

RESEARCH ARTICLE

From rural reconstruction to agricultural engineering: a study of the cooperation between the Chinese Ministry of Agriculture and Forestry and the International Harvester Company (1945–8)

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Abstract

During the period of the Republic of China, a heated debate emerged among Chinese intellectuals concerning whether China should first educate peasants into citizens or help them feed themselves. Some agriculturalists, such as P. W. Tsou, argued that the first essential goal should be to apply technology and increase agricultural production to improve farmers' lives. In 1945, Tsou proposed the Agricultural Engineering Program for China to the International Harvester Company. This programme provided Harvester Fellowships to sponsor twenty Chinese students to study agricultural engineering in the US. In addition, this programme instituted the Committee on Agricultural Engineering, led by J. Brownlee Davidson, to direct teaching, research, and promulgation of agricultural engineering in China. The talent cultivated through this programme chose to remain in mainland China following the Revolution of 1949. They became the first generation of agricultural engineers in the People's Republic of China.

Introduction

During the period of the Republic of China (ROC), a long term but heated debate emerged among Chinese intellectuals concerning whether China's comprehensive rural problems could be solved via a community-centred pattern of development that focused primarily on mass education or a capitalist mode of development that emphasised technological solutions and was less concerned with community building or rural education. Two major rural educators and reformers, Yan Yangchu (Y. C. James Yen) and Liang Shuming, were at the heart of China's rural reconstruction movements during the 1930s, which aimed to educate rural farmers into new citizens. As Liang defined it, China's rural reconstruction movement was a 'Rebirth Movement of the Chinese Culture'.¹ At that time, 'those educated people don't want to do (agricultural) work while those who do (agricultural) work do not have a chance to read books.'² Therefore, using both foreign aid and domestic financial support, these rural educators established a series of experimental stations across China to help cultivate civilised farmers. Although Liang highlighted two essential aspects of rural reconstruction movements, that is, the application of science and technology to people's daily lives and production and the group reorganisation of the disorganised lives of Chinese people, their movements focused more on the organisational education of common farmers because Liang believed that unlike the free individual competition and profit-driven production that prevailed in Western countries, the power of science and technology depended on communal organisation in China.³ These rural educators and reformers cared about the livelihoods of farmers; however, they did not accept market mechanisms or the roles of actors in the private sector such as companies, as Liang emphasised that 'from agriculture to industry, both of them are constructed

for our society and on the basis of our society, . . . China's industry can in no way walk the path toward profitable competition because there is no room left in this world for us to make a profit.⁴ However, some Chinese agriculturalists, including Zou Bingwen (P. W. Tsou), at that time the president of the Agricultural Association of China, argued that the first essential purpose should be the application of technology to increase of agricultural production and improve farmers' lives.⁵ 'The key to prosperity is economic construction, . . . the basic problem of economic construction is agricultural construction, . . . with the increase of agricultural products and farm family income, education, health and all cultural undertakings in rural areas will flourish accordingly.'⁶ Agriculturalists such as Zou emphasised economic development rather than civil education. Accordingly, from whom should we seek to learn regarding agricultural economic development? As Zou argued, before the Second World War, the average annual income of male farmers in America was 765 dollars, that is, almost eighteen times that of male farmers in China, which was only forty-three dollars.⁷ As an alumnus of Cornell, Zou was obviously suggesting that China should learn from the world model: the American agricultural industry. Zou emphasised four aspects on which China should focus for development: agricultural scientific and technological research, agricultural extension, agricultural education, and agricultural finance.⁸ Shen Zonghan (T. H. Shen), at that time the chief of the National Agricultural Research Bureau (NARB) and another alumnus of Cornell, was also very direct and progressive with respect to the application of mechanisation: 'Chinese agriculture is unsuitable for mechanization in a variety of ways; however, if we adjust measures to local conditions, appropriate mechanization is not only feasible but also very important.'⁹ Zou and Shen were not alone in these views. Because the Republic of China was one of the countries allied to the US during the Second World War, many Chinese students, such as Zou and Shen, travelled to study in the US, and agriculture was a popular and important field chosen by these students since the entire country continued to face conditions of starvation. Witnessing the powerful impacts of the application of technology and machineries on American farms, these US-trained students returned to China, where they became agricultural officials in the Nationalist government and university professors. The intimacy entailed by this common educational background naturally led these individuals to prioritise cooperation with US personnel and entities. After these academic advocates of American-style mechanisation gained influence in the Chinese Ministry of Agricultural and Forestry (CMAF) during the 1940s, the Nationalist government's official preference for mechanisation became apparent.

Regarding the US, American missionaries, agriculturalists, non-profit foundations, private companies, and the US government attempted to solve the poverty issues of rural China in various ways, albeit naturally with their own aims and agendas in mind. Compared with the previous communication with American missionaries and agriculturalists at the individual level, American foundations and companies had more efficient organisations, more systematic approaches, and greater impacts. Between the 1920s and 1940s, the Rockefeller Foundation (RF) provided funding for institutional reforms in rural China not only for philanthropic purposes but also potentially to attain further political and economic influence, while agricultural equipment companies such as the International Harvester Company (IHC) introduced modern technology to China specifically with the aim of accessing this vast rural market. The IHC entered into cooperation with the Nationalist government in hopes of meeting both sides' economic and political needs. Since the Rockefeller Foundation and rural reconstructionists could not feed rural China by providing civil education at the farm level, Zou hoped to trade access to China's potentially vast rural market for IHC's technology and machinery to help Chinese farmers increase their productivity, which would essentially solve their problem of low levels of income. Zou and his colleagues were able to convince the leadership of the Nationalist government to participate in this risky form of international cooperation because the Nationalist government was desperate to acquire economic, political, and military assistance from the US following the Second World War. However, whether by the Rockefeller Foundation, a foundation affiliated with one

of the most powerful American family consortiums, or the IHC, an profit-driven private American company, the possibility of engagement and entanglement with Chinese personnel or government were viewed more as formal and informal investments aimed at influencing the Nationalist government's agricultural policy rather than as a way of taking responsibility to feed rural China. Although China was one of the countries allied to the US, both parties to this cooperation had entirely different desires and agendas even though they were seated on the same boat. One can imagine the outcome of this process. Although cooperation between the IHC and the Nationalist government neither met the market needs of the IHC nor saved the Nationalist regime, it did succeed in cultivating the first generation of agricultural engineers in China. Agricultural technological cooperation also became a centerpiece of American foreign policy among its Asian allies in the postwar period. Following the path of the IHC, American entities and organisations continued to advocate for mechanisation and the adoption of other new agricultural technologies on the part of allied countries and regions in Asia.

