

Modernist Dreams and Agrarian Realities

Soy Expansions in the USA and USSR during the Global Agro-Food Regime Transition, 1920s–1950s

Abstract: This article compares the “soybean revolutions” envisioned in the USA and the USSR from the 1920s to the 1950s. Using an adaptation of the multi-level perspective to historical inquiry, the paper traces niche formation, crisis management, and regime building across both cases. In the United States, a state-coordinated yet decentralized knowledge network (US Department of Agriculture, experiment stations, and the American Soybean Association), synergies with hybrid corn, New Deal price and conservation policies, wartime substitution of tropical oils, and postwar trade frameworks upscaled soy from experimental niches to a pillar of the US-centred agro-food regime. In the Soviet Union, early imperial and Far Eastern niches, centralized institutionalization under the All-Union Academy of Agricultural Sciences, and ambitious five-year plans encountered ecological mismatches, weak knowledge transfer to collective farms, coercive collectivization, and repression of scientific expertise. Despite propaganda, selective incentives, and episodic industrial uses, soy remained regionally confined and socially devalued, its expansion repeatedly stalling. The paper argues that these divergent modernization pathways – low modernist, participatory, and socioecologically embedded in the USA versus high modernist, directive, and disembedded in the USSR – better explain the complex outcomes of the “soybean revolutions” than the simple systemic opposition of ‘market’ versus ‘plan.’

Zusammenfassung: Dieser Artikel vergleicht die zwischen den 1920er und 1950er Jahren in den USA und der UdSSR angestrebten ‚Sojarevolutionen‘. Mithilfe einer für die Geschichtswissenschaft adaptierten Multi-Level-Perspektive werden in beiden Fällen Nischenbildung, Krisenmanagement und Regimeaufbau nachgezeichnet. In den Vereinigten Staaten ermöglichten ein staatlich koordiniertes, aber dezentralisiertes Wissensnetzwerk (Landwirtschaftsministerium, Versuchsstationen und die American Soybean Association), Synergien mit dem Hybridmais, die Preis- und Naturschutzpolitik des New Deal, die kriegsbedingte Substitution tropischer Öle sowie die Handelsabkommen der Nachkriegszeit die Aufwertung von Soja von einem experimentellen Nischenproblem zu einem Grundpfeiler des US-zentrierten Agrar- und Ernährungsregimes. In der Sowjetunion stießen frühe imperiale und fernöstliche Nischen, die zentralisierte Institutionalisierung unter der Allunionsakademie der Agrar-

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wissenschaften und ambitionierte Fünfjahrespläne auf ökologische Fehlanpassungen, schwachen Wissenstransfer in die Kollektivwirtschaften, gewaltsame Kollektivierung sowie die Unterdrückung wissenschaftlicher Expertise. Trotz Propaganda, selektiver Anreize und gelegentlicher industrieller Verwendung blieb Soja regional begrenzt und gesellschaftlich geringgeschätzt und seine Ausbreitung kam wiederholt zum Erliegen. Der Artikel argumentiert, dass die komplexen Ergebnisse der ‚Sojarevolutionen‘ weniger aus dem Gegensatz von ‚Markt‘ und ‚Plan‘, sondern aus den unterschiedlichen Modernisierungspfaden erklärbar sind: in den USA niedrig-modernistisch, partizipativ und sozioökologisch eingebettet, in der UdSSR hoch-modernistisch, autoritär und von Sozial- und Naturbeziehungen entkoppelt.

