's control over unoccupied China was much more effective than it had been during the pre-war period.

Meanwhile, China had an urgent need to increase agricultural production to support people's living and the cost of the war, which required contributions from agricultural scientists. During the war, all major agricultural and industrial production areas fell into the hands of the Japanese. The Nationalist government had to depend on the unoccupied regions, including southwest China, as the base of operations and to support the country. During the war, the areas formally controlled by the Nationalist government included Sichuan, Yunan, Guizhou, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang, and parts of Guangdong, Guangxi, Fujian, Jiangxi, Hunan, Hubei, Henan, Shanxi, and Zhejiang provinces. The southeast provinces were the front lines in the fight with the Japanese, and

Shaanxi and Shanxi were interspersed by base areas of the Chinese Communist Party (CCP). Therefore, the Nationalist central government could only effectively practice reforms in the Southwest to improve agricultural production. At a temporary national party congress in March 1938, the Nationalist government passed the *Wartime Principles for state Establishing* (《战时建国纲领》), which stressed that agriculture should have precedence over other industry and transportation. In April 1939, the Nationalist government launched its first national production conference to make a comprehensive plan for agricultural improvement. This conference outlined several essential points for wartime agricultural development, including improving food production, providing raw materials for industrial production, and increasing exportation of economic agricultural products.²⁴²

The Southwest had been an extremely backward region in China until that time. Even the most productive province, Sichuan, needed to import rice every year in the 1930s. Before the war, cotton production in the Southwest only counted for 4% of the national production. Thus the challenge of promoting science and technology to elevate agricultural production in this region was huge and crucial. The National Agricultural Bureau (中央农业实验所, Central Agricultural Experimental Institute) left Nanjing and moved to the Southwest. It finally set a base in Chongqing, the wartime capital where the Nationalist government settled, and its researcher members were distributed to Sichuan,

²⁴² Wu Weirong, "Agricultural Development in rear area during the Anti-Japanese War," *Studies of Modern History*, 1991 No. 01, Beijing: Institute of Modern History in Chinese Academy of Social Sciences, pp. 221-243. (吴伟荣, "论抗战期间后方农业的发展", 《近代史研究》, 1991年第01期, 北京: 中国社会科学院近代史研究所, 页 221-243).

Guangxi, Guizhou, Hunan, and Yunan, and established a series of agricultural research laboratories and extensions in these provinces.²⁴³ During the following eight years, the National Agricultural Bureau took charge of agricultural research in academic organizations and of the popularization of advanced agricultural knowledge and techniques. On one hand, the Bureau operated financial and scientific aids to research institutes in the Academia Sinica (the National Central Academy) and chief universities for research in improving agricultural production. On the other hand, this Bureau functioned as a governmental branch to help each county establish a department of agricultural popularization and more agricultural clubs in villages in order to pass agricultural knowledge and techniques to local peasants directly.²⁴⁴ Its research and extension emphasis moved to the regions in West China, which had never been covered before (see Figure 16 for the Bureau's active regions before and during the war).²⁴⁵ This shift of working emphasis at the National Agricultural Bureau represented the shifts many scientists made from the coastal provinces. Some of them had to change their research fields, and some had to change from science to politics.

In order to fit in its new roles, the National Agricultural Research Bureau reformed in its organization and changed its leaders. Qian Tianhe, the former vice director taking charge of the Bureau, was promoted into Minister of Agriculture and Forestry. Shen

²⁴³ Shen Zonghan's letter to Harry H. Love, June 22, 1938, Harry H. Love Papers, Box 14, folder 36, Kroch Library, Division of Rare & Manuscript Collections, Cornell University, Ithaca, New York.

²⁴⁴ Li Zidian, "The Brief History of the Central Agricultural Experimental Institute," *Historical Archives*, 2006.4, pp.113-120 (李自典, "中央农业实验所论述", 《历史档案》, 2006.4, 113-120 页).

²⁴⁵ Shen, Liying, *Annual Report of the National Agricultural Bureau*, 1940

Zonghan, the outstanding agricultural scientist and educator I discussed in chapter 2, was appointed as vice director of the Bureau and became the one actually taking overall charge of agricultural science in wartime China. Shen recalled that this appointment was the second shifting point in his career.²⁴⁶ He had to give up his own research and devoted himself to political and administrative affairs. Because of the retreat and reforms of academic institutes, many famous and productive agricultural scientists took positions in various non-research oriented organizations. For example, Feng Zefang, director of the Agricultural School at the National Central University, served as a part-time scientist at the National Agricultural Bureau. Shen Liying, wheat breeding scientist and Shen Zonghan's wife, served at the Bureau and a Guizhou provincial extension program at the same time.

The universities from coastal provinces also retreated and reorganized, and this process illustrated the ongoing tension between the central and provincial governments and how university scholars managed to fulfill the desire of serving China through science and knowledge. The Nationalist central government was more willing to support universities and institutes from Nanjing and Southeast China (the base area of its government), especially the National Central University. Although it continued supporting universities from North China, funding for these universities was reduced. For example, Tsinghua, Peking, and Nankai Universities' annual appropriations from the central government were reduced to 75% of that before the war. In addition, national universities from the North were usually required to unify temporarily for the wartime

²⁴⁶ Shen, Zonghan, *ZhongNian ZiShu (Memoir of My Middle Age)*, pp.196-198.

urgency. Tsinghua, Peking, and Nankai Universities formed the National Southwest Associated University. When the central government allocated extra money to universities, the Associated University only counted as one unit even though it was composed of three universities, while the National Central University from Nanjing maintained its independence and counted as one unit as well. The actual result was that Tsinghua, PKU, and Nankai would receive less support from the Nationalist central government compared with their rivals from the base area of the Nationalist government.

On the other hand, some provincial governments were very passionate in inviting these northern universities to relocate to their area. Before the war, the Hunan provincial government started cooperating with Tsinghua in agricultural experiments and education and assigned lands and infrastructure to Tsinghua in 1935. When the Tsinghua University and its neighbors from the North planned to move to the southwest, they received enthusiastic invitations from both the Yunnan and Guangxi provincial presidents. The university leaders finally decided to move to Yunnan because it seemed farther from the battlefield and safer at that time, but the Guangxi government was so zealous that the universities had to send several very famous professors there to express their denial gracefully.²⁴⁷ All these provinces were still influenced by political and military forces that disagreed with the Nationalist government. They were all underdeveloped before the war and their governors believed that the top universities from North China could help them to develop both education and economics. Universities and scholars from North

²⁴⁷ See Liu Yun, *GuFan YuanYing: Chen Daisun's 1900-1952*, p.181.

China found a balance between these political forces and got the chance to survive and thrive in the chaotic environment.

In this chapter, I will explore cases from the National Central University (NCU) and the Tsinghua IOA and argue that the war brought opportunities as well as challenges. Agricultural scientists at these two institutes worked within similar Chinese-foreign tensions, but they held opposite status within the central-local tension. NCU, centrally located in Nanjing before the war, could count on Nationalist government support; whereas Tsinghua, from the North, was more peripheral and less well-favored. I will focus on the works of four second-generation scientists: Feng Zefang and Jin Shanbao at NCU; and Tang Peisong and Liu Chongle at Tsinghua IOA. All these scientists had expressed motivations of love for China and the desire of serving the country through science. They all made valuable scientific contributions despite the migration forced by the war. However, their strategies were quite different due to their different circumstances.

4.1 Opportunities for Agricultural Science Brought by the War: Agricultural School at the National Central University in Chongqing, the Wartime Capital

Just as the Nationalist central government's prestige increased in the run-up to war, the National Central University became more and more appealing for patriotic Chinese intellectuals and young students because of its central status. And this university deserved respect, in both material and non-material conditions and academic performance. Because

of Luo Jialun's in-time actions for the retreat, NCU was able to borrow troopships to move its research and education materials to the Southwest. Faculty and staff at the agricultural school even paid their own funds to hire commercial ships and moved all the research livestock to Chongqing (which took almost one year), because they did not want to leave anything to the enemy.²⁴⁸ As a result, NCU's loss was much smaller than other leading national and private universities. Because of its location, NCU had close connections with the Nationalist Central government. Its education and research usually appeared more practically oriented toward protecting and constructing the country. Although the National central government's control over NCU was much stronger than over other academic institutes, under the most critical tension between China and the foreign, scholars' autonomy seemed less important than the survival and development of China. Therefore NCU kept appealing to patriotic young scholars and students with strong love for their country. Among the best national universities, the "Big Four National Universities (国立四大名校)"²⁴⁹ during the war, the number of NCU's applicants was even larger than the total of the other three.

During the eight years in Chongqing, the NCU Agricultural School had been directed by two American-trained scientists: cotton scientist Feng Zefang (冯泽芳, serving as director from 1938 to 1943), and wheat scientist Jin Shanbao (金善宝, serving

²⁴⁸ Liu Yun, *GuFan YuanYing: Chen Daisun's 1900-1952*, pp. 182-183.

²⁴⁹ The Big Four National Universities: the National Central University in Chongqing, the National Wuhan University in Leshan, the National Zhejiang University in Zunyi (Guizhou province) and Yishan (Guangxi province), and the National Southwestern Associated University (*Lianda*) in Kunming. They were called as the Big Five before and after the war, when Peking University and Tsinghua were independent from each other.

as director of the School from 1943 to 1948). Feng and Jin were representatives of the second-generation American-trained Chinese scientists. They both received college education at the Southeastern University in the early 1920s under Zou Bingwen's mentoring. They both had served in agricultural extension programs sponsored by the Zhejiang provincial government.²⁵⁰ They both traveled to study at the agricultural school of Cornell University in 1930 through networks built by the first-generation scholars (with recommendations from Zou Bingwen and Shen Zonghan²⁵¹). They both served at the National Central University after returning to China, and chose to work on wheat and cotton, the most important crops for Chinese people's food and clothing. They both made remarkable contributions in crop breeding science. In addition, despite the frustrations of wartime conditions and the forced migration, they both made breakthroughs in their research fields stimulated by opportunities brought by the movement to new areas of the country.

Jin Shanbao (金善宝, 1895-1997) took professional education at the Nanjing Higher Normal School between 1917 and 1920. In 1920, Rong Zongjing (荣宗敬), the most well-known flour merchant in Shanghai, sponsored the Nanjing Higher Normal School to establish an experiment farm in Nanjing for wheat research. Jin Shanbao became a technician of this farm and worked there for six years (this farm was later reformed into the Dashengguan Experimental Farm of the National Central University). In 1927, he

²⁵⁰ I have introduced this program in Chapter 2; see the part of Shen Zonghan.

²⁵¹ See correspondence between Shen Zonghan and Harry H. Love in July and October 1930, the Harry H. Love Papers, Box 14, Folder 35, Kroch Library, Division of Rare & Manuscript Collections, Cornell University, Ithaca, New York.

received a bachelor's degree through continuing education from the Southeastern University.

Jin Shanbao had a strong desire to improve his country through agricultural studies almost all through his life, but his attitude towards science (especially the scientific knowledge from western countries) changed significantly as his career developed. During the years at the Nanjing Higher Normal School/Southeastern University (1917-1927), Jin was studying and working under Zou Bingwen and other American-trained scientists. Although it seemed that he was far away from direct American training, his knowledge and skills were deeply influenced by American agricultural sciences through these teachers. When working at the experiment farm, Jin's wheat research had a strong preference for local needs and situations, and he had a strong desire to improve Chinese wheat production by introducing improved varieties and methods from western countries.²⁵² We will see that during Jin's career, the local conditions greatly influenced his accomplishments. His most noticeable achievements at this stage included wheat breeding and surveys. He achieved and extended two high-yielding varieties (南京赤壳 and 武进无芒) suitable for the natural situation near Nanjing. These wheat varieties increased wheat production by as much as 20%.²⁵³ In addition, from 1925 to 1927, Jin investigated over 900 wheat strains from 790 counties in 26 provinces and published an

²⁵² Wang Lianzheng, Preface for the *Selected Works of Jin Shanbao*, page 2.

²⁵³ See Mo Dingsen and Zhou Fengming, "Reports on the Properties of *Nanjing Chike* and *Wujin Wumang* wheat," *Reports of Crop Research at the Agricultural School of the National Central University*, Vol. 1, June 1929 (莫定森, 周凤鸣, 《南京赤壳及武进无芒麦粒物理性态研究报告》); and Jin Shanbao, "Summary of the Recent Situations of Crop Breeding and Cultivation in China," January 1936, in *Selected Works of Jin Shanbao*, p. 79. (金善宝, "中国近年来作物育种和作物栽培的进步概况")

article “Preliminary Studies of the Classification of Chinese Wheat Varieties” (“中国小麦分类之初步”)²⁵⁴ in July 1926. This article modeled the American scientist Jacob Allen Clark’s *Classification of American Wheat Varieties*, and it was the first scientific work systematically exploring the properties, classification, and distribution of Chinese wheat. Limited by research conditions, Jin was not able to leave Nanjing. He collected wheat varieties from around the country by contacting local officials and received most of the samples by mail. However, his results were very reliable and correlated well with a later survey conducted by Japanese scholars in 1934-35. Jin’s 1926 article provided useful information for wheat research and cultivation in China during the 1930s.²⁵⁵

During the Nanjing Decade, both the Nationalist central government and provincial governments increased financial support for Chinese people studying abroad. Jin succeeded in acquiring governmental funds from Zhejiang province for studying in the U.S. in 1930. He studied plant physiology and genetics at Cornell University and University of Minnesota. During the years at Cornell, Jin Shanbao studied together with several other Chinese students including Feng Zefang (冯泽芳), Cheng Shifu (程世抚) Mao Baozhi (马保之), Lu Shougeng (卢守耕), and Guan Jiaji (管家骥), all of whom later became important agricultural scientists or scientific activists in China. They launched an agricultural club named “Society of Chinese Crops Improvement” (中华作

²⁵⁴ *Reports of Crop Research at the Agricultural School of the National Central University*, Vol. 2, May 1929. (《国立中央大学农学院作物研究报告》，第二册，民国十八年五月再版)

²⁵⁵ Jin Shanbao, “Thirty-year History of the Improvement of Wheat in China,” September 1943, in *Selected Works of Jin Shanbao*, Chinese Agricultural Press, 1994, pp. 110-111. (金善宝, “中国近三十年小麦改进史”, 《金善宝文选》, 中国农业出版社, 1994年, 110-111页)

物改良学会, see figure), which later merged into the Agriculture Society of China (中华农学会) and became a major part of this most authoritative agricultural civil society in Republican China. Jin was enthusiastic in learning more American agricultural knowledge and practice, rather than getting a degree. He recalled in his late years: “food is the first necessity of the people. Agriculture is the foundation for constructing the country. I would like to work for the ‘first necessity’ and the ‘foundation’... I was already 35 years old and could not afford spending my life on a degree thesis.”²⁵⁶

Another reason might explain Jin Shanbao’s giving up on completion of his graduate degree in the United States. Jin recalled many times in his later years: when studying at Cornell University, he felt deeply humiliated by some American students. Once at dinner, an American student embarrassed Jin by giving him some spoiled food and said: “there are so many Chinese people starving; you may bring the food for them so that they would not starve to die.” Jin was very upset, but he could only answer: “there are also hungry American people; please keep the food for poor people in Chicago Street.” After this unpleasant experience, Jin Shanbao decided to leave Cornell, partly because of these personal conflicts, but also because he wished to take action to improve China’s poverty as soon as possible.²⁵⁷

After returning to China in 1932, Jin became a professor at the National Central University, and worked there until 1948. Jin gradually realized that simply introducing

²⁵⁶ Li, Yan, preface of *Jin ShanBao Yu ZhongGuo XianDai NongYe KeJi YanJiu (Jin Shanbao and Modern Chinese Agricultural Science and Technology)*, Beijing: Chinese Agricultural Science and Technology Press, May 2013.