Historians have also argued about the impacts and assessment of Sino-US rural communication and entanglement for decades. The relevant research can be mainly divided into two categories: research focused on rural reconstruction themes and research emphasising technological themes. In the rural reconstruction camp, Chen Yixin studied a primitive version of the rural reconstruction movement, the China International Famine Relief Commission (CIFRC), from the perspective of financial history by focusing on the rural cooperative movement in Hebei from the 1920s to the 1930s. Yixin argued that although this movement primarily helped 'middle farmers' instead of the poorest peasants, this rural financial project inspired rural reformers among the Nationalists to employ rural cooperatives as a 'key element' in the modernisation of rural China.¹⁰ Kate Merkel-Hess argued that the significance of rural reconstruction movements from the 1930s to 1940s pertained to the fact that these intellectuals 'created a new version of China that handpicked portions of Western modernities but rejected what did not suit them and retained Chinese elements that did', which offered a 'compelling "middle course between Chiang Kai-shek's Nationalists and Mao Zedong's Communists"' in the Republic of China.¹¹ Rana Mitter studied rural reconstruction cooperation between the Nationalist government and the United Nations Relief and Rehabilitation Administration (UNRRA) during the 1940s. Rana argued that because UNRRA's Western officials failed to appreciate the changed dynamics in China and because Chiang Kai-shek attempted to establish China as an exemplar of an anti-imperialist state in the postwar world, 'it was a (very unhappy) collaboration between a national organization and a new transnational one, UNRRA.'¹² In the technology camp, Shen Zhizhong argued in his book that China and the US made some achievements in terms of agricultural technological communication and cooperation, particularly in the fields of crop breeding and the introduction and improvement of advanced agricultural equipment.¹³ However, in *The Stubborn Earth*, Randall E. Stross claimed that these American agricultural technological assistance programmes in China were 'too often regarded merely as a technical challenge for the agronomist in the laboratory. The Americans failed to realize that changes in the wider polity, society, and economy were necessary.'¹⁴

The literature offers a broad view of the historical background of US-China rural interactions. Most of these scholars, however, have focused on either rural reconstruction or technological cooperative programmes in isolation. Some scholars have recognised the transition from rural education to agricultural technology during this period, but they have not analysed how and why this shift was initiated in rural China from the 1930s to the 1940s in further detail. Particularly, in regard to the cooperation between the Chinese Ministry of Agriculture and Forestry and International Harvester Company (1945–8), only programme reports and some participants' memoirs have addressed this subject. There is substantial academic demand for scholarly attention to this transnational profit-driven cooperative programme.

Utilising sufficient primary and secondary materials from the US, mainland China and Taiwan, this article provides a comprehensive and persuasive study concerning US-China economic

entanglements among the IHC, an American agricultural machinery company, Chinese intellectuals and the Nationalist government during the period of the Republic of China. In addition, by examining the clash of visions between the US-educated Chinese social reformers and technocrats who attempted to reshape rural China, this article on transnational rural history contributes a new case study to the literature concerning the ways in which Western entities have attempted to reshape non-Western rural societies worldwide.

Rural reconstruction movements

Aiming to increase the well-being of rural populations, many rural reconstruction initiatives were developed in the context of different institutions during the period of the Republic of China. At that time, many Chinese intellectuals believed that rural reconstruction work was the sixth national salvation movement following the Taiping Heavenly Kingdom, the Hundred Days' Reform, the 1911 Revolution, the May Fourth Movement, and the National Revolutionary Army's Northern Expedition.¹⁵ The prototype of the rural reconstruction movement dates back to the China International Famine Relief Commission (CIFRC) established by American missionaries in 1921. As Chen Yixin argued, 'almost all the reconstruction organizations' at that time had 'collaborated with the CIFRC or had imitated the CIFRC's experience in promotion of cooperatives in their regions'.¹⁶ Although criticised for its inability to provide economic assistance to the poorest members of the rural population, the most important contribution made by the CIFRC was the development of a preliminary version of a modern agricultural financial system.¹⁷ However, unlike CIFRC's attempts to 'materially' attract farmers, Liang and Yan's rural reconstruction approach focused more on mass education and cultural reform in rural China. As Kate Merkel-Hess argued in her book, these rural reconstructionists were 'a loose coalition of reform-minded elites who sought to create a rural alternative to urban modernity that would mobilize rural people and strengthen the nation'.¹⁸ Yan Yangchu highlighted the three essential steps involved in conducting rural reconstruction work to achieve 'the Reconstruction of the Nation' in 1934: rural experiments, professional talent training, and inductive extension. At the centre of this movement is the task of cultivating vast rural farmers into new citizens, which was the most difficult problem faced by previous movements.¹⁹ Not only were Chinese intellectuals excited to participate in these rural reconstruction experiments, following the establishment of the Peking Union Medical College (PUMC) in 1917, the Rockefeller Foundation (RF) was also interested in contributing to larger institutional change to reshape the very fabric of rural society in China.²⁰ The China Program, for example, which was inaugurated on 21st December 1934, received \$1,000,000 in funding from the RF over a three-year period.²¹ Under this programme, the RF funded many Chinese institutions that were engaged in rural reconstruction work, including Yenching University, Nankai University, Tsinghua University, Peking Union Medical College, and the Chinese Mass Education Movement. In April 1936, the RF also established the North China Council for Rural Reconstruction (NCCRR) with the aim of applying social science to rural administrations by recommending university professors for certain administrative positions at the prefecture level, such as 'magistrates, commissioners of education, civil affairs, etc.'.²² These rural reconstructionists believed that their movement would ensure comprehensive rural rebuilding, including economic, cultural, and political reforms, in terms of improving farmers' livelihood, uniting farmers for self-governance, and solving the problem of illiteracy among the rural population.²³ Although an educational approach, such as rural administration training or literacy campaigns, was important for rural China, it proved to be too slow to have obvious effects at a time when the country's economy and farmers' livelihoods were both near collapse. As Kate Merkel-Hess argued, these decentralised and diffuse reforms were 'at variance with the demands of the historical moment – a moment that had little patience for the slow accretion of individual transformations'.²⁴ The crucial work should have focused on the most immediate aspects of increasing

agricultural production and farmers' incomes.²⁵ Compared with educational approaches, the adoption of modern agricultural science and technology, especially mechanisation, could be a more effective path for achieving this aim at that time. As early as 1931, Lan Mengjiu, a soil chemist who later served as a committee member of the Ministry of Agriculture and Forestry for the ROC, argued that China must achieve agricultural mechanisation because 'agriculture is the foundation of all the industry, and only after we consolidate agriculture can our industry and commerce flourish.'²⁶ Almost all Western countries at that time were developing agricultural mechanisation, electrification, and scientific modernisation; therefore, China should proceed with determination.²⁷ Lan provided a detailed introduction to the categories of agricultural machineries, utilisation methods of agricultural engineering and organisational drafts of cooperatives in his paper, which received a great deal of intellectual attention in academia.²⁸ However, dissenting voices were also very strong and widespread. In the 1920s, Zhang Hongjun, a professor of sociology at Yenching University and a council member of the NCCRR, bought various pieces of American agricultural equipment for field experiments on his ranch at Tongliao in the Inner Mongolia Autonomous Region.²⁹ Zhang claimed the results of these experiments proved that 'seeders and cultivators were absolutely unsuitable for farming in northeastern China.'³⁰ This kind of suspicion became more comprehensive and systematic until the 1930s. Qu Zhaowen, for example, claimed that China could not adopt large-scale agricultural mechanisation because the existing agricultural areas in China were unsuitable for mechanisation.³¹ Moreover, China had never been a society that lacked labour. Mechanisation would only aggravate unemployment and other related social problems.³² Apparently, many Chinese intellectuals and agriculturalists such as Qu were not ready to accept agricultural mechanisation.