Keywords: soybean, United States, Soviet Union, New Deal, collectivization, agro-food regime

Introduction

Although neither William J. Morse nor Nikolai I. Vavilov were what might be called dreamy men, they shared a dream. The former was an agronomist at the Bureau of Plant Industry of the US Department of Agriculture (USDA) (Figure 1), while the latter served as president of the Lenin All-Union Academy of Agricultural Sciences (VASKhNIL) (Figure 2). In 1930, Morse issued a USDA report praising the virtues of a recent crop innovation: “The widespread interest in the soybean, created by the phenomenal increase in acreage and production, indicates that the crop is destined to become one of considerable economic value in the United States.”¹ In the same year, Vavilov answered the question why his academy had founded research institutes for soybeans and corn in the newspaper *Pravda*: “Because these two crops are destined to revolutionize the fields of the USSR in the southern agricultural belt, and in the very near future.”² It was their shared enthusiasm for the ‘miracle bean’ that made the two men’s paths cross: Morse, accompanied by his elder colleague Palemon H. Dorsett, visited Vavilov in Leningrad that year.³ It was not their first encounter, however. The two restless USDA officials had already met the world-famous geneticist a year before in Seoul when they were studying soybean cultivation and collecting seeds during a two-year expedition across East Asia. They had also known each other from an earlier meeting in Washington, D.C.⁴ In short, the US and Soviet soy enthusiasts crossed the oceans in both directions. Despite the different politico-economic environments, such international contacts were the rule rather than the exception during the interwar period. Agricultural engineers, plant breeders, and other agrarian experts were fascinated by steps towards the modernization of farming on the other side of the ocean: “The Russians tended to be envious of the level of capitalization,

1 William J. Morse, Soybean Utilization, Farmers’ Bulletin 1617, Washington, D.C., 1932, 1. The report was issued in 1930.

2 Nikolai Vavilov, Pochemu Sel’skokhoziaistvennaia akademiia otkryla vne ocheredi instituty soi i kukuruzy [Why the Agricultural Academy Has Urgently Opened the Institutes of Soy and Maize], in: *Pravda*, 15 April 1930, 3.

3 Igor G. Loskutov, Vavilov Institute (VIR): Historical Aspects of International Cooperation for Plant Genetic Resources, in: *Genetic Resources and Crop Evolution* 67 (2020), 2237–2253, 2240.

4 Theodore Hymowitz, Dorsett-Morse Soybean Collection Trip to East Asia: 50 Year Retrospective, in: *Economic Botany* 38/4 (1984), 378–388, 381.

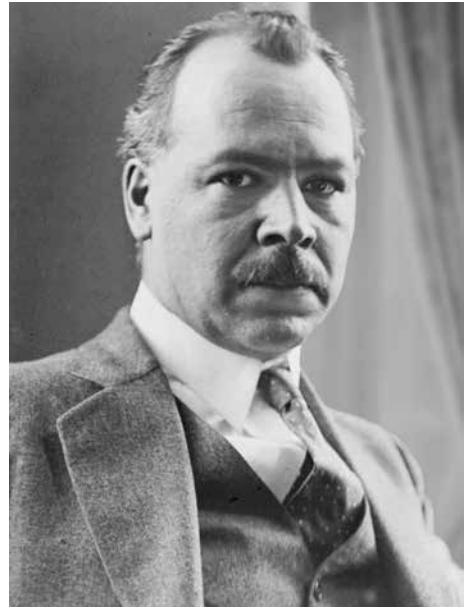
particularly in mechanization, of American farms, while the Americans were envious of the political scope of Soviet planning.”⁵ These mutual interests between US and Soviet agrarian experts motivated the emergence of transnational networks of knowledge and technology transfer.

Figure 1: William J. Morse, 1929



Source: Shurtleff/Aoyagi, Morse, 310.

Figure 2: Nikolai I. Vavilov, 1933



Source: Library of Congress Prints and Photographs Division, World Telegram & Sun, photo, LC-USZ62-118109. Public domain.