²⁵⁷ Jin, Shanbao, *Selected Works of Jin Shanbao*, Beijing: Chinese Agriculture Press, 1994.

western crop strains, techniques, and theories would not help China. When returning to NCU and the Dashengguan Experiment Farm, the farm he had worked at for six years, he found that wheat on over 16 acres of experimental plots had become infected with stinking smut. This wheat variety was an “elite breed” introduced by the Nanjing Nationalist government from America to relieve the 1932 famine in China. Noticing that the American relief wheat showed quality much better than local Chinese wheat, the Ministry of Agriculture commissioned agriculturalists at NCU to plant and domesticate this wheat variety. However, when selling the wheat, the American food company had treated all the grain with bacterial spores to prevent the Chinese government from domesticating the wheat (to protect its profits and its patent). It would not be a problem if just cooking the grains, but once the grains were planted, the spore would germinate along with the wheat seed and ruin the plants. Jin happened to see how the sick wheat germinated and grew, and he had to burn all of the plants. This unsuccessful experiment at NCU deeply stimulated Jin Shanbao. He became more determined that Chinese people must figure out ways on their own to improve Chinese agriculture.²⁵⁸

Jin continued referring to western knowledge, but in practice, he became more focused on local natural conditions and materials. This shift is reflected in his scientific writings. During his pre-war years at NCU, Jin’s most noticeable work was the book *Practical Wheat Science* (《实用小麦论》) published in 1934. This was the first Chinese book comprehensively exploring scientific knowledge about wheat in agriculture. Unlike his 1926 wheat classification article, which stressed his adopting

²⁵⁸ Ibid.

American methods, this 1934 book introduced advanced theories and methods in western countries, but with a strong emphasis of local preference:

“For evaluation and comparison, [I] use the wheat breeding methods from American Cornell University, but make proper changes according to local situations. ... As for knowledge mentioned in this book, the parts of pure science are mostly referring to foreign publications, but those about practice are mostly from research discoveries in our country. For example, in introducing wheat classification, [I] borrow the wheat classification system of Pencival from England and Clark from America, but most of the wheat varieties are domestic from our country. All the foreign agricultural implements appearing in this book have been tested in China and have been proved to have good effect, so that they are suitable for the practical situation of our country.”²⁵⁹

The *Practical Wheat Science* filled the gap in Chinese scientists’ studies of wheat. It covered topics such as the properties, classification, genetics, breeding, distribution²⁶⁰, cultivation, pathology, storage of wheat in China. This book was soon adopted by agricultural colleges and professional schools all over the country as a principal textbook, and it influenced younger Chinese wheat researchers all through the century. It is an example of the hybrid knowledge and practice created by western-trained Chinese scientists. Jin’s skillful hybridization of foreign theories and local realities in China was a chief reason for its success.

²⁵⁹ Jin Shanbao, Preface of the *Practical Wheat Science*, in the *Selected Works of Jin Shanbao*, p. 308.

²⁶⁰ The distribution part of this book was largely based on Jin Shanbao’s 1928 article.

When the Sino-Japanese War broke out in 1937, the entire National Central University moved from Nanjing to Chongqing, the wartime capital. This retreat to Chongqing brought difficulties for Jin Shanbao and his colleagues. Their earlier work was mostly based on conditions in Southeastern China, while the natural conditions in the southwestern provinces were quite different. They also needed to deal with the tough research and living conditions, like other scholars moving from the eastern provinces to the unoccupied western area. But this forced migration brought Jin Shanbao opportunities as well. For instance, he continued his research on wheat classification and distribution for decades, and published his conclusions in an article “Wheat Areas in China” in 1943. In this article, Jin analyzed 2834 wheat varieties from 28 provinces, and figured out three main wheat districts: the hard red spring wheat area, the hard winter and spring wheat area, and the soft red winter wheat area.²⁶¹ This article established the foundation for the studies of wheat resources and distribution in China. The materials, methods, and theoretical analysis in this work were much more substantial and authoritative than his 1926 article “Preliminary Studies of the Classification of Chinese Wheat Varieties.” In the 1920s, Jin managed to collect samples from around the country, but we can see that he included more representation of wheat varieties from the eastern provinces such as Zhili, Shandong, and Jiangsu. This result is largely because the relatively advanced scientific and educational level in these regions made Jin’s surveys easier. After his 1937 forced migration, along with his assistant Cai Xu (蔡旭), he was able to conduct detailed

²⁶¹ Jin Shanbao, “Wheat Areas in China,” in *Selected Works of Jin Shanbao*, pp. 101-102.

investigations on wheat varieties in the southwestern provinces including Sichuan, Guizhou, Yunnan, and Hunan.

This shift was important for two reasons. For the country, these unoccupied regions were required to produce more food as soon as possible in order to support the large population fleeing from the eastern provinces. Therefore it was critical to figure out an accurate picture of the crop resources and potential in Southwest China. In addition, Jin pointed out that “in the southwestern provinces, the local landscapes, field environments, and farming systems are more complicated [than in the East and the North]; [therefore] the varieties and classification of wheat are more complicated. The Northern provinces have plain landscapes and simpler farming environments; the wheat varieties are not as complicated as in the South, and the range of cultivation for each variety is usually larger than the southern varieties.”²⁶² Southwest China is a very mountainous region with a high degree of micro-climates and bio-diversity. The wheat varieties in this region were as diverse as the micro-climates, which had not been recognized before. Jin and his colleagues’ comprehensive exploration in the Southwest had increased scientists’ understanding of the global classification and distribution of wheat. Therefore they contributed to “pure” scientific knowledge by incorporating local Chinese conditions.

²⁶² Jin Shanbao, “Thirty-year History of the Improvement of Wheat in China,” September 1943, in *Selected Works of Jin Shanbao*, p. 111.

Another significant case deserving our notice was *Zhongda 2419* (later renamed as *Nanda 2419* after 1949²⁶³), one of the most outstanding wheat breeds in the history of Chinese agriculture. Since the early 1930s, Jin and his NCU colleagues had introduced over 3000 foreign wheat varieties for strain selection and breeding. *Zhongda 2419* was a strain derived from the Italian *Mentana* and had exhibited fine properties such as a larger ear, more grains, early-maturing, and strong resistance to disease, pests, and falling down. During experiments near Nanjing, the yield of this strain was 250-500 kilograms per *mu* (1 *mu* = 667 m² = 0.16 acre), which was at least 30% more than local wheat strains. These promising experiments were abruptly interrupted by the war. Fleeing with seeds in his bags, Jin had to finish the later steps of his project near Chongqing and Chengdu in the west. This worried Jin because the growing conditions were so different. To his surprise, the variety *Zhongda 2419* continued to be very productive and disease/pest/lodging-resistant even in the new environment. In 1939, Jin Shanbao published an article introducing the virtues of this new wheat variety. Because of the unexpected interruption and migration during breeding research, this variety experienced tests in different natural environments and proved its exceptional adaptability. In 1941, the *Zhongda 2419* was first extended into Sichuan province.²⁶⁴ Later it was introduced to over seventy million *mu* of lands along the Changjiang River. For over forty years it was the most primary and influential wheat strain in China. It had more than one hundred derivative strains, and this

²⁶³ “Zhongda (中大)” is the abbreviation of the “Central University,” and “Nanda” is an abbreviation of “Nanjing University.” After 1949, when the Communist Party defeated the KMT and unified China, the NCU lost its central status, and changed its name into Nanjing University. Therefore the crop strains named after the NCU had to change their names as well.

²⁶⁴ Jin Shanbao, “Thirty-year History of the Improvement of Wheat in China,” September 1943, in *Selected Works of Jin Shanbao*, pp. 116-117.

wheat family was later extended to all the seven chief wheat districts in China. Such outstanding performance has made *Zhongda 2419* (*Nanda 2419*) a milestone in not only China, but also the history of wheat studies around the world. Jin Shanbao's research brought real benefits to his countrymen (a higher-yielding wheat that would grow anywhere) and to the international scientific community (new information on wheat genetics and adaptation to unusual micro-climates). In this sense, it was the war and forced migration that facilitated the scientists' research in new locations and under very different environmental conditions (although unwillingly at the beginning, probably) and to achieve such significant improvement. This case also suggested the "improvement" of the scientists themselves. During the process of seeking an approach to benefit Chinese people through science, Jin Shanbao had gradually become less dependent on foreign knowledge and more capable of expanding his research from the area around Nanjing to the entire country. He became more confident in his ability to improve China *and* contribute to global circulations of scientific information with the knowledge he had developed in the diverse and complicated natural and political conditions of Republican China.²⁶⁵

I would also like to emphasize that despite his age, Jin Shanbao was definitely a "second-generation" American-trained Chinese scientist. He received professional and undergraduate education at the Nanjing Higher Normal School/the Southeastern

²⁶⁵ Considering the fact that by 1937, the NCU had established experimental farms in so many provinces including Sichuan, Jin Shanbao would very likely send the selected wheat strains to diverse locations to test their qualities even without the war. But it was not likely that he could conduct the research at those locations himself. Therefore, it was the Sino-Japanese war and the forced retreat to the Southwest that facilitated Jin to develop his research from local to countrywide.

University, studied under the direction of first-generation American-trained scientists such as Zou Bingwen, traveled to the U.S. in the early 1930s for graduate education, entered well-established scientific institutions after returning to China, and devoted himself more to generating new scientific knowledge rather than founding new institutes. Compared with the working focuses of Jin Shanbao and Zou Bingwen (as I have described in chapter 1), we can see clearly the change in roles of American-trained scientists, which also reflected the development of agricultural science in China. The case of cotton scientist Feng Zefang (冯泽芳), Jin Shanbao's schoolfellow at the Nanjing Higher Normal School and Cornell University, would exemplify this change as well.

Feng Zefang (1899-1959) studied at the Nanjing Higher Normal School from 1918 to 1921. Then he worked as teacher and technician at several agricultural schools in Nanjing while taking continuing education at the Southeastern University. Feng received his bachelor's degree in 1925. He served at some provincial agricultural farms and schools during the following four years, and published articles such as the "Properties and Classification of Chinese Cotton" (《中棉形态及其分类》), the first scientific work exploring Asian cotton strains in China) and "The Primary Report of Mendelian Genetics of Chinese Cotton" (《中棉之孟德尔性初次报告》). These researches were based on the knowledge Feng acquired from the American-trained scholars at the Nanjing Higher Normal School and the Southeastern University. In 1930, Feng Zefang traveled to the U.S. and studied genetics and cotton breeding at Cornell University. He received his doctoral degree in 1933.

After returning to China, Feng served as a cotton expert at several governmental departments including the National Cotton Improvement Institute and the National Agricultural Research Bureau (the two institutes largely overlapped). Meanwhile, he taught at the agronomy department of NCU as a part-time professor. When President Luo Jialun reformed the NCU, most faculty members were required to serve solely full-time for this university. Feng, because of his outstanding academic and educational performance, was one of the few scholars able to keep job positions at other institutes and organizations. Due to this, and his connections to Cornell University, Feng succeeded his Cornell professor H. H. Love in taking charge of the countrywide experiment to test and screen 31 fine cotton breeds in over ten provinces in China. This project continued until 1936. Feng and his colleagues identified two American cotton breeds showing high production and good quality in both north and south China.²⁶⁶

From 1936, Feng Zhaochuan started a series of surveys on the distribution of cotton producing areas in China. These surveys were sponsored and charged by the National Cotton Improvement Institute and the National Central University to investigate natural resources in West China in order to prepare for the coming war. In 1936, the political situation showed clearly that the war between China and Japan was inevitable. At that time, all the chief cotton producing and processing centers were in the coastal provinces,

²⁶⁶ Feng Zefang, "American Cotton Varieties Suitable for China," *Agricultural News*, 1935, Vol. 2, No. 27; "Another Report of the S. and D. Cotton Breeds," *Agricultural News* 1936, Vol. 3, No. 25; and "Research and Extension of the Stoneeville Cotton Breed," *Agricultural News*, 1937, Vol. 4, No. 17; in Feng Zefang Xian Sheng Tu Cun, pp. 51-54. (冯泽芳, "适于中国栽培之美棉新品种"《农报》1935年第2卷第27期, "再论斯字棉与德字棉"《农报》1936年第3卷第25期, "斯字棉之试验成绩与繁殖推广之现状"《农报》1937年第4卷第17期, 《冯泽芳先生图存》, 51-54页)

which would doubtless become quickly engulfed in the fighting. The Nationalist government and its affiliated institutes (such as the Academia Sinica, the National Agricultural Research Bureau, and the National Central University) therefore were investigating the western provinces to make preparation for the coming war (as I have mentioned in chapter 3). As a chief scientist at the National Agricultural Bureau and professor of the National Central University, Feng led the cotton surveys in Western China and reported his discoveries in newspapers and academic conferences.²⁶⁷ After retreating to the Southwest in 1937, Feng continued his surveys and experimental research on cotton, based in Yunnan province. During the war, his research focused mainly on two aspects: cotton producing areas in China, and “tree cotton” in Yunnan province. Studies in both areas shared similar goals: improving cotton production and building the cotton industry in the Southwest.