Preparation for entering the new market

Following the creation of the IHC in 1902, the company and its principal predecessor, the McCormick Company, were eager to extend their agricultural machinery worldwide. Since 1905, Russia had been the IHC's most important foreign market due to tariff exemptions and favourable agricultural resources.³³ The IHC also desired to extend its equipment empire to China in the 1910s. Since the IHC had an office in Vladivostok, in far eastern Russia, company officials set their eyes on the open land in northwestern China, that is, Manchuria. As Charles H. Haney, the supervisor of foreign sales of the IHC, noted, Manchuria was 'probably the most progressive and probably the most likely to develop trade in our line than any of the other provinces in China.'³⁴ However, from 1912 to 1913, the IHC was able to send only approximately one hundred walking ploughs and a few mowing machines, disk harrows, drills, and rakes.³⁵ In August 1924, local Chinese farmers invited the IHC to send Russian employees to Manchuria to conduct demonstrations.³⁶ The IHC sent six of its employees from far eastern Russia to Manchuria in April 1925.³⁷ Subsequently, in 1930, the company was able to send two of their Russian employees to Manchuria once again to help assemble and adjust new agricultural machinery imported from the US.³⁸

Not only did the IHC continue to sell its equipment in Manchuria, but its products were also sold in other regions of China during the 1920s and 1930s. In 1924, the Dayou Farming and Animal Husbandry Company at Taolin, Chahar Province, bought five cultivators from the IHC. The cultivators' motors operated at 15 to 30 horsepower, which allowed for the cultivation of four hectares per day.³⁹ In 1929, in northwestern China, the Shanxi Provincial Agricultural Experiment Station also acquired trucks, disk harrows, drill seeders, and combine harvesters from the IHC.⁴⁰ In the Yangtze River Region, between 1924 and 1925, Anderson Meyer & Company imported IHC's 3-horsepower water pumps to sell to farmers in Jiangsu and Zhejiang Provinces.⁴¹ Later, the IHC officially hired Anderson Meyer & Company as its sales agency in Shanghai. From this greater platform in Shanghai, the IHC was able to sell various products, such as diesel engines,

grain drills, cotton pickers, ploughs, manure spreaders, harvesters, irrigation machines, and threshers. According to statistics, among all foreign countries, the US exported most of the agricultural equipment sold in China.⁴² The IHC was undoubtedly one of the most important exporters of agricultural equipment. Therefore, the IHC believed that the company could access a potentially broad market in China.

Even if IHC's mechanised equipment was imported to China, however, this fact does not entail that machinery from the US extended throughout China. According to statistics from the Harbin branch of International Harvester Export Company, for instance, approximately 100 binders and 250 reapers were in use in northern Manchuria, while the numbers of such machines on farms in southern Manchuria were even smaller.⁴³ Considering the facts that the national territorial area of Manchukuo was 1303143.252 square kilometres in 1934 and that its population was approximately 34 million in 1932, it is obvious just how much of a drop in the bucket this situation truly was.⁴⁴ Due to the long-term chaos caused by war, even though farmers may have been interested in learning about new machineries imported from the US, they had very low purchasing power and could not afford such equipment without external assistance. Common farmers in Manchuria did all the farming, including cultivating, planting, and threshing, by hand or with the aid of animal power. Given that Manchuria was one of the most industrialised areas in China during the early Republic due to Japanese colonial rule, the rest of China probably faced a similar or even worse situation.

Initiation of cooperation

Harold Fowler McCormick, Chairman of the Board of Directors of the IHC, however, did not lose interest in China. As John D. Rockefeller's son-in-law and the third inaugural trustee of the RF, McCormick were confident that, when the political and social situation stabilised, the IHC would be in the right position to ensure success because of the excellent quality of the company's products.⁴⁵ With regard to China, although the previous incremental reforms of the rural reconstruction movements were too slow, the new opportunity presented by the IHC successfully created new conditions for the Nationalist government, which seemed to resolve fundamental problems in rural areas that were very difficult to remedy. Although this approach represented a last-ditch effort on the part of America to fix China's rural problems in a rather rudimentary way by throwing money and technology at the potential but still untapped Chinese market, both sides expected further cooperation. The turning point came during the later period of the Second World War, when the United Nations Conference on Food and Agriculture was held at Hot Springs, Virginia, from 18th May to 3rd June 1943. Representatives of forty-four nations, including China, participated in this conference. The Chinese delegation was led by Guo Bingwen and included two important agriculturalists, Shen Zonghan and Zou Bingwen.⁴⁶ Unlike the rural reconstructionists who hesitated to apply and promote mechanization in the context of previous movements, both agriculturalists, who had studied at Cornell University, had very clear aims of applying technology to rural China. During the conference, the Chinese delegation held a press conference on 21st May 1943. At this press conference, Zou announced that 'China both needs and welcomes agricultural technological assistance and cooperation with other developed countries.'⁴⁷ Shen also noted that the greatest needs of agriculture in China were compatible modern agricultural equipment and machines.⁴⁸ This conference was the first time that the Nationalist government emphasised the importance of international cooperation with respect to agricultural engineering. Since the Nationalist government was allied with the US during the Second World War and due to the government's official and unofficial intimacy and entanglements with the US government and related entities following the Second World War, when Zou and Shen announced that they were seeking international cooperation, they were exclusively focused on international cooperation with the US.

Subsequently, following the conference, Zou was appointed as the resident representative of the Chinese Minister of Agriculture and Forestry in the United States. Additionally, on 6th October 1945, Zou was elected to serve as a member of the Executive Committee of the United Nations Food and Agriculture Organization (FAO) at the inaugural conference of the FAO in Quebec, Canada.⁴⁹ During Zou's residence in the US, he observed the important contributions that mechanisation made to the large farm agricultural industry. As Professor J. Brownlee Davidson, the founder of the American Society of Agricultural Engineers and subsequently the chair of the Committee on Agricultural Engineering in China, observed, 'the increase in the use of power on the American farm, and the resulting progress in agriculture, has been the principal influence in placing America in the lead among nations in the production of food and fiber.'⁵⁰ In June 1944, Zou attended the annual meeting of the American Society of Agricultural Engineers in Milwaukee, Wisconsin. In his famous speech, which was titled 'China Must Have Agricultural Engineering', Zou called for technological assistance from American agricultural engineers and entrepreneurs to help China rebuild its agricultural industry and restore its depressed countryside.⁵¹

Subsequently, in early 1945, Zou proposed the Agricultural Engineering Program for China to the International Harvester Company. As the chairman of the Board of Directors of the IHC, Fowler McCormick agreed to sponsor this programme with some modifications.⁵² Since Zou was the representative of the Chinese Minister of Agriculture and Forestry, later that year, the Chinese Nationalist government quickly approved the Plan for Promoting Agricultural Engineering Research and Education by the International Harvester Company in Cooperation with the Chinese Government.⁵³ This initiative, which was supported by the International Harvester Company, was intended to help China quickly accomplish agricultural mechanisation. The plan included a Harvester Fellowships Programme to sponsor Chinese students to learn agricultural engineering in the US and an American committee on agricultural engineering to conduct field investigations, demonstrations, and teaching in China.⁵⁴

International Harvester Fellowship Programme

With respect to the fellowship programme, the Chinese Ministry of Education offered four open enrollment exams at Chongqing, Kunming, Chengdu, and Xi'an simultaneously to determine the awardees. Through strict exams, the Nationalist government selected ten graduates majoring in agriculture and ten graduates majoring in engineering, all of whom had two to three years of practical work experience.⁵⁵ In early 1945, the Ministry of Education announced the admission list, including twenty admitted students.⁵⁶ Among these twenty students who travelled to the US to study agricultural engineering, graduates with engineering majors were sent to the University of Minnesota, while graduates of agricultural universities were admitted to engage in course work and field training at Iowa State College (later known as Iowa State University).⁵⁷ The International Harvester Company provided these students with full scholarships, including tuition, living expenses, books, equipment, and travel expenses for their internship.

In June 1945, the first group of ten graduates arrived at Norfolk, Virginia, for an initial meeting with Zou in Washington, DC.⁵⁸ Zou coordinated the activities of these students during the first few days of their stay in the US, including visits to the United States Department of Agriculture (USDA) and the Beltsville Agricultural Research Center (BARC), and a meeting with Arthur W. Turner, the assistant chief for the Bureau of Plant Industry, Soils, and Agricultural Engineering.⁵⁹ Subsequently, these ten awardees of the International Fellowship were warmly greeted in Chicago by their sponsors, Fowler McCormick, and J. L. McCaffrey, the president of the IHC.⁶⁰

The second group of ten Chinese students arrived in the US in August 1945 as planned. For their course work, these Chinese students were first directed to take undergraduate courses pertaining to agricultural engineering in these two institutions. Subsequently, they would continue their course work to meet the requirements to obtain a master's degree in science from their

respective universities. Following two years of course work, the students acquired a general knowledge base concerning both applied agricultural science and engineering technology.

After receiving their degrees, the students participated in several weeks of professional internships at local farms and agricultural companies in the US. These Chinese students were assigned to engage in fieldwork for eight to thirteen weeks at both state and corporate farms, including Iowa State Farm, University of Minnesota Farm, Seabrook Farms of New Jersey, and International Harvester Farm of Illinois, where they were able to operate tractors and field machines.⁶¹ These students were also distributed across various state and federal research institutions and numerous agricultural companies throughout the country.⁶² Each student was able to visit five to six states during their year of practical training to conduct on-the-spot investigations of agricultural engineering research, education, extension, and business.⁶³

In 1948, during the final stage of their training, the IHC rented an eighty-acre farm in Stockton, California, to conduct a ten-week group training programme for these students. In this final field training, tractors, ploughs, cultivators, feed mills, manure spreaders, harvesters, and various equipment were provided by the IHC to allow the students to engage in daily practice in operating, adjusting, and servicing the equipment.⁶⁴ These students immersed themselves in learning and practicing with the latest agricultural technology and machinery in the US. Both their professional scientific knowledge and practical skills regarding agricultural engineering were comprehensively improved. During their residence in the US, the IHC provided each student with a living allowance of US \$150 per month, a book allowance of US \$100, and travel expenses for the practical training year of US \$250.⁶⁵ Considering the facts that students' rent was approximately US \$5 per week and their food expenses were approximately US \$3 per day, the IHC fellowship covered nearly all reasonable expenses incurred by these Chinese students during their residence in the US.⁶⁶ The IHC's generous support freed students from financial difficulties and logistical concerns and allowed them to devote themselves to learning and training in the US.

Following the completion of training, seventeen students travelled to China from San Francisco on 27th May 1948, while He Xianzhang, Zhang Jigao, Xu Peicong did not return as planned.⁶⁷ He Xianzhang's wife was sick, so he stayed behind to care for her. Zhang Jigao was in the process of applying for a patent for his two-row tractor in the US. Xu Peicong, who withdrew from the programme, chose to remain in the US. In June 1948, the seventeen students arrived in Shanghai. They were invited to visit the NARB at Nanking from 28th June to 2nd July. At this welcoming conference, these International Harvester fellows participated in many academic activities, including a meeting with Zou and Shen, a meeting with the Committee on Agricultural Engineering for China, and visits to the Agricultural Engineering Laboratory at the NARB, the Central Training Corps Experiment Farm, the Nanking Ministry Shop of the National Agricultural Engineering Corporation (NAEC), the College of Agriculture at the University of Nanking, and the College of Agriculture at the National Central University.⁶⁸ Subsequently, according to their own desires and the government's needs, these graduates were assigned to various positions related to agricultural engineering in a variety of agricultural institutions.⁶⁹ These fellows were the first organised group of Chinese students to study agricultural engineering in the United States. Following their returns to China, most of these individuals became leading agricultural engineering experts both for ROC and subsequently for the People's Republic of China (PRC).

Committee on Agricultural Engineering in China

In 1945, Zou, representing the CMAF, also reached an agreement with the IHC for the company to sponsor four American agricultural engineering experts to visit China as soon as possible. Over a three-year period, these American experts were expected to form a committee to conduct field investigations and provide training services to help China establish its own agricultural engineering system for education, research, and the promulgation of related knowledge and ability.⁷⁰ The