Because of the achievements of the previous “golden decade,” the Chinese cotton industry was almost able to be self-sufficient by 1936. However, the distribution of the cotton industry was very unequal around the country. According to Feng’s investigation, there were five big cotton producing areas in China: the Yellow River Area, the Yangtze River Area, the Early-Maturing Area, the Northwestern Inland Area, and the Southern Area. Feng argued that the growth of cotton varieties in different areas needed to be

²⁶⁷ Feng Zefang, “Distribution of Chinese Cotton Production and Its Relations with Climate and Geography,” presented at the 19th annual conference of the China Agriculture Society, 1936. (冯泽芳, “中国棉产之分布及其与气候地理之关系”, 1936年第十九届中华农学会年会论文提要). Feng Zefang, “Surveys of Cotton Producing Areas in Gansu, Sichuan, and Yunnan, and Expectations for the Future,” *The Central Daily*, March 6, 1936. (冯泽芳, “甘川滇三省棉区之考察及其将来之希望”, 《中央日报》, 1936年3月6日)

keyed to different natural conditions such as temperature, precipitation, sunshine, frost-free season, altitude, and soil. Therefore, cotton breeding and extension should be conducted within the proper area, or the production would decrease.²⁶⁸ Feng's theory of the five cotton producing areas in China has been accepted by later cotton scientists and became a framework for cotton studies in China through today.

On the other hand, however, over 90% of the cotton industry was located in coastal provinces, especially the areas around Shanghai and Tianjin. As a result, after 1938, almost all the cotton mills fell in the Japanese-occupied area, and by 1939, cotton textile production in the Southwestern unoccupied area could hardly reach 5% of the annual production before the war. In 1940, Feng published an article "Rational Distribution of the Cotton Industry in China" ("我国棉工业区的合理分布"). In this work, Feng explored the problems of pre-war distribution of the cotton industry and pointed out that the cotton textile mills were too far away from the cotton producing area, which increased transportation costs greatly even during peaceful eras. Noticing the fact that most prewar cotton industry was controlled by foreign capital, especially Japanese capital, Feng believed that the unsound distribution of the cotton industry was a result of Japanese economic invasion rather than the spontaneous development of the Chinese cotton industry and production.²⁶⁹

²⁶⁸ Feng, Zefang, "Distribution of Chinese Cotton Production and Its Relations with Climate and Geography," presented at the 19th annual conference of the China Agriculture Society, 1936.

²⁶⁹ Feng, Zefang, and Harry H. Love, *ZhongGuo De MianHua*, Shanghai: Commercial Press, 1935.

Since his 1936 surveys, Feng Zefang noticed that in Yunnan province *Mumian* (wood cotton, 木棉) was a very vague term used to refer to a variety of plants. In other places in China, this term usually means “tree cotton” or kapok, a high arbor with beautiful red or orange flowers. However, through his field investigation and research, Feng realized that in most regions of Yunnan, *mumian* actually referred to two varieties of Island cotton and Egyptian cotton introduced by American and British missionaries since the late nineteenth century (*Bombaceae*, *Gossampinu s. malabarica* and *Gossypinu barbadense* L.). Chinese and Egyptian cottons were usually annual plants in other parts of China. However, Yunnan province, because of its latitude and altitude, had a warm and wet climate and it seldom snowed. Therefore *Mumian* in Yunnan became perennial and it would have high production if planted properly. Feng’s discovery of cottons in Yunnan was first published in January 1937 in *MianYe YueKan*. In this report, Feng elucidated that the fiber of *Mumian* in Yunnan might be comparable with the fibers of Egyptian cotton and could be widely utilized in the cotton industry. He suggested that plantings of these two types of *Mumian* could be expanded in southern parts of Yunnan in order to support the cotton and textile industry.²⁷⁰ Such a detailed investigation, in such a remote area, was impossible without the pressure from the upcoming war. Feng’s (re)-discovery of *Mumian* in Yunnan revealed a uniquely adapted plant that had developed new growth patterns in response to the environment. Recognizing and propagating it, Feng not only helped Chinese wartime cotton production but also described new adaptations on the part

²⁷⁰ Feng, Zefang, *MianYe YueKan*, Volume 1, No. 2, 1937. (冯泽芳, “云南植棉考察报告附陈改进意见”, 《棉业月刊》1937年第一卷第2期)

of the plant. In this sense, the war brought not only difficulties and frustrations, but also opportunities for the development of Chinese agricultural sciences.

After retreating to Chongqing, Feng Zefang continued travelling in western provinces and investigated cotton varieties in unoccupied China. During governmental reorganization in 1938, the National Cotton Improvement Institute merged into the National Agricultural Research Bureau. Feng became principal cotton scientist at the Bureau. Meanwhile he was promoted as director of the Agricultural School at the National Central University. Feng established a cotton experimental station at Poxi (婆兮), Yunnan, to conduct genetic and cytological research of Chinese cottons and to breed cotton varieties for extension.²⁷¹ He also traveled to Northern provinces and traveled in areas along the railway from Luoyang (Henan province) to Lanzhou (Gansu province) for surveys of cotton distribution. In May 1940, Feng Zefang published his article “MianHua QuYu ShiYan Zhi ChengJi Ji ZhongGuo SanGe MianHua ShiYing QuYu (Report of Regional Experiments of Cottons and Three Cotton Planting Areas in China),” which was the first scientific survey of cotton distribution to include all of China.²⁷²

Similar to senior American-trained agricultural scientists such as Shen Zonghan and Zhao Lianfang, Feng Zefang gradually realized that non-scientific factors usually played more important roles for increasing agricultural production and elevating Chinese people’s standard of living, and that simply conducting agricultural science was not

²⁷¹ Zeng, Yushan, *Feng ZeFang Yu ZhongGuo XianDai MianYe GaiJin YanJiu* (Feng Zefang and Cotton Improvement in Modern China), Beijing: Chinese Agricultural Science and Technology Press, 2012, pp. 84-85.

²⁷² Feng, Zefang, “MianHua QuYu ShiYan Zhi ChengJi Ji ZhongGuo SanGe MianHua ShiYing QuYu (Report of Regional Experiments of Cottons and Three Cotton Planting Areas in China),” May 1940. (“棉花区域试验之成绩及中国三个棉花适应区域”, 1940年5月)

enough to serve and improve China. In a 1940 news report, Feng proposed that the bottleneck for availability of Chinese clothing was not cotton production in agriculture, but the industrial ability to store, transport, and process cotton. He pointed out that to resolve the shortage of textile products, “[improving the] textile industry was more urgent than planting cotton; storing and transporting was more urgent than producing (cotton) (纺织急于种棉, 储运急于生产).”²⁷³ The chief cotton productive regions were mainly inland, but almost all textile factories were in coastal provinces where electricity was reliable and social environment was more amiable. Transportation services between the cotton productive regions and the coastal regions were extremely undeveloped. Therefore, the shortage of raw materials in the textile industry was mainly caused by the skewed distribution of industry and agriculture as well as disadvantages of transportation, which formed the most critical bottleneck for improving textile production. Improving cotton production through advanced science and technology was important, but not most urgent at that time.

The quality cotton varieties developed by Feng and his colleagues had been extended in most counties of Yunnan province and over 850 thousand *mu* (567 km²) in Shaanxi province, which could increase cotton production by up to 40.98%.²⁷⁴ However, although historians have noticed and explored how Feng’s cotton varieties was extended, I have not yet found any detailed historical works about how these cottons had finally

²⁷³ Feng, Zefang, “Current Problems of Clothing Materials,” *SaoDangBao*, November 29, 1940. (“现阶段的衣料问题”, 《扫荡报》, 1940年11月29日)

²⁷⁴ Zeng, Yushan, *Feng ZeFang Yu ZhongGuo XianDai MianYe GaiJin YanJiu* (Feng Zefang and Cotton Improvement in Modern China), Beijing: Chinese Agricultural Science and Technology Press, 2012, p. 84.

influenced industrial production and Chinese people's living. Since Feng Zefang publicly expressed his understanding about the importance of non-scientific factors in textile production, there might be some efforts from the government and academia about how to resolve the urgent problems Feng proposed. It may be an interesting and significant research topic for my future studies.

Through the cases of Jin Shanbao and Feng Zefang, we can see two facts about the NCU agricultural scientists. First, challenges and opportunities came along with the war. Scientists' works were inevitably disturbed by displacement. However, forced migration could also have positive effects on agricultural scientists' studies and allowed them to achieve results which were impossible without the displacement. Second, NCU scholars' academic works were very practical and closely connected with urgent necessities of the country and state. Many of their research projects were directly assigned by the central government. This fact was largely because of its central status. The state, or the Nationalist central government, provided much more supports for NCU scholars than for intellectuals at institutes in the periphery. Meanwhile, its control over these scholars was much stricter. Agricultural scientists at NCU usually needed to partly give up their academic autonomy to work on what the state expected them to work on. This was not a big problem for these scientists. Under the wartime condition, it was easier than usual for patriotic intellectuals to give up private interests to the country's benefit. Moreover, the Nationalist government's control over the remaining part of China got strengthened because of pressure from outside, and it became a more effective agent to serve the country.

Unlike those at NCU, scientists in the political periphery might have greater freedom in choosing their research topics. For example, scientists at the Institute of Agriculture at Tsinghua University held strong patriotic feeling for China as well, but they were far away from the state government. It is interesting to explore their strategies of balancing pure and practical research and serving the country at the same time.

4.2 Agricultural Science in the Periphery: Tsinghua IOA in Kunming, Yunnan

When the Second Sino-Japanese War broke out in July 1937, it seemed that the Institute of Agriculture in Tsinghua University in Beijing faced an unfortunate fate to be terminated. The Japanese Army quickly occupied the campuses of several leading universities in North China, such as the Peking University and Tsinghua University in Beijing, as well as Nankai University in Tianjin. On August 28, 1937, the Ministry of Education instructed the three presidents—Mei Yiqi of Tsinghua, Jiang Menglin of Peking University, and Zhang Boling of Nankai University—to arrange a retreat to Changsha, Hunan province, in order to unite together and to continue education and research in exile during the war. On September 10, the Ministry of Education's No. 16696 Instruction joined the three universities and established the National Changsha Temporary University. The university officially opened on November 1, 1937. However, the war went much worse than Chinese people's expectations. Shanghai and Nanjing fell into the hands of the Japanese army in November and December. Wuhan and Changsha

in Central China quickly became the front. From February to April 1938, the Changsha Temporary University had to move once again to Kuming and was renamed as the National Southwest Associated University (国立西南联合大学, abbreviated as *Lianda*).²⁷⁵ (See Figure 16, the map of Tsinghua's movements.)

Tsinghua IOA was not totally unready for the retreat. Already when Japan plotted to create a separate puppet regime in North China in autumn 1935, the Tsinghua University had realized the danger and started to purchase land and buildings in Changsha to prepare for the retreat. In summer 1936, the Tsinghua IOA started a cooperative program with the Hunan Provincial Advanced Agricultural Professional School in Changsha in order to transfer its research focus to Central China.²⁷⁶ Nevertheless, no one had expected that the war would come so rapidly or that the Chinese army would be overpowered. Tsinghua IOA had to leave Beiping so hastily that they could neither harvest their plants nor rescue their research materials. Although a German company later helped the scientists move some equipment to Kunming, they had lost all the books and journals, research data, specimens, and seeds. On January 19, 1938, the Tsinghua university committee felt that it had no choice but to eliminate the Tsinghua IOA and to amalgamate it with the department of biology in *Lianda*.²⁷⁷

After arriving in Kunming, the southwest provincial capital city, the situation changed. Tsinghua University was willing to restore and expand the IOA for the sake of both the country and the university itself. According to Tang Peisong's memoirs, all the

²⁷⁵ See John Israel, *Lianda: A Chinese University in War and Revolution*, Stanford, CA: Stanford University Press, 1998.

²⁷⁶ Tsinghua University Archives, file 1-2:1-201.