IHC would cover the salaries and travel expenses of four American experts. The IHC also agreed to provide modern equipment and machines with a total value of US \$80,000 for research, demonstration, and training to the NARB in China.⁷¹ The IHC later provided equipment worth US \$15,000 to both the University of Nanking and National Central University.⁷² Professor Davidson was invited by Zou and the IHC to serve as the chair of the Committee on Agricultural Engineering in China. As the chair of the Department of Agricultural Engineering at Iowa State College, Davidson was undoubtedly the leading agricultural engineer in the US at that time. Therefore, very quickly, Zhou Yichun (Y. T. Tsur), the Minister of Agriculture and Forestry, appointed Davidson as the chief engineer of the Department of Agricultural Engineering in the National Agricultural Research Bureau.⁷³ The CMAF also asked Davidson to select three well-qualified American agricultural engineers to form this committee.⁷⁴ Davidson recruited Howard Franklin McColly, who was the former chief water facilities engineer at the Farm Security Administration of the USDA, as his aide at NARB.⁷⁵ Davidson also nominated Edwin L. Hansen, a former agricultural engineer with the Portland Cement Association, to teach at the University of Nanking and Archie A. Stone, the former head of the Department of Rural Engineering at New York State Institute of Agriculture at Farmingdale, to teach at the National Central University, both of whom would also engage in research work at NARB.⁷⁶ The Committee on Agricultural Engineering was formed by four experienced American agricultural engineers who departed from San Francisco in January 1947.⁷⁷ These individuals arrived in China in February to begin their work in Nanjing. The Committee highlighted two ambitious objectives in their plan presented to the National government and the IHC. The first of these objectives was the study of agricultural research and educational institutions and the study of agricultural conditions in China. Second, they proposed to conduct research and perform demonstrations of the application of American agricultural equipment and machineries to Chinese agriculture.⁷⁸ Since the entirety of the committee's travel expense was covered by the IHC, their study obviously focused more on seeking potential areas for profit growth for the IHC rather than the task of solving the fundamental problems of rural China. On the other hand, the Nationalist government was constantly eager to gain any possible guidance from its American ally.

Study of Agricultural Institutions

First, since the four members of the Committee were associated with NARB, the National Central University, and the University of Nanking, they began with these three institutions in their attempt to study agricultural education and research in China. NARB, under the direction of Shen Zonghan, featured ten departments including 330 junior and senior agriculturalists. The Department of Agricultural Engineering was established not long before the Committee travelled to China. The Committee was assigned two newly furnished buildings, the Machinery Hall, which featured a floor area of 3,600 square feet, and the Shoo Building, which offered a floor area of 4,400 square feet, to house the machinery from the US.⁷⁹ Committee member Stone taught at the National Central University (NCU). Stone's position was in the Division of Agricultural Engineering of the Department of Agronomy in the College of Agriculture. The university assigned a small tract of land for agricultural engineering demonstrations and a remodelled building for teaching and research. NCU also developed a curriculum in agricultural engineering as early as the fall of 1945 after Zou proposed his plan to the IHC. Therefore, when Stone travelled to NCU, a few junior students were already majoring in agricultural engineering. The Committee helped NCU add additional credit hours for some vital subjects to their curriculum, including General Physics and Differential & Integral Calculus during the first year, Applied Mechanics and Strength Materials during the sophomore year, General Horticulture, Farm Shop and Farm Machinery during the junior year, and Farm Structures, Farm Power, and General Plant Pathology or Entomology during the senior year.⁸⁰ The Committee and NCU also attempted

to provide more opportunities for students to engage in additional field practice and to use mechanical equipment by adding courses such as the Heat Power Engineering Lab, the Electrical Engineering Lab and Repair of Farm Machinery.⁸¹ The University of Nanking was one of the largest private mission universities to have a top-level College of Agriculture and Forestry in China. This College was founded in 1914 by an American missionary educator in China and was led by an alumnus of Cornell, Zhang Zhiwen (C. W. Chang), during the 1940s. This College also established a Division of Agricultural Engineering in the Department of Agronomy that was composed of seven faculty members, and Zhang served as the acting head of this division.⁸² Agricultural engineering was one of seven majors and one of three minors offered by the Department of Agronomy.⁸³ Edwin L. Hansen served as a professor and advisor in this division. In 1948, twenty-eight students majored or minored in agricultural engineering according to the University's records.⁸⁴

Study on agricultural conditions

For the study of the agricultural conditions in China, the Committee planned to conduct a series of observation and study trips across China. However, US Army General George C. Marshall's diplomatic mission to negotiate a unified government between the Chinese Communist Party and the Nationalist government eventually failed, with Marshall leaving China in February 1947. The Chinese Civil War resumed in March, which greatly restricted the committee's travel plans. With some areas being either located in warzones or under the control of the People's Liberation Army, the committee could only follow the Nationalist government's travel recommendations. In April of 1947, organised by the CMAF and the NARB, McColly and Stone made a seven-day inspection trip to the Yellow River Flooded Area alongside approximately sixty government officials.⁸⁵ Due to centuries of sediment deposition and accumulation from the Yellow River, this delta area was one of the richest double-cropping agricultural regions for staple crops, such as winter wheat, and economic crops, such as cotton and tobacco, in the North China Plain. However, Chiang Kai-shek ordered the dikes retaining the Yellow River to be opened to block further military action by the Japanese army in 1938. As a result, millions of farming families in Henan and Anhui provinces lost their homes and land. In 1947, with international aid, the Nationalist government repaired the dikes, although the social and economic disruption remained. According to the Committee's investigation, during the nine years of flooding, sand and silt at depths of up to 15 feet had been deposited over the land. If farmers had modern equipment, machines, and improved seeds, this catastrophic disaster could have been an opportunity for one of the largest reclamation projects in the world.⁸⁶ However, a fact of which the Committee was unaware was that successive years of the Yellow River flooding disaster had driven the majority of the population in this region into bankruptcy. As Kathryn Edgerton-Tarpley argued, the relief fund that the Nationalist government provided to millions of disaster refugees was 'woefully insufficient'; for instance, in Anhui, this fund came to an average of only two fen (cents) per person, which was not sufficient to meet anyone's living expenses.⁸⁷ A factor that exacerbated this situation was that due to insufficient allocation for dike repair, the new dikes were often too fragile to efficiently protect the cities and farms from the catastrophic flooding of the high-water season. Although plans to send refugees to reclaim land and foster agricultural production were created, as Muscolino argued, the state mobilised only fifty thousand refugees to Shaanxi's Huanglongshan region to "civilize previously 'uncivilized' landscapes"; compared with the total number of millions of refugees, such efforts provided only very limited help to people living in this region as a whole.⁸⁸ Constant breaches, repeated flooding and the resulting large-scale famine had already exhausted local people's last hope and trust in the government. Alongside the devastating war against the Japanese and the ongoing civil war, both the Henan and Anhui provincial governments and local farmers had no buying capacity and no market

confidence to purchase IHC's expensive machinery unless these new toys were allocated by the central government or donated by the IHC for free.