²⁷⁷ Tsinghua University Archives, file 1-3:3-40, p. 2.

three universities—Tsinghua, Peking University, and Nankai—believed that the association of *Lianda* was merely an expedient measure and that they would definitely separate after the war. Therefore, all three were willing to conserve forces for postwar development.²⁷⁸ After Shanghai, where the main office of China Foundation was located, fell into the hands of Japan, Tsinghua could not get its monthly funds any more. The central government's fund for *Lianda* was 75% of the total of the three universities' prewar funds, which, considering skyrocketing prices during the war, was clearly not enough for further development. Therefore, Tsinghua decided to request a loan from banks with its temporarily unavailable China Foundation fund as guarantee. The loan allowed Tsinghua to establish and expand several research institutes independent from *Lianda*. In June 1938, the Institute of Agriculture was restored and expanded in Kunming. Meanwhile, Tsinghua established the Institute of Radio Science, the Institute of Metallurgy, the Institute of Aeronautics, and the Institute of National Condition Survey. Ye Qisun (叶企孙) was appointed as chairman of these special institutes.²⁷⁹

The two prewar divisions got the opportunity to recruit new researchers with American postgraduate training backgrounds. Yu Dafu (俞大绂) and Lu Jinren (陆近仁) joined the divisions of pathology and entomology as associate professors respectively in July and October 1938. In addition, the Tsinghua IOA established a new division, Laboratory of Physiology, which later became the most active one. The new division was

²⁷⁸ Tang Peisong, "Wei Jie Zhao Xia Gu Xi Yang," in *Memoirs of Prominent Academicians*, edited by Han Cunzhi, Shanghai: Shanghai Science Technology and Education Press, volume 1, 2003, p. 76. (汤佩松, "为接朝霞顾夕阳", 《资深院士回忆录》, 韩存志主编, 上海: 上海科技教育出版社, 第一卷, 2003年, 第76页)

²⁷⁹ *Historical Materials of Tsinghua University*, volume 3, 1990, pp. 116-118.

chaired by Tang Peisong (汤佩松), whom I will introduce in the next paragraph. Yin Hongzhang, who had already been engaged with the department of biology in Lianda, also started to work at Tang Peisong's group as an honorary fellow. Zhang Xincheng, Tang Peisong's student and colleague at Wuhan University, joined the physiology group as an associate professor in May 1939. In summer 1939, Lou Chenghou (娄成后, 1911-2009), Tang Peisong's Tsinghua junior and University of Minnesota alumnus, returned from Minnesota after receiving his Ph.D. degree and joined Tang's group with latest instruments for electrophysiology purchased from the United States. Therefore, Tang Peisong's group became the best equipped plant physiology laboratory in southwest China.²⁸⁰

Tang Peisong (1903-2001) was born into a revolutionist family. His father Tang Hualong (汤化龙, 1874-1918) was a jurist, journalist, and politician and had taken important positions in the republican government, such as congress chairman and minister of education. Because of his political dissent, Tang Hualong was murdered by the KMT (the Chinese Nationalist Party) in 1918. Possibly due to the suffering of his father, Tang Peisong never had any positive opinion of the KMT government, even though he had been a passionate patriot all through his life.²⁸¹

Tang Peisong took secondary education at Tsinghua College from 1917 to 1925. He described the Tsinghua fund in his memoirs with strong emotion:

²⁸⁰ Tang Peisong, p. 83.

²⁸¹ Tang Peisong, *Wei Jie Zhao Xia Gu Xi Yang*, p. 1 and p. 40.

“The Tsinghua fund was from the returned part of the Boxer Indemnity. This indemnity was extorted by an Eight-Nation Alliance whose troops traveled overseas to invade and plunder our country land and to insult the Qing government. My schoolmates and I were educated with the four hundred and fifty million taels of fine silver from four hundred and fifty million Chinese people (over ninety percent of whom were poor people); that is, each Chinese person donated one tael of blood to cultivate us. I still feel profoundly guilty and grateful up to the present... I encouraged myself with the country’s humiliation and swore to study hard in order to reciprocate favours bestowed by the country.”²⁸²

This quotation suggests one component of “love of China” for both the first and the second-generation American-trained Chinese scientists: they felt guilt and a passion to help China become strong and important in international science, because they owed their education to their countrymen. In addition, this strong feeling was not a love for the political state, but love for the social and cultural countrymen. All the three leading scientists in Tsinghua IOA including Tang Peisong were alumni of Tsinghua College, and the younger Tsinghua IOA researchers who later studied in the United States were all sponsored by the Boxer scholarship. As Tang articulated, this sponsorship had stimulated them to respond to the reality that their country was still in dire suffering and the best way for them to save the country and to repay their debt was their knowledge and its application.

²⁸² Tang Peisong, pp. 1-2.

Under the suggestion of Tu Zhi (涂治), his friend at Tsinghua, Tang Peisong came to the agricultural school in University of Minnesota in 1925.²⁸³ But he quickly transferred to the school of liberal arts because of a strong interest in pure research to explore the foundations of biology. He studied botany under William Cooper. During this period, Tang Peisong was exposed to the general physiology of Jacques Loeb and this raised his strong interest in exploring the fundamental nature of living creatures with physical and chemical principles. In summer 1927, Tang Peisong received his B.A. degree and won the first prize. He then was admitted by the plant physiology laboratory of Burton E. Livingston in the Johns Hopkins University and was deeply impressed by its graduate school. Ten years later, after becoming a professor in Tsinghua, he modeled his own research group after JHU's advanced education. Tang Peisong received his Ph.D. degree in the summer of 1930. Then he spent the summers in 1930 and 1931 working as a research assistant at Woods Hole Marine Biological Laboratory, where he published two articles about the respiration intensity of sea urchins and asters, and tested the level of phosphagen in the lobster's nerve conduction. During these summers, Tang Peisong got a chance to participate in the lectures and discussions of Otto H. Warburg, Leonor Michaelis, Frank and Ralph Lillie, Archibald Vivian Hill, and Otto Meyerhof. Influenced

²⁸³ Along with Tang Peisong, there were at least three other Chinese students at the UMN agricultural school—Tu Zhi, Zhang Kewei (张克威), and Sun Qingbo (孙清波). All of them returned to China and became leaders in the agricultural sciences. Zhang Kewei (1901-1974) was an animal husbandry scientist. He was the founder and first president of the Shenyang Agricultural College. Sun Qingbo had chaired the department of agricultural mechanics in the National Central University (Nanjing University) after 1948.

by these scientists, Tang Peisong decided to choose thermodynamics of plant respiration and photosynthesis as his lifelong career.²⁸⁴

From September 1930 to August 1933, Tang Peisong worked as a fellowship researcher and instructor at William John Crozier's laboratory of general physiology at Harvard University. However, Tang Peisong's understanding of *in situ* activation energy was quite different from the hypothesis of Crozier and they two did not get along with each other very well (later scientific discoveries have demonstrated that Tang was right).²⁸⁵ Tang Peisong started to contact universities in China for a faculty position. In spring 1933, he received an invitation from the National Wuhan University with an offer of \$2,000 to launch a laboratory.²⁸⁶

When considering the Tsinghua IOA scientists' returning to China after their training in the United States, we should remember that their affection for the country was not directly applicable to specific governments. For these scientists maturing in the early twentieth century, the country had been torn by warlordism for decades and the Nationalist central government was not necessarily representative of China for them. Most of these scientists were merely indifferent in politics, while a few of them were radical democrats and some were socialists. However, because of a sense of belonging, their self-identities as Chinese people were quite similar, and this encouraged them to return to build a stronger China. Tang Peisong explained this in his memoir:

²⁸⁴ Tang Peisong, pp. 30-32.

²⁸⁵ Tang Peisong, chapter 5.

²⁸⁶ This opportunity was arranged by Ren Hongjun (任鸿隽), Tang Hualong's close friend and one of the founders of the Science Society of China. Tang Peisong, chapter 6.

“The fund from [Robert] Marshall²⁸⁷ may guarantee my career and life in the U.S. Then why did I insist on giving up this fund and returning to chaotic China—China under the government of a party murdering my father in 1918? ... Now I have got the answer: although my life in the U.S. has been very comfortable, there has always been a sense reminding me that I don’t belong here.”²⁸⁸

Tang returned to China because he loved the country, but not the nation governed by the KMT party (the so-called Chinese Nationalist Party). It was the sense of “belonging to China” as a cultural and social entity—not a political one—that motivated Chinese scientists such as Tang to study in the U.S. and to return China to apply their knowledge to the social problems of their homeland. They wanted to use the advanced knowledge in science and engineering they had learned abroad to improve and rebuild their country despite the turbulent political situation.

Tang Peisong went back to China, where he started working at the National Wuhan University in fall 1933. He was the first scientist to teach and research general physiology in Chinese universities. From 1933 to 1937, he organized other physiologists to compile textbooks and to teach physiology courses in Chinese, established a laboratory of cellular physiology and general physiology, and invited several other western-trained scientists to join his research, including Lin Chunyou (林春猷), Gao Shangmeng (高尚萌), Wu

²⁸⁷ Robert Marshall was Tang Peisong’s labmate and close friend in the Johns Hopkins University. When hearing that Tang Peisong was planning to go back to China, Marshall strongly suggested Tang to stay in the U.S. and promised to set up a fund in a university in New York City to support the career and life of Tang and his family. Tang Peisong declined this generous offer and went back to China in August 1933.

²⁸⁸ Tang Peisong, pp. 40-41.

Maoyi (吴懋仪), Yin Hongzhang (殷宏章), Zhang Xincheng (张信诚), and Shen Qiyi (沈其益). From 1936 to 1938, Tang Peisong, Lin Chunyou, and Wu Maoyi published seven articles on the thermodynamics of cellular respiration in *Journal of Cellular and Comparative Physiology*. This group was at a very promising stage when the July 7 Incident²⁸⁹ broke out. This incident refers to the battle between Japanese and Chinese armies near Peiping on July 7th, 1937. It marks Japanese troops' comprehensive invasion of China and the start of the Second Sino-Japanese War. The war completely disrupted the physiology group, forcing them to move and adapt to new circumstances.

By the end of 1937, Tang Peisong was faced with three choices—he could stay with Wuhan University, which would retreat to Leshan (乐山) in Sichuan Province; he could obey the Ministry of Education, which had instructed him along with several medical scientists from Peiping and Nanjing to establish a medical college in Guiyang, Guizhou province; or he could accept the offer of Mei Yiqi, the Tsinghua president, who sent him a letter inviting him to join the Tsinghua IOA to organize a plant physiology research group. Tang Peisong was most interested in plant physiology and its economic applications, so his preference was to join Tsinghua IOA in Yunnan province. However, he also felt obligated to help the medical scientists. As a result, he first spent half a year establishing the Guiyang Medical College (March to August 1938), and then traveled to Kunming to start his research at Tsinghua IOA in August 1938.²⁹⁰

²⁹⁰ Tsinghua University Archives, file 1-3:3-40.

While Dai Fanglan's patriotic activities were located mainly in universities and academic circles, Tang Peisong's love for China and desire to serve his country seemed to be much more radical and showed in many ways. When the July 7 Incident broke out, Tang Peisong was extremely lost at the beginning and wondered what he could do for the nation. He quickly took two actions—first, recording BBC's reports about the Anti-Japanese War and spreading this international perspective with leaflets among faculty and students at the National Wuhan University; and, he applied to join the Nationalist government's army to fight against the Japanese. The first action lasted for about one month and was very popular. Obviously, Tang could not have done this without his western experience and language skills. However, Wang Xinggong (王星拱), president of the Wuhan University, told him that some secret service members in the KMT government were investigating and punishing any activity that spread news different from official reports of the KMT central government. So Tang Peisong had to give up his leaflets. As for joining the army, only one military official treated Tang Peisong's application seriously: General Hu Zongnan (胡宗南) invited Tang Peisong to join his troops in Shaanxi (Northwest China) to suppress CCP in Yan'an, which was unacceptable for Tang Peisong. Disappointed by the KMT government and army, Tang Peisong reassessed the situation and realized that the best and only reasonable way for him to serve his country during this crisis was scientific research and its applications to increase agricultural and industrial production.²⁹¹

²⁹¹ Tang Peisong, pp. 60-65.

Tang's life is an excellent example of how "love for China" and being a scientist created this dual-identity. At Tsinghua IOA, even the younger passionate patriots found that practicing science was the best way to serve their country. It is understandable that in the chaotic atmosphere of wartime China, researchers at the Tsinghua IOA presented their identity of being Chinese in many aspects other than science. Some patriotic activities involved political issues. However, usually these scientists would return to scientific studies. One example is Zhou Jiachi's travels to Northwest China. Zhou Jiachi (1911-1998) took his college education at the School of Agriculture in Jinda from 1928 to 1932. He first entered the department of agronomy but then transferred to pathology in order to study under Dai Fanglan. He was highly devoted in scientific studies but also enthusiastic in patriotic activities. After the September 18 Incident²⁹², Zhou Jiachi participated in a series of public activities to appeal to the Nationalist government to resist Japanese invasion and to encourage Chinese compatriots in anti-Japanese activities. He even missed some courses and experiments required for his education—fortunately professor Dai Fanglan never blamed him for the absence but helped him to catch up and finish the B.S. thesis.²⁹³ After working as a research assistant in Lingnan University for one year, Zhou Jiachi joined the Tsinghua IOA at Dai Fanglan's invitation. He had substantial achievements in plant pathology research and published four articles during the three years in Peiping.²⁹⁴ However, Zhou Jiachi had felt extremely depressed after the July 7 Incident. When hearing the Tsinghua university committee's decision to suspend

²⁹² The Japanese troops occupied Northeast China after September 18, 1931.

²⁹³ Cheng Guangsheng, p. 27.

²⁹⁴ Tsinghua University Archives, file 1-3:3-88, pp. 10-21, Dai Fanglan's report on the Division of Plant Pathology.

the IOA in January 1938, he decided almost at once to leave the university and travel to Northwest China in order to do something for the country more directly.²⁹⁵ From January to June 1938, Zhou Jiachi traveled to Yanan and received training at Shanbei Public School, a political school training revolutionaries for the CCP. However, when Dai Fanglan asked him to return the Tsinghua IOA in June 1938, he returned to his mycological and plant pathological studies at once. In Yan'an and returning to Tsinghua IOA, Zhou Jiachi was realizing his wish to contribute to the country in practice, by using his scientific knowledge and skills.²⁹⁶

Now looking back to Tsinghua IOA in 1939, although it had three groups, its formation and operation became a problem again. Again, both Dai Fanglan and Liu Chongle were totally indifferent to being head of this institute. Tang Peisong was very interested in this managerial job, but as a newcomer and the youngest professor, it was inappropriate for him to take this position. Therefore the Tsinghua IOA stayed in three independent groups without an institute head.

Through early 1939, the Tsinghua IOA stayed together with Lianda at some temporary campus buildings in Kunming. However, after September 1939, the Japanese air force started to bomb Kunming. Air attacks became more and more frequent once Japanese troops occupied Hanoi, Vietnam in 1940. Many temporary classrooms and laboratories were ruined in the air attacks. The city was not a safe place any more. The

²⁹⁵ Tsinghua University Archives, file 1-3:3-40.

²⁹⁶ Qiu Weifan, "Professor Dai Fanglan," in *Yi En Shi (Recollection on Our Mentors)*, edited by Wu Ruzhuo, Wang Buzheng, and Xu Zenghua, Beijing: China's Agricultural University Press, 2010. (裘维蕃, "戴芳澜教授", 《忆恩师》, 吴汝焯, 王步峥, 许增华主编, 中国农业大学出版社, 2010)

Tsinghua university committee decided to rent lands in rural areas near Kunming and move the special institutes out of town to avoid air attacks. From January to September, 1939, Mei Yiqi and Ye Qisun contacted the Department of Construction of Yunnan Province and signed a ten-year lease to rent a land of 165.87 *mu* (0.11 square kilometers) at Dapuji (大普吉), northwestern suburb of Kunming. From the end of 1939 to the summer 1946, Dapuji was the base for the divisions of pathology and physiology of Tsinghua IOA, as well as the base for the Institute of Radio Science and the Institute of Metallurgy. The division of entomology set an office in Kunming and rented a land of ten *mu* at Poxi (婆兮), a small town 170 kilometers south of Kunming, as their experimental farm to plant fruit-trees and sugarcane (important crops of the southwest).²⁹⁷

Living conditions at these villages were extremely tough. These prominent scientists had to build up houses as well as establish basic water and power systems for their lives and research. They also needed to deal with harassment from brigands, local peasants, and the soldiers protecting them.²⁹⁸ By 1939, the annual fund from Tsinghua for each research group had increased to 30,000 CND. In addition, the divisions of plant pathology and entomology received 8,000 CND annual stipend from CAEI; the group of

²⁹⁷ Tsinghua University Archives, file 1-3:3-92, “Documents and Contracts about How the Tsinghua IOA’s Rented Lands at Dapuji”.

²⁹⁸ Before Tsinghua, some scholars from the National Sun Yat-Sen University had moved to a farm near Dapuji, and they suffered robbery in February 1940 (see Tsinghua University Archives, file 1-3:3-92, p. 31). At the request of President Mei Yiqi, Long Yun (龙云), chairman of Yunnan province, sent some soldiers to Dapuji for a security guard. From then on the Tsinghua researchers had to tolerate noise from the soldiers. In addition, local peasants along with the soldiers usually came to the experimental farm and garden of Tsinghua IOA to steal fruits. The elegant Tsinghua intellectuals could hardly stop such rude harassment.

general physiology had a grant of U.S. \$2,500 from the Rockefeller Foundation.²⁹⁹

Although the funding had increased, the scientists had to repurchase apparatus and journals, and, different from in Peiping, there were few other research organizations in Kunming to share research equipment with Tsinghua IOA. The financial situation for the Tsinghua IOA became even tougher after 1940, when severe inflation happened in Southwest China.

However, in the villages the scientists were finally able to stay far away from air attacks and to settle down for their research and education. Since the summer of 1939, when Lianda restarted to recruit graduate students, Tsinghua IOA had accepted many graduate students from the departments of biology and chemistry as research assistants. It provided a relatively peaceful environment for graduate students to conduct experimental research and finish their studies at the master's level. Also after 1939, Lianda restarted the exams to select talented Chinese students to study in the U.S. The Tsinghua IOA functioned as a preparatory training institute and allowed the selected biology and agriculture students to undertake short-term research before going to the U.S.³⁰⁰

Because all professors at Tsinghua IOA were American-trained scientists and familiar with English and American culture, they played an important role in receiving western scientists. After 1941, when the United States joined the Allies of WWII, China restored its diplomatic communication with it and Britain. Academic communications

²⁹⁹ Tsinghua University Archives, file 1-3:3-88, draft reports of the Institute of Agriculture in 1940.

³⁰⁰ From 1942 to 1945, some lecturers in Tsinghua IOA went to study in the U.S. as well, for example, Mao Yingdou, Jiang Huaizhang, and Zhu Hongfu.

became active as well.³⁰¹ Tsinghua IOA scientists' contribution to the local-global circulation of scientific knowledge lasted till the 1970s and 1980s.

During its early development, Tsinghua was established as a preparatory school for the Boxer students. It had been highly inclined to prepare students for practical studies because according to the agreement between the American and the Chinese government, more than 80% of the Boxer students must major in practical knowledge such as science, engineer, medicine, and agriculture. The primary goal for training western-style intellectuals was to introduce practical knowledge directly beneficial to China. In addition, China was underdeveloped in both economics and scientific institutions, and the leadership was not willing to support pure scientific research without obvious use. It was very hard for Chinese scientists to have equal academic communication exchange with their foreign colleagues. Since the late 1920s, however, scientific research and education institutions had greatly improved in many areas of China, as mentioned above. It was no longer an extravagant hope for the Chinese people to create international-level scientific knowledge within their home country. At this time, Tsinghua had evolved to a leading university in China, which meant that it needed to maintain both its teaching and research at a high level. On one hand, Yu Zhenyong's unsuccessful agricultural department suggested that simply applying agricultural knowledge and directly teaching the peasants was not enough for the development of agricultural department in a leading Chinese university. On the other hand, pure research without application was definitely unsuitable for the actual conditions of Republican China, because most parts of the country were

³⁰¹ For example, Joseph and Dorothy Needham had visited Dapuji and built up a close friendship with Tang Peisong and other scientists in the physiology group.

still very poor and the country could not afford huge investments in scientific research without noticeable reward. Therefore, it was the time for Chinese scientists to re-evaluate the importance of pure and applied sciences in order to make a long-term development plan.

I argue here that the Tsinghua IOA scientists found a way to emphasize both pure research and application, which allowed them to be able to adapt to local conditions and to communicate with their international scientific colleagues. Dai Fanglan had pointed out at the very beginning of Tsinghua IOA's establishment that:

“[O]ur institute will devote our research to resolving practical problems in agricultural production. We are not focusing on profound research. This is why we name us as the Institute of Agriculture (农业研究所) rather than institute of agricultural sciences (农学研究所).”³⁰²

And that:

“All applied sciences are built up on the base of pure research.”³⁰³

These paradoxical expressions do not imply an inconsistency among the Tsinghua IOA scientists. Actually, historians of science in modern China have already noticed that pure and applied sciences in China have not been in a tension as they had in the United States.³⁰⁴ Although debates around the relationship between pure and applied sciences

³⁰² Tsinghua University Archives, file 1-2:1-200, p. 30.

³⁰³ Tsinghua University Archives, file 1-3:3-94, pp. 2-4.

³⁰⁴ For example, in his book *The Study of Change: Chemistry in China, 1840-1949* (Cambridge: Cambridge University Press, 1991), James Reardon-Anderson analyzes how the KMT government compromised with scientific activists and researchers to balance both pure and applied scientific research during the republican period. Sigrid Schmalzer also explores how the basic/applied science dichotomy in China differed from in the United States through cases of

had lasted through the Republican period in mainland China, generally speaking, Chinese scholars in the 1920s and the 1930s believed that the two were inseparable and deserved equal attention and investment. For example, in 1936, Cai Yuanpei (蔡元培) proposed that:

“Scientific research should not set application as the only purpose. Many applicable scientific results were achieved as the byproduct of pure scientific research. ... It is undeniable that achievements of pure sciences may become foundations of applied sciences, while concerns of applied sciences can provide new topics and methodologies for pure sciences. We should place equal emphasis on both of them and therefore receive double-wins. Ignoring one of the two would result in failure for both of them.”³⁰⁵

Scientists such as Ding Wenjiang and Tao Menghe also declared that the so-called “pure” or “applied” sciences were just simple and convenient categories to distinguish some new disciplines, while science itself should be a cohesive entirety rather than separate fragments. “It should be called the application of sciences, rather than applied sciences.”³⁰⁶

Therefore, although Chinese scientists motivated by their identity of being Chinese were inclined to conduct the scientific research most useful and practical for China’s

agricultural science in socialist China in her “Self-Reliant Science: The Impact of the Cold War on Science in Socialist China”, in Naomi Oreskes and John Krige, eds. *Science and Technology in the Global Cold War*, MIT Press, 2014.

³⁰⁵ Cai Yuanpei, “Process Outline of the National Central Academy” (April 16th, 1936), *The First Draft of the History of the Academia Sinica*, Taipei: the Academia Sinica, 1988, pp. 23-28. (蔡元培, “国立中央研究院进行工作大纲”(1936年4月16日), 《中央研究院史初稿》, 台北, 中央研究院, 1988年, 第25-26页)

³⁰⁶ Yang Tsui-Hua, p. 149.

prosperity and strength, they were able to stress the identity of being scientists and therefore were able to balance pure research and applications in their results. The reason for the successful balance was that, although the government and people in China—just as in the U.S.—were demanding that scientists produce most beneficial outcomes, Chinese scientists felt that it was critical to contribute to international scientific research, because science in China had developed with significant foreign influence. With pride in being Chinese scientists, they wanted to create and circulate new scientific knowledge around the world in order to promote China's status in the global scientific community as well as to promote the development of science. Such strategies were reflected in Tsinghua scientists' work in three areas: the biological control of insects led by Liu Chongle, water potential in plant respiration led by Tang Peisong, and fungal classification led by Dai Fanglan. Fungal classification in the group of plant pathology was a continuation of Dai Fanglan's prewar research, and I will briefly introduce the first and second case to analyze how these agricultural scientists motivated by love for country took proper strategies to realize their desire of serving China through agricultural sciences.

Compared with Dai Fanglan and Tang Peisong, Liu Chongle, director of the Division of Entomology at Tsinghua IOA, seemed to be quieter and less public. However, his experience in Republican China might be the best example of how scientific knowledge circulated between China and the West.

Liu was born in Shanghai on September 20, 1901. His grandfather Liu Qixian (刘齐銜, 1815-1877), the son-in-law of Lin Zexu (林则徐), had held provincial civil positions

including governor and judge (e.g., 陕西布政使, and 浙江按察使). Liu Chongle majored in chemistry and biology at Tsinghua College from 1916 to 1920. He received a B.S. degree from Cornell University in 1922 and entered the department of entomology at the agricultural school in this university. After receiving a doctoral degree, Liu Chongle returned to China in September 1926 and served as a professor at the Northeastern University in Shenyang. After the September 18 Incident,³⁰⁷ when most faculty and students of the Northeastern University were exiled to Peiping, Liu Chongle was engaged by the department of biology in the National Peiping Normal University (Beijing Normal University). By 1933, Liu Chongle had become the chair of this department. However, compared with universities with foreign support such as *Jinda* and Tsinghua, the Peiping Normal University (funded by the Ministry of Education in Nanjing) did not have enough funding to effectively support scientific survey and research. Liu Chongle had not gotten the chance to put what he had learned from the Cornell agricultural school to good use until he joined Tsinghua IOA in 1934.³⁰⁸

Biological control of insect pests had been Liu Chongle's research focus all through his life. During his research trip in 1934 and 1935, Liu Chongle visited six western institutes for this topic—the agricultural experiment station of the Hawaiian Sugar Planters' Association, Honolulu, Hawaii; the Cities Experiment Station, Riverside,

³⁰⁷ Japanese troops invaded Northeast China on September 18, 1931.

³⁰⁸ It is not easy to figure out details of Liu Chongle's life. He was persecuted to death at the beginning of the Cultural Revolution without leaving any memoir or biography. Almost all archival materials of the Institute of Zoology in CAS (where Liu Chongle had been working since 1953) were ruined during the Cultural Revolution and all personal records of the scientists were lost. This brief introduction is based on Tsinghua University Archives file 1-2:1-200 and *The Brief History of the Institute of Zoology in Chinese Academy of Sciences*, Beijing: Science Press, 2008.

California; the Gipsy Moth Laboratory, Melrose Highlands, Massachusetts; European Corn Borer laboratory, Arlington, Massachusetts; Japanese Beetle Laboratory, Moorestown, New Jersey; and the parasite laboratory of the Imperial Bureau of Entomology, Farnham Royal, England. He was deeply impressed by the use of parasitic wasps in controlling orange pests in California.³⁰⁹

We see Liu's strategy to link his basic science research program to local applications very clearly when he and his Tsinghua colleagues fled to Yunnan Province to escape the Japanese Army during the war. From 1936 to 1937, Liu designed and headed a research program in which his assistants and students identified natural enemies of pests of plants important to the economy in North China, including cotton, sorghum, and oak. After moving to Yunnan, Liu and the Tsinghua entomologists shifted their emphasis to pest insects of peaches, sugarcane, and some other plants that were economically important to this south-western province. In the southwest, they had to start over to figure out the life histories of local pest insects and identify some of the natural predatory insects of these pests through experiments. Meanwhile, the entomology group cooperated with the physiology group to give weekly lectures to researchers from Lianda, Tsinghua, and local schools and institutes. Liu Chongle was the first presenter of this lecture series and his topic was on a parasitic wasp of a beetle larva. Lacking the personnel, Tsinghua IOA by itself was not able to popularize this scientific method. However, Liu and his Tsinghua colleagues gave their research results to the agricultural departments of the provincial government for further popularization and education.

³⁰⁹ Tsinghua University Archives, file 1-2-1-200, "Liu Chongle's Research Travel Plan of studying agricultural entomology in America and Europe", pp. 57-59.