In December 1947, the Sichuan provincial authority and Lu Zuofu (Lu Tso Fu), president of the Ming Sheng (Ming Sung) Industrial Company, invited the committee to visit their Beibei (Peipei) Sample Community to the northwest of the war capital, Chongqing. Beibei was one of the most famous experimental communities for rural reconstruction movements in Sichuan, and it had been led by Lu during the 1930s. Lu and local leaders brought the Committee to review the achievements that intensive and productive agriculture and progressive schools had made in Beibei in hopes of attracting the Committee's approval and possible investment from the IHC.⁸⁹ The Committee initially observed that with the exception of a few work animals, such as buffalo and oxen, all agricultural operations were conducted by manual labour.⁹⁰ It seemed that this community could be a demonstration area for modern agricultural engineering. However, the land conditions were not very conducive to this purpose. Much of the field work for growing rice in Sichuan and likely across southern China, including ploughing, smoothing and transplanting, was carried out in flooded paddy fields, making the use of mechanised equipment technically difficult at that time. In addition, the average size of the farm owned by a household in Sichuan was only 1.43 acres due to the need to cultivate on steep slopes, which was also problematic for the operation of mechanised equipment. The Committee needed to clarify that IHC's machinery could not be used economically in many regions in Sichuan where the fields were too small or the topography too rough.⁹¹ The longer they studied, the more pessimistic they felt. During the committee's visit to Sichuan, committee members were also informed that the landlords could take up to 80 per cent of the crop yield as the rent, which left only approximately 20 per cent for tenant farmers' daily living expenses.⁹² The majority of farmers in Sichuan also had no buying capacity and no consumption demand for IHC's products at that time. Given a lack of favourable land and economic conditions, the Committee and the IHC did not make further moves in Sichuan. Shortly thereafter, in October 1948, the Joint Commission on Rural Reconstruction in China (JCRR) was jointly established in Nanjing by the US government and the Nationalist government. The local authority of Beibei promptly sent an application for US aid in November to the JCRR with a detailed budget sheet asking for US \$15,280,000, to finance purchases including an oil press, a water pump and other cooperative machineries.⁹³ These authorities were eager to obtain from the US government what they were unable to acquire from the IHC. After all, any aid was better than nothing.

Subsequently, having been invited by Marshall Yan Xishan (Yen Hsi-shan) of Shanxi Province, the Committee also travelled to this province by air in July 1948. Shanxi was on the frontlines both in the war against the Japanese and in the subsequent civil war against the communists, and this province had suffered heavy losses in terms of cattle used for ploughing. According to an investigation conducted in thirteen prefectures in the Linfen area, farmers in this region had lost 69 per cent of their draft animals. Although the period of the loss was not identified, the total loss throughout the whole province was estimated at more than 340,000 heads.⁹⁴ Similarly, there was also a severe shortage of able-bodied males to engage in farm labour because such individuals had either been conscripted into the army or forced to work on military constructions such as fortifications. Obviously, this tremendous loss could not be recovered over a short period of time. Therefore, Yan requested an allocation of two hundred tractors with two-bottom ploughs and harrows, which, his team claimed, would benefit 22,000,000 mou of suitable land across sixty-nine prefectures in Shanxi.⁹⁵ Their wish list also included twenty fertiliser distributors, thirty harvesters, and thirty each of grain drills, manure spreaders, mowers, cultivators, soil pulverizers, and dyke makers.⁹⁶ However, in regard to money, Yan's team claimed that given the total expenditure of CNC (Chinese National Currency) \$2,000,000,000 for the introduction of machinery and personnel training in Shanxi alone, they planned to request CNC \$1,500,000,000 from the CMAF, while the balance would be raised on their own terms.⁹⁷ In addition, by mid-1948, Yan's domain in Shanxi was closely surrounded by an increasing number of Communist troops. As American

Consul General O. Edmund Clubb noted, the shipment of tractors into Shanxi Province would encounter military and technical difficulties since 'all transportation in and out of the province must now be by air', with 'the top load limit for the planes presently flying being 5 tons'.⁹⁸ In addition, even assuming that Yan could successfully receive these tractors, would he put them into agricultural production or utilise them for more urgent military purposes? This question could not be answered by agricultural officials such as Zou and Shen, not to mention the fact that CMAF did not have sufficient funds to provide all the equipment that Yan requested, with the exception of the demonstration pieces that the IHC had donated. Therefore, in the case of Shanxi, the invitation for American agricultural engineers to visit Shanxi and the wish list of IHC's equipment represented Yan's disguised request for additional economic assistance from the central government and, if possible, the Americans as well.

The complicated situations in Henan, Sichuan and Shanxi were probably not isolated cases in China. Ideally, two groups of people at the local level would be interested in agricultural equipment in China: farmers and local leaders. The general extreme scarcity of disposable income for many tenant farmers had already directly destroyed IHC's potential market among farmers. What remained were local warlords and kindred consortiums. There were at least two major factors among the local warlords, and kindred consortiums across China claimed that they were highly interested in the introduction of the IHC's agricultural equipment. Initially, local warlords invited American committee members to their regions to observe local agricultural conditions. During these investigation trips, they treated the Americans well, and all of these warlords demonstrated their strong interest in acquiring sophisticated American mechanised equipment regardless of type or size simply to indicate to the central government and the Americans just how civilised and progressive they themselves were. For instance, the governor of Suiyuan Province wanted 'the latest and best types of equipment suited for the area in order that he may show the central government his progressiveness, and also to gain a certain measure of political strength'.⁹⁹ Second, these figures were willing to write proposals to any American organisations, including the IHC. Whether for steam engine machinery or gasoline engine machinery, their requests for all kinds of American equipment did not demonstrate that their hopes rested on mechanised agricultural production but rather revealed that they were in desperate need of any kind of economic assistance from both the central government and the Americans in general.¹⁰⁰ Without the central government's allocation, these local leaders simply had no will to invest their own money in agricultural mechanisation when they were facing severe attacks from the People's Liberation Army and serious economic difficulties in 1948.¹⁰¹ In June 1948, the same governor of Suiyuan Province delivered a confidential message to American Consul Frederick W. Hinke via an American intermediary agent to indicate that he was willing to arrange a barter deal of Mongolian raw materials in his possession, including linseed and cashmere wool, for American agricultural equipment.¹⁰² Of course, the IHC and other American agricultural machinery manufacturers could not accept these raw materials as payment directly. Therefore, the governor proposed selling approximately US \$2,000,000 worth of raw materials to the Supreme Commander for the Allied Powers (SCAP) in Japan to obtain sufficient US dollars as a first step.¹⁰³ However, would the governor utilise this large sum of foreign exchange entirely for this purchase of equipment benefiting the public? Most likely, this promise would not be fulfilled. The American intermediary agent was straightforward in suggested that the country needed to make this deal 'with the Chinese methods of doing business through the application of a little inducement'.¹⁰⁴ This agent also noted that 'when the deal was completed, the Governor of Suiyuan would be in a sufficiently strong financial position to retire, if he so desired.'¹⁰⁵ It turned out that the governor was making bargains with Americans to obtain US dollars at least partially to ensure his own 'retirement' under the guise of purchasing American equipment. It is possible that warlords in other regions of China made similar calculations considering that the rapid depreciation of the currency was inevitable in 1948. The tremendous costs of the war caused the Nationalist government to be unable to make ends meet, and so it had to rely on an ever-increasing supply of paper money that ultimately

reached astronomical figures, which directly created this vicious cycle of hyperinflation and currency depreciation. According to the Chinese financial historian Ma Junqi at the People's Bank of China, the exchange rate in March 1946 was set at CNC \$2020 to US \$1, while the street exchange rate in August 1948 skyrocketed to as high as CNC \$10,000,000 to US \$1.¹⁰⁶ Within a very short period of two-and-a-half years, the Chinese National Currency underwent a nearly five-thousand-fold devaluation. Paper money was the equivalent of wastepaper, which prevented both local leaders and the central government from being able to use Chinese National Currency in hand to buy IHC machinery aside from risky third-party barter exchanges or begging for economic assistance from the IHC. However, the American Committee also realised that the committee could not satisfy everyone's desires or solve this overall financial crisis on its own; 'with many requests for assistance and cooperation', what the committee could do was to limit its programme 'so that things undertaken shall be well done.'¹⁰⁷ Apparently, due to the viciously oscillating exchange rates and difficulties in transportation and turmoil caused by the civil war between 1948 and 1949, the IHC, the CMAF and local warlords, that is, all the parties in this game, straddled the fence until the collapse of the ROC.