Because of Tsinghua IOA's collaboration with these governmental organizations, the idea of biological control of pests was disseminated to peasants in South China and became a popular method to treat pests after the 1950s. Interestingly, although the idea of bio-control originated in western countries, it declined in the United States and Europe after the wide application of chemical fertilizer and pesticides. As a result, when mainland China restarted diplomatic communications with the United States, scientists from America were deeply impressed by bio-control of insect pest in China, and this method was re-introduced to American people as an example of mass science from communist China.³¹⁰

According to the extant documents of Liu Chongle, unlike Dai Fanglan and Tang Peisong, Liu did not talk too much about love for his country. He was always quiet towards political and social issues beyond the scope of his scientific research. Compared with the identity of being Chinese, the identity of being a scientist seemed to be a stronger motivation through Liu's life and career. For example, Liu Chongle described the goals of Tsinghua IOA as:

“This program was established under the request of government and belongs to a university. ... The working emphasis must be research and cultivating scientists. ... The general steps for insect research were surveying, experimenting, and popularizing...”³¹¹

³¹⁰ See Sigrid Schmalzer, “Insect Control in Socialist China and Corporate United States.: The Act of Comparison, The Tendency to Forget, and The Construction of Difference in 1970s U.S.-Chinese Scientific Exchange,” *Isis*, 2013, 104:303-329.

³¹¹ Tsinghua University Archives, file 1-3:3-94, pp. 2-4.

And when talking about the biological control of pests, he believed that the duty of Tsinghua scientists was research rather than popularization and education:

“Our research outcomes may be applied to the control and utilization of insects.

However, our labors were too limited to popularize the outcomes among peasants.

We need to cooperate with governmental departments for the popularization.”³¹²

Compared with Dai Fanglan’s description of the goals of the IOA, his words reveal that Liu was not as interested in institution building and especially publicity. He preferred to focus narrowly on his research and let the government popularize and apply his findings.

During the wartime, the National Agricultural Bureau (the Central Agricultural Experimental Institute) provided about half of the research funding for Liu Chongle’s group, which implied that the central government was expecting some practical results from Liu’s research. From the case of Liu’s bio-control research, we can see that this scientist did not especially alter his research interest to fit the requirements of the government. However, we should also notice that even without the motivation of governmental funding, Liu was choosing—maybe unconsciously—some research topic potentially beneficial for his country. During his 1934-1935 research trip, Liu wrote to president Mei Yiqi to introduce the bio-control method he saw in California, and expressed an enthusiasm to apply this method in rural China. While the idea of biological control of insect pests can only be applied based on specific local conditions, Liu Chongle’s research exemplified how a general scientific idea from western countries adapted to and developed in local environments, and how Chinese scientists transferred

³¹² Tsinghua University Archives, file 1-3:3-88, pp. 38-42.

the developed ideas back to their western colleagues. Liu also exemplified a way of Chinese scientists to realize their dual-identity—they claimed to be focusing on pure scientific research of their interest, and claimed to be indifferent in politics and practical application of knowledge. However, motivated by the identity of being Chinese (maybe unconsciously), their research interests were entangled with the actual needs of Chinese society. Therefore, when conducting and creating scientific knowledge, they were also contributing to their country and particularly to the welfare of its people.

Among the three leading Tsinghua IOA scientists, Tang Peisong had especially emphasized pure research while he was also a major contributor to the application of science. His practical research included producing lubricant oil with castor-oil plants as raw materials; cultivating fast-growing crops and seedless fruits by applying auxin, colchicine, and low-temperature treatments; researching fermentation processes and producing acetone and calcium lactate; and surveying the nutritional details of Chinese diets and planning a balanced diet for Chinese soldiers. These contributions made Tang's group very attractive for both young students and governmental and industrial financial support during the war. Tang created a very good balance between practical studies of applied science and the pure research of sciences with less obvious direct benefits. These practical studies, on one hand, realized Tang's identity of "being for the Chinese people"—the desire to serve China; on the other hand, this work also enabled him to realize his identity of being a scientist—to conduct the basic research in which he was interested.

Tang Peisong had developed a strong interest in exploring the fundamental nature of physical and chemical principles of living things as he pursued advanced research after his years at the University of Minnesota. During his studies at the Johns Hopkins University, Woods Hole, and Harvard University, he decided to choose the physiology of plant respiration and photosynthesis as the focus of his scientific career—and he did insist on this focus all through his life, even during wartime. Research conditions were extremely poor at Kunming during the war. Tang’s Laboratory of General Physiology was considered as the best-equipped laboratory in Southwest China because Lou Chenghou, an associate professor at this group, had brought back some specialized electrophysiology equipment from the United States. However, Lou’s research was separated from the works of other scientists. For Tang and most of his colleagues and students, even the incubator and the refrigerators would break down very frequently. However, these scientists were still able to overcome these difficulties and generate top-ranking scientific knowledge. For instance, in March 1940, Tang Peisong and Luo Shiwei (罗士苇) published their research on polyploidy induced by colchicine treatment in *Science* (No. 2357).³¹³ In December 1943, Luo Shiwei and Wang Fuxiong (王伏雄) published their works on conifer physiology in *Science* (No. 2555).³¹⁴ In 1945, because of Joseph Needham’s introduction, three young scientists at Tang’s group, Zheng Bolin (郑柏林), Chen Shaoling (陈绍龄), and Zheng Weiguang (郑伟光), published their research

³¹³ P.S. Tang, and W.S. Loo, “Polyploidy in Soybean, Pea, Wheat and Rice, Induced by Colchicine Treatment,” *Science*, Vol. 91, No. 2357, 1 March 1940, p. 222.

³¹⁴ S.W. Loo, and F.H. Wang, “The Culture of Young Conifer Embryos *in vitro*,” *Science*, Vol. 98, No. 2555. 17 December 1943, p. 544.

of puchiin in *Nature* (Vol. 156),³¹⁵ which was the first time anyone had purified an antibiotic from higher plants.³¹⁶ Among all the achievements of this group, I believe that the most interesting and remarkable one should be Tang Peisong's 1941 article on the "water relations" (now called "water potential" in plant physiology) during plant metabolism.

In 1940, Tang Peisong collaborated with Wang Zhuxi (王竹溪), a physics professor at Lianda, working on water relations in plant cells. They submitted their discoveries to the *Journal of Physical Chemistry* in U.S. in August 1940, in a study entitled "A Thermodynamic Formulation of the Water Relation in an Isolated Living Cell." This article was published in the third issue of *Journal of Physical Chemistry* in 1941. It proposed the thermodynamic methods to explain and calculate the water movement of plant cells with the concept of intra- and extra-cellular chemical potentials (although they did not use the term "potential" directly). Tang Peisong and Wang Zhuxi's results were an important breakthrough in understanding the physical chemistry of water metabolism in plants at that time. This article demonstrated that scientists in wartime China were still active and enthusiastic in fundamental research and in participating actively in international scientific communication. However, their discoveries were too far ahead of their time and were ignored for decades.³¹⁷ In the 1960s, western scientists such as R. O. Slatyer, S. A. Taylor, and P. J. Kramer developed a systematic way to describe water

³¹⁵ S.L. Chen, B.L. Cheng, W.K. Cheng, and P.S. Tang, "An Antibiotic Substance in the Chinese Water-chestnut, *Eleocharis tuberosa*," *Nature*, Vol. 156, 25 August 1945, p. 234.

³¹⁶ *The Brief History of the Institute of Botany at CAS*, p. 622.

³¹⁷ According to Google scholar (searched on August 3, 2012), Tang Peisong and Wang Zhuxi's 1941 article has only been cited by 14, while P. J. Kramer's 1984 book *Water Relations of Plants and Soils* has been cited by 2514.

metabolism in plant cells using the concept of “water potential.” They were considered as pioneers in unifying studies in this field, while Tang and Wang’s 1941 article had actually covered all essential points in the works of Slatyer, Taylor, and Kramer. In 1984, Kramer expressed a deep regret for neglecting Tang and Wang’s results.³¹⁸

After 1949, Tang Peisong continued his research in the physiology of plant respiration and photosynthesis. For example, when taking the position of vice director of the Institute of Botany at CAS, Tang led his group in elucidating multiple pathways when a U.S. Plant Studies Delegation visited China during August and September 1974,³¹⁹ Tang proposed to leaders at CAS that China might also send a scientist delegation to the U.S. He suggested that photosynthesis was a hot topic at that time, and Chinese scientists had strong background in this field, so this delegation might be composed scientists focusing on plant metabolism and photosynthesis. The CAS leaders accepted Tang’s proposal and organized a “Plant Photosynthesis Delegation.” This delegation consisted of eight plant scientists and visited the United States from November 15 to December 15, 1974. Tang Peisong was excluded from this group because of his suspicious political

³¹⁸ Liu Jixing, “Collaboration between Tang Peisong and Wang Zhuxi on Water Relation in Plant Cells,” in *Tsinghua University and Science and Technology in Modern China*, edited by Yang Jian and Dai Wusan, Beijing: Tsinghua University Press, 2006, pp. 97-118. Originally published in *Physics*, 2003, No. 6 & No. 7. (刘寄星, “汤佩松和王竹溪关于植物细胞水分关系的合作研究及其启示”, 《清华大学与中国近现代科学技术》, 杨舰, 戴吾三编著, 北京: 清华大学出版社, 2006, 页 211-222。原载《物理》2003 年第 6、7 期)

³¹⁹ This delegation visited China from August 27 to September 23, 1974. Its members included world-renowned scientists, such as Richard L. Bernard, Norman E. Borlaug, Nyle C. Brady, Glenn W. Burton, John L. Creech, Jack R. Harlan, Arthur Kelman, Henry M. Munger, George F. Sprague, and Sterling Wortman. They visited many botany and agriculture institutes in China. Tang was suffering political persecution and not able to meet these American scientists, but some of his old colleagues (such as Yin Hongzhang) got the chance to meet and talk with the delegation. See Sun Qiliang, “中国与美国古植物学交流与合作的大门是如何被打开的? ”, <http://blog.sciencenet.cn/home.php?mod=space&uid=225931&do=blog&id=378602>

background. But he was still very proud that this delegation of Chinese scientists was traveling to meet their western counterparts and to describe their research. The crucial impact of such an international delegation during the Cold War was not lost by Tang. In his memoirs, he bantered that this delegation functioned as “photosynthesis diplomacy.”³²⁰

4.3 Summary

The War of Resistance from 1937 to 1945 forced almost all leading Chinese intellectuals and agricultural scientists to leave their homes and institutions in the coastal regions and move to the Southwest. During wartime, political forces and academic organizations were both reconstructed. In his 1991 book *The Study of Change: Chemistry in China, 1840-1949*, James Reardon-Anderson claimed that the war brought sharper conflict between scientists and the state because political leaders demanded that the scientists serve the immediate practical needs of industry and military, whereas the scientists insisted on their professional autonomy.³²¹ After examining cases of agricultural scientists from the National Central University and the Institute of Agriculture at Tsinghua University, I think Reardon-Anderson’s assertion does not apply well to the agricultural scientists. It was true that the state (the Nationalist central government) was requesting immediate assistance from the scientists, and some scientists still kept their interests in pure research without instant practical benefits. However, at

³²⁰ Tang Peisong, p. 52.

³²¹ Reardon-Anderson, James, *The Study of Change: Chemistry in China 1840-1949*, p. 363.

least in the field of agricultural sciences, the war relieved, rather than sharpened, conflicts between scientists and the state.

This relief was because of the following reasons. Firstly, when the war broke out, tension between the “Chinese” and the “foreign” became the most principal tension in China, which strongly invoked Chinese intellectuals’ feeling of patriotism. For patriotic scientists under pressure of foreign invasion and danger of national subjugation, the social responsibility of a Chinese citizen took precedence over the professional interests of a research scientist. Agricultural scientists’ desire of serving the country through their academic work coincided with the state’s expectations for scientists. Secondly, the state’s command for agricultural scientists was largely relevant to exploring southwestern China to improve production and support the war. For agricultural scientists, joining governmental projects meant more opportunities for their scientific research, which they would never have gotten before the war. Therefore, agricultural scientists’ desire of serving the country usually did not conflict with their pursuit in science. Thirdly, although the Nationalist government’s domination got strengthened, it was still not strong enough to control regions previously ruled by other warlords. Therefore, it was possible for scientists disagreeing with the Nationalist state to maintain some academic autonomy in the political periphery, as the Tsinghua scientists did.

In conclusion, the eight-year war brought opportunities as well as difficulties and frustrations for the development of Chinese sciences. Under external pressure, agricultural scientists’ motivation of serving their country through science became even stronger than before. During the war, when tension between China and the “foreign”

overwhelmed the central-local tension and disagreements between scholars and governments, agricultural scientists were less hesitant about their careers, because the principal tension was more clear than before. They were able to select and implement strategies appropriate to their pursuit of being both patriotic Chinese people and productive scientists, and therefore contributed to both their country and to science. Comparison between scientists from NCU and Tsinghua exemplified different effective strategies taken under different conditions. Moreover, the migrant scientists were able to explore the southwest area which used to be too far away from the prewar scientific and academic centers. Such exploration significantly promoted the development of Chinese science. Achievements in this period had deep influences on Chinese agriculture, science, and education after the war—and even through today.