Therefore, the introduction of agricultural engineering into China faced deep and complex problems. Not least of these problems were the fact that few farmers had the necessary buying capacity and the lack of investment at both the local and central levels of government. In addition, due to the difficulty and expense of transportation, the exploitive land rental and ownership system, and the fluctuating currency exchange rate, manufacturers faced a myriad of problems that had no simple solutions. These systemic problems revealed that mechanisation alone was not a real solution to China's rural problems. Eventually, following the committee's investigatory trips throughout China, the committee itself became very cautious regarding the outcome because they felt that the results of the programme were 'intangible and difficult to evaluate, ... it depends on an understanding of the factors involved and faith in the guiding philosophy'.¹⁰⁸

Research and demonstrations

Nevertheless, the most important mission for the committee was to conduct research and demonstrations pertaining to the application of American agricultural equipment and technologies to Chinese agriculture. As early as December 1945, the NARB had already submitted its wish list to the IHC. This list included a variety of machine shop equipment worth US \$34,868, laboratory instruments worth US \$14,347, literature worth US \$581.05, and supplementary machines and tools worth US \$26,603.95, for a total value of US \$80,000 in value.¹⁰⁹ Due to the supply shortage indicated by some models and low rates of production in the US, the first shipment from the IHC arrived in Shanghai alongside the committee in February 1947.

Subsequently, bureaucratic problems emerged. In accordance with the wartime import regulations of the Nationalist government, all goods from foreign countries required a special permit for tax exemption at the Jianghai Custom of Shanghai. The CMAF was required to complete a great deal of paperwork for Executive Yuan arguing that this equipment and the committee's personal belongings were intended only for the purposes of research and teaching with respect to agricultural engineering in China.¹¹⁰ These considerable bureaucratic delays led to the postponement of the committee's plan, which occasionally meant a delay for another crop season. This difficulty was just one example of the ways in which the institutional inefficiency of the Nationalist bureaucratic system greatly reduced the effectiveness of the committee's work on agricultural modernisation in China.

Nevertheless, throughout the committee's residence, the IHC made four large shipments to China. With this modern equipment, the committee proposed several research and demonstration projects. These projects included training sessions regarding the operation of equipment, field tests of machines, cost comparison between human labour and machine production of wheat,

cotton, tobacco, rice, corn, soybean, and sorghum, as well as demonstrations concerning well drilling, grain storage, and crop processing.¹¹¹ These machinery demonstration projects could potentially lead to a broader extension of agricultural mechanisation throughout China, which could change the shape of rural China for the Nationalist government and lead to the emergence of an important new market for the IHC. However, due to constant shipping delays and the turmoil caused by the civil war, most of these projects took place only on paper. Nevertheless, despite limited resources, the committee tested a certain number of machines at NARB during its residence, including McCormick-Deering and International Harvester combines, Farmall A and Farmall Club tractors, a Farquahar one-row transplanter, a 52-R harvester and thresher, a corn picker, and various modern farming tools.¹¹² Because both the committee and NARB had little time to prepare for these demonstrations, however, and since most of their operators had no previous experience with this machinery, the results of these demonstrates were either not very accurate or in need of further study.

Finally, to emphasise the importance of agricultural engineering to common farmers, members of academia, and government officials, the committee also focused on training sessions, conferences, visits to farms, inspection of laboratories, discussions with students, and publications in journals. Davidson, for example, authorised Ma Fengzhou, a Chinese agricultural engineer working in the AMOMO, to translate his paper concerning US agricultural mechanisation into Chinese for publication in the journal *Dongfang Zazhi*, which demonstrated to Chinese readers that the introduction of agricultural engineering was the most important advancement in the history of American agricultural development.¹¹³ Davidson's paper highlighted the promising future of China's development of agricultural engineering.

By December 1948, however, the People's Liberation Army had gradually emerged victorious from the civil war. The political and military conditions were unsuitable for the committee to remain in China. Assisted by the US Embassy, the committee returned to the US on 15th December 1948.¹¹⁴

Impact and significance

As a unique channel of official cooperation between a private American company and the Nationalist government during the crucial transitional period from the ROC to the PRC, this programme had both direct consequences for the ROC and long-term significance for the PRC following 1949.

With respect to IHC, obviously, the company had a vested interest in advocating for agricultural mechanisation as the solution to the problems in rural areas of China, as such mechanisation would allow the company to generate tremendous profits via the sale of agricultural equipment to China. The IHC, as a profit-driven private American company, considered its cooperation with the CMAF to be an informal investment with the aim of opening this vast rural market. First, during the United Nations Conference on Food and Agriculture in 1943, high-ranking officials in the CMAF, including Shen and Zou, favoured IHC's paradigm of mechanisation to the proposals of other competitors, both in America and worldwide, which put the IHC into the most advantageous position to function as a unique official partner in the project of China's agricultural mechanisation. Thereafter, the fellowship programme allowed the first group of the most brilliant Chinese agricultural engineers to attain various important positions in major agricultural institutions in China, including the National Agricultural Engineering Corporation, the National Agricultural Research Bureau, and National Central University. Furthermore, the committee established by the company conducted some preliminary but necessary studies to investigate the agricultural conditions in China as well as tests and demonstrations of modern machinery for agricultural production. These nationwide investigations and demonstrations not only drew the attention of Nationalist central and provincial officials to agricultural mechanisation but also

demonstrated the corporation's influence on the internal debate in China concerning whether American-style big-farm mechanisation was necessary for China.

With respect to China, which was struggling with the difficulties caused by both the Second World War and the Civil War, the Nationalist government had neither the economic capacity nor sufficient strategic recognition to develop agricultural science and technology independently. Prior to cooperation with the IHC, the allied forces established the China Office of the UNRRA in 1944 to facilitate the postwar rehabilitation of China. However, UNRRA's vision was 'a temporary and short-term job of helping to meet only immediate basic needs', while the Nationalist government expected much greater assistance by the UNRRA.¹¹⁵ The UNRRA was only willing to offer immediate famine relief to what was, in their eyes, a corrupt and highly dysfunctional state, while the Nationalist officials aimed to utilise this cooperation to realise their goals of strengthening social welfare at home and enhancing national sovereignty in the postwar order. As Rana Mitter argued, there was too much cognitive dissonance and 'changed dynamics' between the Nationalist government and the UNRRA as a new transnational organisation, which led to the failure of this cooperation and a dearth of achievements in 1947.¹¹⁶ Confronted with a lack of financial support and technological assistance from international society at that time, cooperation with American universities, foundations, companies and the US government in agricultural science and education seemed to be a safe move. In a sense, these cooperative projects made some attempts and experiments to cultivate China's agricultural talent, introduce modern scientific research systems, promote rural policy reforms, and advocate for agricultural mechanisation. However, because they did not provide any substantive response to ordinary farmers' problems with respect to food and clothing or their appeals for land, these programmes did not gain recognition among most Chinese farmers. As in the case of cooperation with the IHC, the Nationalist government neither organised effective demonstrations nor distributed IHC's equipment to rural China during the chaotic year of 1948. To Nationalist politicians and warlords at the local level, who aimed to solicit both political and economic support from the US during the civil war, this cooperation was less focused on solving the problems of rural China than on serving as a propaganda tool to attract attention from Western organisations, and in exchange for aid, these actors promised the potential of a broad market for agricultural equipment to ensure profits for Western entities. Granted, both Shen and Zou were agricultural professionals who wanted to help promote the agricultural production of China through cooperation with American companies. However, as middle-level technocrats, they were unable to affect the political motivations of senior leadership and local warlords, who intended to exchange access to the Chinese market for instant economic support from the US, nor did they have the power or leverage to compel the American companies to provide additional economic assistance rather than pursue profits in China. Therefore, such an asymmetric form of international cooperation in agriculture could not provide essential help to facilitate China's independent agricultural development.

Some elements of long-term significance are also worthy of scholarly attention. Although the IHC's investment did not lead to physical profit due to the loss of mainland China by the Nationalists, the company's work and efforts contributed to China's agricultural mechanisation following 1949. In 1959, Chairman Mao made his famous claim that 'the fundamental way out of agriculture lies in mechanization' in the Inner Party Newsletter.¹¹⁷ Perhaps due to the double influence of the US and the Soviet Union, the leadership of the PRC and the party's agricultural officials realised the importance of mechanisation, which led directly to the PRC's strong focus on research, education, and promulgation of agricultural engineering during the second half of the twentieth century. In 1949, despite considerable political uncertainty, most International Harvester Fellows chose to remain in mainland China. Since that time, most of these figures have devoted themselves to teaching and scientific research concerning agricultural engineering. As Tao Dinglai, one of the International Harvester fellows who subsequently became the vice president of the Chinese Academy of Agricultural Sciences (CAAS) in 1978, described, 'at that time, there was no such term as agricultural engineering in China, and nobody knew exactly what it

Table 1. Positions held by some International Harvester Fellows in the PRC

Li Kezuo	Vice Director of the North China Agricultural Machinery General Factory; General Manager of the Beijing Automotive Industry Corporation
Yu Youtai	President of Northeast China Agricultural College; Honorary President of the Heilongjiang Provincial Association of Science and Technology
Wu Kezhou	Professor at the Northeast China Agricultural College
Zhang Dejun	Dean of the College of Agricultural Engineering at Jilin University of Technology
Zeng Dechao	Professor at Beijing University of Agricultural Engineering
Li Hanru	Professor at Beijing University of Agricultural Engineering
Cui Yinan	Professor at Jilin University of Technology; Professor at Beijing University of Agricultural Engineering
Wang Wanjun	Vice President and Chief Engineer of the Chinese Academy of Agricultural Mechanization Sciences
Zhang Jigao	Head of the Department of Agricultural Engineering at Shenyang Agricultural College; Vice President of the Chinese Academy of Agricultural Engineering Research and Planning
Fang Zhengsan	Senior Engineer at the Chinese Academy of Agricultural Engineering Research and Planning
Wu Xianggan	Head of the Department of Agricultural Engineering at Nanjing Agricultural College
Gao Liangrun	President of Jiangsu Institute of Technology
Wu Qiya	Professor at Jiangsu Institute of Technology
Shui Xinyuan	Deputy Director of the Nanjing Institute of Agricultural Mechanization of the Ministry of Agriculture
He Xianzhong	Chief Engineer of Guangdong Provincial Agricultural Mechanization Research Institute
Tao Dinglai	President of the Chinese Academy of Agricultural Engineering Research and Planning; Vice-President of the Chinese Academy of Agricultural Sciences

Source: Yu Youtai 余友泰 and others, 'Jinian woguo nongye gongcheng shiye de xiandaozhe- zou bingwen xiansheng 纪念我国农业工程事业的先驱者-邹秉文先生', in Hua Shu 华恕, *Zou Bingwen Jinianji* 邹秉文纪念集 (Beijing: China Agriculture Press, 1993), pp. 219–24.

referred to.¹¹⁸ Perhaps the most important contribution of the IHC was the introduction of the modern discipline of agricultural engineering to China. As shown in Table 1, most international Harvester Fellows held important positions throughout China for a long period of time following the Revolution of 1949. Some of these individuals continued to work until the 1990s. The PRC not only took over, transformed, and reorganised the ROC's scientific research and higher education institutions but also united a vast number of ROC scientists and educators. As Sigrid Schmalzer argued, 'perhaps surprisingly, the Chinese approach exhibited far more striking parallels to the research and extension system embraced in the early twentieth-century United States and promoted abroad (including in pre-1949 China) by the Rockefeller Foundation and other U.S. organizations.'¹¹⁹ International Harvester Fellows applied the knowledge of agricultural engineering knowledge that they had acquired in the US to promote the research and education of agricultural mechanisation in socialist China. Agricultural mechanisation as well as other agricultural technologies, such as crop breeding, pesticides, and fertiliser, jointly defined the term 'Socialist Scientific Farming' in the 1950s and 1960s in mainland China.

Parallel to this shift was a similar shift among American allies in the developing world following 1949, as American entities and organisations continued to advocate for mechanisation and the use of other new agricultural technologies in allied countries and regions. Although the IHC failed to develop new markets in mainland China, from the 1940s to the 1960s, the RF and the Ford Foundation sponsored a series of agricultural programmes focusing on crop breeding,

mechanisation and chemical pesticides in Mexico, the Philippines, the ROC (Taiwan), India, and eventually parts of Africa that became known as the Green Revolution. These American organisations employed a concentrated approach that relied on high-yield agricultural technology instead of social science-based approaches to rural reform. They attempted to increase productivity to meet food demands and abandoned their earlier aim of comprehensive rural rebuilding in China's rural reconstruction movements. To some extent, the notions of 'Socialist Scientific Farming' and the Green Revolution fulfilled the IHC's unfinished mission via different paths that nevertheless led to the same destination of rural modernisation.

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