Figure 14 Founders of the Chinese Crop Improvement Association at Cornell University, February 1932 (left to right: Ma Baozhi, Cheng Shifu, Jin Shanbao, Feng Zefang, Lu Shougeng, Guan Jiaji)



Figure 15 The National Agricultural Bureau's working area: before and during the War (Annual Reports of the Department of Plant Pathology, the National Agricultural Bureau, left: 1940, right: 1942)

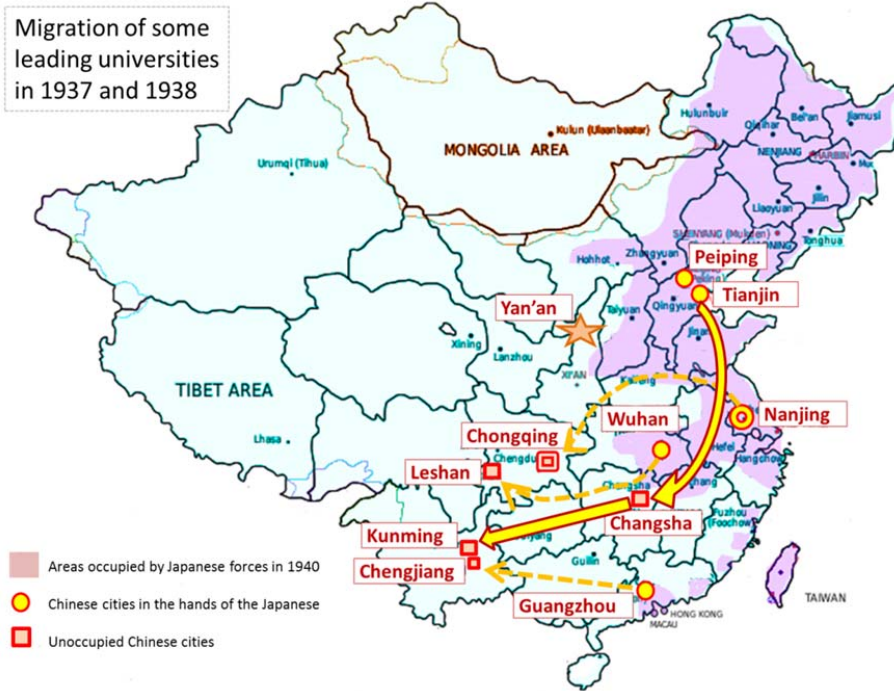


Figure 16 Movement of leading national universities with agricultural schools (Tsinghua IOA along with PKU, Tsinghua, and Nankai to Kunming, NCU to Chongqing, National Wuhan University to Leshan, the National Sun Yat-sen University to Chengjiang)

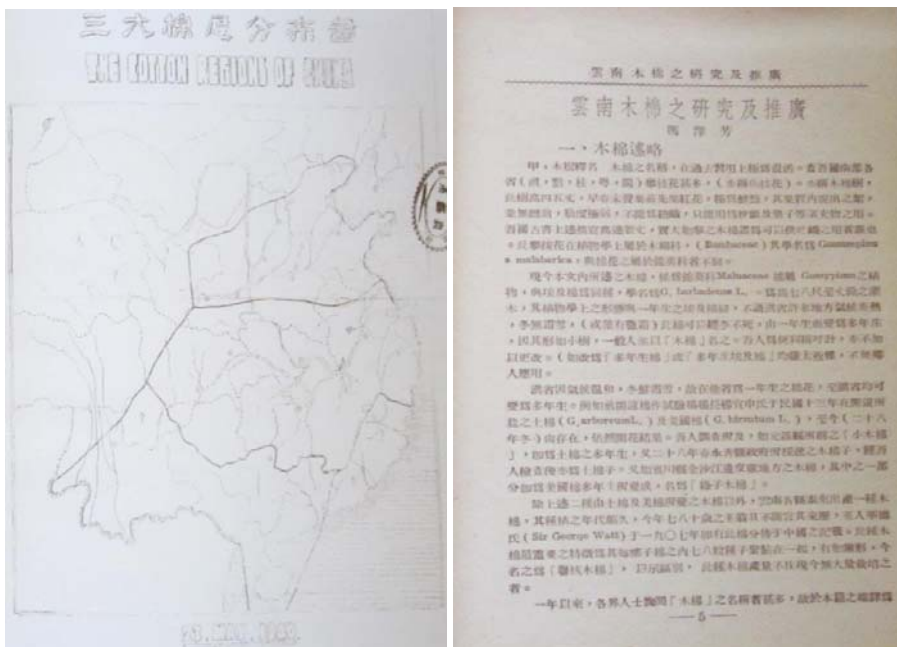


Figure 17 Feng Zefang's Research of Cotton in China



Figure 18 *Kaiyuan Mumian* in Yunnan, identified by Feng Zefang and his team in 1936



Figure 19 *Mumian* at Kaiyuan, Yunnan, taken by Feng Zefang in 1936

Research Stations of the Division of Entomology during the war, in Yunnan province

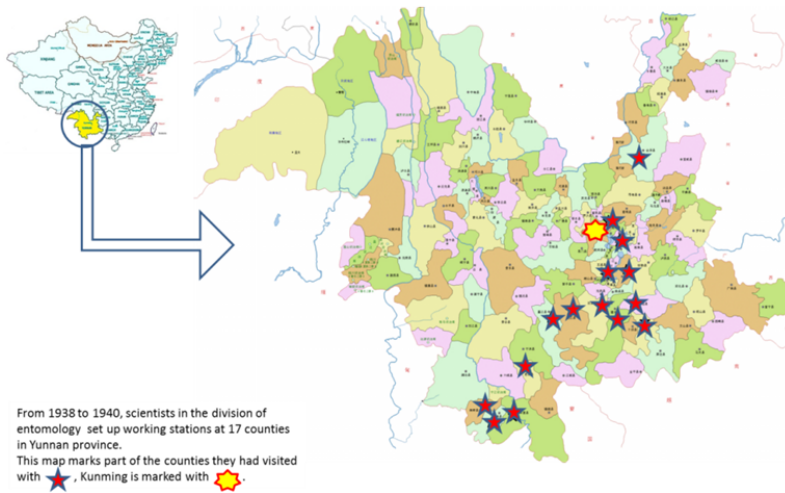


Figure 20 Research stations of Tsinghua IOA in Yunnan

Epilogue and Conclusion

When the war ended in August 1945, it seemed that the future would be positive for both the Nationalist government and Chinese scientists. After winning the War of Resistance, the Nationalist government's authority and prestige among Chinese people reached a peak. During the last year of the Sino-Japanese War, Jiang Jieshi, leader of the Nationalist Party, seized military power from the remaining warlords who disagreed with him (the price was that the command power of the Chinese army got confused, and the Japanese army took the chance to seize several provinces in South China). For the Nationalist government, the only remarkable enemy was the Chinese Communist Party based in the North, which governed about one-fourth of the country's population. With financial, technical, scientific, and military support from America, it seemed not a big problem to defeat the Communist Party and unify all of China.

Most universities' scholars were optimistic about the future of the country and their scientific endeavors in late 1945 and early 1946. Take agricultural scientists at Tsinghua, for example. The Tsinghua IOA returned to Peiping in August 1946. The Tsinghua campus had been occupied by the Japanese army for eight years. Offices and experiment rooms of IOA had been used as wards and horse stables. All books and equipment were ruined or lost. Despite tough conditions, Tsinghua scholars quickly managed to restart their research and education. The Institute of Agriculture was reorganized into the School of Agriculture in 1947, with Tang Peisong as the director. Several professors (such as Yin Hongzhang and Yu Dafu) left for foreign organizations or Peking University, but the

three leading scientists stayed in the new agricultural school. The “divisions” of plant pathology and entomology were reformed into the “departments” of plant pathology and entomology. The Laboratory of General Physiology was changed into the department of agricultural chemistry. Tang Peisong borrowed the institutional model of Johns Hopkins University and aimed to establish the agricultural school at Tsinghua as an institute training elite scientists. For instance, there were in total 12 professors, all of whom were western-trained scientists with teaching experience, in the three departments. And in 1947 this school enrolled only 12 students. Tang Peisong wished to maintain the faculty/students ratio around 1:5 after five years. He got permission to use an area³²² near the Summer Palace as a site for the agricultural school. In addition, he purchased and installed the most advanced apparatus for field work and laboratory research.³²³

However, the turbulent political environment broke Tang Peisong’s dream of building a Johns Hopkins University in China. When the civil war between the Nationalist government and Communist Party broke out, the positive situation for Chinese academia changed. The most urgent desire for patriotic intellectuals was to return home, promote their careers and lives, and serve China and the Chinese people with their science and knowledge. But the Nationalist government seemed reluctant to help some of the university scholars return home. It facilitated the NCU’s move back to Nanjing, but plotted to have Southwest Associated University stay in Yunnan and continue functioning as one university—that is why the Tsinghua scientists were not able

³²² Sheng Ping Shu (昇平署) was an old but beautiful governmental office next to the east gate of the Summer Palace (颐和园). The Japanese occupying army had started a farm near this office and Tsinghua had taken both the office and the farm in 1946.

³²³ Tang Peisong, Chapter 12.

to return to their Beiping campus until August 1946. Moreover, the Nationalist central government showed much greater enthusiasm in diminishing the Communists. However, the government's goal was not the goal of most agricultural scientists. A civil war—fighting against other Chinese people—seemed meaningless for most Chinese intellectuals who held a strong love for their country.

More important, the Nationalist government failed to control the economy and currency inflation. By September 1947, the average price index in urban China had increased 46 thousand times compared with that index in 1937. And it increased over one hundred thousand times in the following seven months. Almost all Chinese people, including the university scientists, went broke by April 1948.³²⁴ Once living became a problem, scholars could hardly devote themselves to sincerely serving China through knowledge. Many promising young scientists had to leave academia, because it was impossible for them to maintain subsistence with the salary of university scientists. For example, Chen Sheng, a young biochemist, started working as a research assistant at Tang Peisong's plant physiology group in 1943 and exhibited excellent ability in scientific research and analysis. But he had a poor extended family to feed. As living costs kept increasing, the salary for a research assistant grew much more slowly than the inflation rate and was far from enough to feed them, so Chen had to search for positions in business with higher income, although he was very interested in physiological research. Tang Peisong managed to help Chen stay at Tsinghua, because he thought Chen's brilliance should not be wasted. He persuaded President Mei Yiqi to send Chen

³²⁴ Liu Yun, 《孤帆远影：陈岱孙的 1900-1952》 p. 224.

rice rather than money as salary (*Mi Dai Jin*).³²⁵ In addition, Tang directly gave Chen financial support with his own salary. However, as living costs kept skyrocketing, President Mei could not provide *Mi Dai Jin* for an ordinary research assistant any more, because even professors competed fiercely for this benefit; and Tang's salary became insufficient to support his own family. As a result, Chen had to resign his research position, which made Tang Peisong feel deep regret.³²⁶ University scholars had belonged to a high-income stratum before the war, but they had to struggle for basic subsistence after returning to coastal areas after the war. When Tsinghua professors had to earn money through selling dairy products, repairing machines and appliances, and selling their calligraphy and carvings, it was impractical to expect them to effectively be making contributions toward serving China. By 1948, few university scholars still had a positive attitude toward the Nationalist government. A common perspective was: no matter how bad the new (very likely the communist) government would be, it could not be worse than the Nationalist one.³²⁷

Losing the confidence of Chinese people, and losing control over national economics, the Nationalist government quickly lost in the civil war as well. In the middle of December 1948, the PLA troops (People's Liberation Army, the army of the CCP)

³²⁵ This approach was invented by the Nationalist government during the war. It functioned as a bonus benefit for intellectuals working at national institutes, named *Mi Dai Jin* (米代金, to replace money with rice), aiming to help officials and governmental intellectuals survive the inflation more easily.

³²⁶ Tsinghua University Archives, file 1-3:3-94, correspondence between Tang Peisong and Mei Yiqi.

³²⁷ Qiu, Weifan, "ZhuiYi ZhenJunXue DaShi Dai Fanglan Er San Shi (Several Anecdotes of Dai Fanglan, the Great Mycologist)," in *ZiShen YuanShi HuiYiLu (Memories of Famous Academicians)*, volume 2.

besieged Peiping. President Mei Yiqi fled to Nanjing. All Tsinghua professors gathered together to discuss the future of their university. Tang Peisong was the first one to stand up and appeal that “Tsinghua was built up with the blood of Chinese people. Now it is time to give it back to the people!”³²⁸ His appeal received a thunder of applause. Most Tsinghua faculty and students had no affection for the Nationalist government. They took a university-wide vote and decided to accept liberation of the CCP. The discussion and voting exemplified Tsinghua scientists’ nationalist thoughts and activities. From the stand-point of most Tsinghua scholars—especially some with strong patriotism—the Nationalist government’s unsuccessful governing made it seem almost opposed to the Chinese people. Therefore, even though most of these scholars did not know a lot about the CCP, they were willing to give up an alliance with the Nationalist government.

Nine months later, under an instruction from the Communist central government, the Tsinghua agricultural school was integrated into the new Beijing Agricultural University (BAU) along with the Peking University agricultural school and an agricultural division from the North China University. Scientists from the Tsinghua IOA reunited at the BAU, and the Tsinghua IOA itself had finally ended up in this new specialized agricultural university.

Experiences of the agricultural schools in Nanjing started a little better than Tsinghua IOA, but ended similarly. Thus, the National Central University had more priority in returning to its original sites and restore education and research. However, because of its “central” status, faculty and students at the NCU were closer to the

³²⁸ Tang Peisong, pp. 125-126.

corruption and incompetence of the Nationalist government. Disappointed by the Nationalist central government, in 1947 and 1948 several leading scientists at the agricultural school (such as Shen Qiyi and Deng Shuqun) even escaped to regions controlled by the Communist Party. When the PLA got close to Nanjing, the NCU faculty did not exhibit radical words or behaviors as the Tsinghua faculty had done, probably because they had been more deeply influenced by the Nationalist government for over two decades, or probably because the scholars who most hated the Nationalist government had already left. However, the majority of the NCU faculty and students decided to stay in Nanjing and refused to retreat to Taiwan with the Nationalist government. In 1952, the Communist government split and reorganized universities and colleges in the entire country. NCU's agricultural school merged with the College of Agriculture and Forestry of the University of Nanking and formed the Nanjing Agricultural University. Through tremendous efforts in the following decades, the Nanjing Agricultural University has been considered the best higher education institute in South China specializing in agriculture, through today.

The choice between leaving for Taiwan or staying in the mainland actually may reflect scholars' different strategies to fulfill their love for China and the desire of serving the Chinese people. For patriotic scientists like Tang Peisong and Shen Qiyi, it was the land and people that represented China. A "legitimate" state government losing confidence of the people and leaving the land could not stand for the country, even if it had international recognition. Therefore, they chose to stay with the object they wish to serve. On the other hand, scholars' decision of leaving for Taiwan did not necessarily

indicate trust or affection with the Nationalist government. For instance, President Mei Yiqi left Tsinghua and fled to Taiwan because he believed that once the Communist Party took in charge, very likely the American federal government would suspend diplomatic relations with mainland China. Then the Boxer Scholarship could hardly continue. As the sole legitimate representative of Tsinghua University, Mei believed that if he was trapped in the mainland and lost effective connection with America, support for Tsinghua from the Boxer Scholarship (the China Foundation) would terminate. Therefore he decided to move to where he could continue cultivating capable Chinese intellectuals with the Boxer funding. History partly corroborated Mei's expectations. Official connections between mainland China and America were suspended for almost three decades. Although none of the Tsinghua faculty moved to Taiwan with Mei, he was able to re-establish a National Tsinghua University in Taiwan with financial support from the China Foundation and it remains one of the top universities in Taiwan today.³²⁹ The cases I studied demonstrate that similar goals of serving China and Chinese people might motivate scholars taking opposite (but both reasonable and effective) strategies.

In the four chapters of this dissertation, I have studied motivations, goals, and strategies as keys to illuminate the American-trained scholars' "scientific nationalism" or ideology of "serving China through agricultural science." To conclude my dissertation, I still need to answer a big question: what was the result of these scholars' efforts of serving China through science? Or, did the American-trained Chinese scholars succeed in realize their goals through their diverse strategies?

³²⁹ Even today there are still disagreements about which Tsinghua—the one in Beijing or the one in Taiwan—is the authentic Tsinghua.

In my opinion, by the end of the war, university agriculturalists had made significant and valuable achievements in agricultural research and education. But their success in establishing agricultural extension was limited because of non-scientific factors. As I have explained, agricultural scientists, such as Zhao Lianfang, Shen Zonghan, and Feng Zefang, became aware that problems of imbalanced economical structures and distribution of agriculture and industry might be more important for improving the lives of farming people and increasing China's wealth and strength. But it was beyond university scholars' ability to reform the non-scientific factors. Some of the university agricultural scientists finally chose to leave universities and join governmental departments in order to regulate and improve non-scientific factors to facilitate extension of agricultural science, such as Shen Zonghan and Zhao Lianfang did. Some of them (such as Dai Fanglan) continued focusing on research and education, but gave the duty of improving agricultural extension to governmental scientists. The National Agricultural Research Bureau succeeded in extending advanced agricultural knowledge and technology in certain regions through agricultural clubs and experimental stations, but the Nationalist government failed to fundamentally reform the economic structure in rural China, and the Bureau's efforts only covered a small part of China. According to Shen Zonghan's memoir, by 1949 when he moved to Taiwan along with the Nationalist central government, the Bureau had established experimental stations in almost one hundred counties, but there were still hundreds of counties in mainland China not covered by the Bureau's extension.

On the other hand, it was obvious that the American-trained Chinese scholars had successfully improved scientific and educational institutions in China. Their work facilitated the generation and circulation of scientific knowledge, which elevated China's status in international academic communities. In the mid-1930s, Chinese agricultural scientists made few presentations at international scientific conferences, and only seven Chinese universities were acknowledged by American academia (graduates from other Chinese universities had to take one or two years of additional training in American colleges, or they could not be admitted by American graduate school). However, by the end of the war, Chinese scientists at Tsinghua and the National Central University had published a considerable number of well-regarded articles in top ranking scientific journals such as *Nature* and the *Journal of Physical Chemistry*. From 1943 to 1948, many leading Chinese agriculturalists had attended and presented at international conferences in foreign countries.³³⁰ High-level international communications had become a normal part of the careers of scholars in leading Chinese universities.

As for graduate education, in his 1944 annual report, Dai Fanglan stated with confidence that Chinese universities like Tsinghua were competent for training masters students, and suggested that the Boxer scholarship should reduce its budget for supporting undergraduate and master students to study abroad, but increase supporting young faculty and researchers with working experience to take specialized training in

³³⁰ This type of international communication started during the war. For example, in spring 1943, Shen Zonghan, Zou Bingwen, and Zhao Lianfang were appointed as governmental representatives to attend the Post-War World Food and Agriculture Conference in Washington D.C. After the conference in April, Shen and Zou spent four months visiting Cornell University and some other agricultural colleges and institutes in the Midwest and California, investigating wartime American agricultural extension. See *Shen Zonghan's Memoir*, volume 2, pp. 254-282.

foreign institutes that matched their particular research areas. Similarly to Dai's perspective, in 1947, the Academia Sinica proposed a draft ten-year plan of improving applied science, which also pointed out that governmental scholarship for studying abroad would prefer supporting experienced researchers to take advanced training, and would diminish the number of students at the college and masters level, whose education could be accomplished by Chinese universities. Meanwhile, the central government would increase support for improving graduate education in leading Chinese universities. Generally speaking, when the War of Resistance newly finished, a considerable number of American-trained Chinese scholars had partly realized the goal of serving China through agricultural sciences in education and scientific research. They were also confident in expanding their academic works and promoting their "serving the country through science" into a new stage.

To fully understand the development of these scholars' "scientific nationalism," we cannot ignore roles of the state, or the Nationalist central government. As I have argued in the introduction, when talking about *KeXue BaoGuo* or serving China through science, American-trained Chinese scholars usually considered *Guo*, the object of their service, as a country in the sense of culture and history, rather than the state government. Foremost in their minds was a dedication to their Chinese countrypeople. This concept was perhaps most powerfully stated by Tang Peisong in his eloquent statement: "Each Chinese person donated one tael of blood to cultivate us. I... swore to study hard in order to reciprocate favours bestowed by the country." By focusing their attention on the welfare and benefits of the Chinese people and China as a country, they were able to ensure that they were

serving the country for which they felt love and belonging and dedicated loyalty, rather than any specific state government. Therefore, although almost all patriotic scholars cooperated with the Nationalist government during the war, most of them merely considered this as one of the many strategies they had taken to achieve their goals. The strategy of serving the Nationalist state was effective in serving the country under strong tension from war with foreigners. However, the ultimate goals for the scholars I have studied were still to improve the welfare of Chinese people and to strengthen China as a country, rather than the state as a political entity. If the Nationalist state government became a constraint for improving China as a country, these scholars' profound love and loyalty for their country and country-people would motivate them to give up on this state.

In conclusion, did American-trained Chinese scholars succeed in realizing their goals through their diverse strategies? My answer is: if we just consider the Republican era, these scholars' strategies effectively helped them improve research and education in the agricultural sciences in academic institutes. They not only survived and adapted to the chaotic environment, but also made remarkable contributions to both their country and the sciences by establishing and improving scientific and educational institutions in China. Moreover, they developed more advanced scientific knowledge in local Chinese environments and fed these achievements back to their foreign colleagues, and therefore contributed to the global circulation of scientific knowledge. But their success in extending scientific agricultural knowledge to working farmers was limited because of non-scientific factors such as problematic economical structures, imbalanced distribution

of agriculture and industry, and noncooperation of ignorant Chinese farming people.³³¹

However, if we look to the post-1949 period or even the post-reform period after 1978, a considerable portion of Republican-era agriculturalists' scientific programs were extended after the Communist government reconstructed the country's agriculture, industry, and academia (at very high price in both funding and people). Many scientific and educational achievements of the American-trained scholars during the Republican era were extended and resulted in positive outcomes even through the change in political regime. I am not able to assert that these scholars were more successful in realizing their goals in the Communist era, because it is undeniable that new movements and situations after 1949 drastically disturbed and interrupted the normal careers of most American-trained Chinese scholars (and even damaged their lives). However, I believe that the strategies and efforts of these scholars continued to be a positive force in serving China through agricultural science before and after 1949. We must consider the entire twentieth

³³¹ Several cases in this dissertation (for example, Tsinghua scientists' conflicts with peasants in YuanMingYuan, in section 3.3) suggest that resistance of the peasant farmers was an important reason why the agricultural scientists were not very successful in extension. Actually, there was another group of western-trained scholars in Republican China believing in that the root of China's backwardness was its unenlightened ignorant people characterized by *Pin Yu Ruo Si* (贫愚弱私, material poverty, intellectual ignorance, physical feebleness, and moral selfishness), and that the fundamental solution of improving China was to improve the peasants through mass education and public health. This group of Chinese intellectuals was represented by Yan Yangchu (晏阳初, James Yen) whom I have mentioned several times in the dissertation. Their motivation of improving China was similar to the motivation of agricultural scientists I am exploring, but their strategies of improving China through mass education were far away from (and seemed less successful than) those of improving China through sciences. Some efforts of the Mass Education were very famous, such as its programs in DingXian (定县). But the Mass Education programs suspended in mainland China after 1937 and did not achieve remarkable result in regions except Dingxian. For more information about Yan Yangchu and his colleagues' efforts in mass education, see Charles W. Hayford, *To the People: James Yen and Village China*, Columbia University Press, 1990.

century in order to understand the complex influences on the development of Chinese agricultural sciences—and the strategies used by devoted and determined scientists who sought to serve China.

List of Chief Scholars in This Dissertation

Dai Fanglan (戴芳澜, 1893-1973)

Dai Fanglan was a famous mycologist and plant pathologist. He was one of the first academicians of the Academia Sinica and the Chinese Academy of Sciences. Dai was founder of in China, and one of the founders of scientific institution of plant pathology in China. Dai traveled to American as a Boxer student in 1913. He received bachelor's degree from the department of plant pathology at Cornell University in 1916, and master's degree of plant pathology from Columbia University in 1918. After returning to China, Dai had worked at the Guangdong Provincial Agricultural College (1922-1923), the Southeastern University (1923-1927), the University of Nanking (1927-1934), Tsinghua University (1934-1949), the Beijing Agricultural College (1949-1952), and the Chinese Academy of Sciences (1953-1973).

Feng Zefang (冯泽芳, 1899-1959)

Feng Zefang was founder of modern cotton science in China. He took college education at the Southeastern University, and received doctoral degree from Cornell University in 1933. Since 1933 Feng had worked at the National Central University, Nanjing University, and the Nanjing Agricultural College.

Guo Bingwen (郭秉文, 1880-1969)

Guo was one of the first American-trained Chinese educationalists. He established the Southeastern University in Nanjing and supported Zou Bingwen to build the agricultural section a leading agricultural school in China. Guo took missionary education since childhood. He traveled to the United States with missionary funds in 1908 and received doctoral degree of education from Columbia University in 1914.

Hu Shi (胡适, 1891-1962)

Hu Shi was the most well-known philosopher, writer, educationalist and diplomat in twentieth-century China. He had served as president of Peking University, president of the Academia Sinica, and China's ambassador to the United States. Hu was among the first Boxer students to travel to the United States in 1911. Hu Shi studied agricultural science at Cornell University for one year. Then he transferred to philosophy and literature, and received doctoral degree of philosophy from Columbia University. He was well-known for advocating the use of written vernacular Chinese. He was also a key contributor of promoting scientific approaches and ideology.

Jin Shanbao (金善宝, 1895-1997)

Jin Shanbao was a famous wheat scientist. His wheat variety *Zhongda 2419* has been the most widely planted wheat in China for over four decades. Jin Shanbao received bachelor's degree from the agricultural school of the Southeastern University, and studied plant pathology and genetics at Cornell University and the University of Minnesota

during 1930-1932. He had served as director of the agricultural college of the National Central University and worked at the Nanjing Agricultural College after 1952.

Luo Jialun (罗家伦, 1897-1969)

Luo Jialun was a famous historian, educationalist, social activist, and nationalist politician in Republican China. He took college education at Peking University during the New Cultural Movement from 1917 to 1920, and then received governmental scholarship to travel to and study at six top universities in America, Britain, France, and Germany. Luo Jialun was known as leader of the May Fourth Movement in 1919, author of historical book *KeXue Yu XuanXue (Science and Metaphysics)*, president of the National Tsinghua University and National Central University, and an outstanding diplomat at the Nationalist Government.

Shen Zonghan (沈宗瀚, 1895-1980)

Shen Zonghan was the most famous agronomist and agricultural activist in Republican China. He received master's degree from the Georgia state University and doctoral degree of agronomy and plant pathology from Cornell University. He had worked as a leading scientist at the missionary University of Nanking from 1927 to 1934 and had taken charge of the National Agricultural Research Bureau during the War of Resistance from 1937 to 1946.

Tang Peisong (汤佩松, 1903-2001)

Tang Peisong was a plant physiologist and biochemist. He took secondary education at Tsinghua, college education at University of Minnesota, and doctoral education at the Johns Hopkins University. He and his students and colleagues at Tsinghua IOA had generated and circulated high quality scientific knowledge in both pure and applied science during the War, and he continued contributing to high-level scientific communication between China and America after 1949. Tang was an excellent example of scientist loving the country and people, but not the state.

Zhao Lianfang (赵连芳, 1894-1968)

Zhao Lianfang was an agronomist and “father of modern Chinese rice”. He was also a boxer student taking undergraduate education at the Iowa state University and received doctoral degree of agronomy from the University of Wisconsin in 1928, focusing on genetics and cytology of rice. Zhao was a leading scientist and popular professor at the National Central University from 1928 to 1933, and a chief scientist at the National Agricultural Research Bureau. As a governmental scientist, he moved to Taiwan with the Nationalist government after 1949, but his students continued influencing younger Chinese agriculturalists with knowledge from Zhao Lianfang.

Zou Bingwen (邹秉文, 1893-1985)

Zou Bingwen was founder of agricultural educational institution in China, and an achieving agricultural activist. He studied in the United States from 1910 to 1915 and majored in plant pathology at Cornell University. He was Founder and director of the

Agriculture Section at the Southeastern University, author of the first plant pathology textbook in Chinese language (1923) and the *Agricultural Education in China* (1923), Vice President of Shanghai Commercial and Savings Bank (1931-1947), president of the Agricultural Association of China (1942-1948), and high advisor to the Ministry of Industry, Natural Resources Committee, Ministry of Agriculture and Forestry of the Nationalist Government.

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