When Morse and Vavilov anticipated the American and Soviet “soybean revolutions” as part of agricultural modernization, the ‘miracle bean’ had already attracted attention in the transnationally connected field of science and beyond. “There are few plants whose cultivation has aroused as much interest and, let us put it this way, as much hope, as soy,” the General Secretary of the International Institute of Agriculture in Rome stated in 1936.⁶ Originating from East Asia, the soybean plant had taken root in the Americas and Eurasia by the 1930s. In the USA, soybeans already covered 1.2 million hectares in 1930, compared to 0.6 million hectares in 1924. But this was only the beginning of an ongoing soy expansion that would skyrocket to 4.2 million hectares in 1940 and 6.1 million hectares in 1950.⁷ Meanwhile, in the USSR, soybean acreage had grown from 26,200 hectares in 1927 to 467,800 hectares in 1931.⁸

5 James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*, New Haven 1998, 197.

6 Institut International d’Agriculture, *Le soja dans le monde*, Rome 1936, V.

7 USDA, *Agricultural Statistics 1951*, Washington, D.C., 1951, 136. Calculations by the authors.

8 *Posevnyye ploshchadi SSSR [Sown Areas in the USSR]*, vol. 1, Moscow 1957, 20–23.

Despite the expanding areas planted with the new crop, however, production was limited due to harvest failures. While US soybeans gained global importance in the postwar era, transforming agro-food relations from production to consumption around the world, their Soviet counterparts remained a regional crop grown in the Russian Far East, close to its centre of origin, and perceived as a low-quality food substitute. Obviously, Morse's dream had come true, but Vavilov's had burst. And it was not just their dreams that ended up differently, but also their lives: While Morse retired from the USDA in 1949 after having been honoured for his scientific and organizational achievements, Vavilov was arrested in the course of Stalinist political cleansing, sentenced to twenty years imprisonment and held captive in a camp, where he died in 1943.⁹

In this article we describe, explain, and compare the envisioned "soybean revolutions" in the USA and the USSR from the 1920s to the 1950s. We argue that Morse's and Vavilov's ambitions reflect modernist projects, which met more or less favourable conditions, including ecological dynamics, political orders, economic modes, social relations, and cultural orientations. Despite the shared vision of industrialized (meaning mechanized, specialized, large-scale, etc.) farming,¹⁰ the outcomes of these projects were quite different. To interpret the gathered empirical evidence, we apply the multi-level perspective (MLP) as a theoretical framework and adapt it for historical inquiry. Accordingly, a transition of an agro-food regime or system results from its interplay with endogenous (niche) and exogenous (landscape) levels. By agro-food regime, we mean a hegemonic arrangement of agricultural production, agro-industrial processing and distribution, and food consumption that is coordinated by regulatory institutions (state policies, business models, popular lifestyles, etc.) at diverse levels from global to (sub-)national. At the global level, the "soybean revolutions" were inserted in the transition from the pre-1914 unipolar regime centred around the British Empire to the post-1945 bipolar regimes centred around the USA and the USSR.¹¹ In the protected spaces of niches at the regime's margins (scientific laboratories, innovative firms, grassroots movements, etc.), alter- or counter-hegemonic activities emerge. Struggles between regime and niche actors are influenced by the surrounding landscape through secular trends (e.g., economic booms) and sudden shocks (e.g., military conflicts).¹²

According to our adaptation of this approach, a regime transition unfolds over time in three phases: First, both human and non-human niche actors build stable but small-scale networks (*niche formation*); second, exogenous pressures from the landscape and endogenous pressures from the niche destabilize the regime, thereby opening windows of opportunity for alternative or radical practices to be upscaled (*crisis management*); third, upscaled niche practices reconfigure the regime, become settled in lock-in mechanisms, and establish a new hegemony (*regime building*). However, this ideal-typical trajectory contrasts in reality with

9 William Shurtleff/Akiko Aoyagi, William Joseph Morse – History of his Work with Soybeans and Soyfoods, Lafayette 2017, 7, 701.

10 Scott, Seeing Like a State, 196–201.

11 Philip McMichael, Food Regimes and Agrarian Questions, Halifax/Winnipeg 2013. On the contested periodization of agro-food regimes, see also the contribution by Mark Tilzey in this issue.

12 Frank W. Geels, Technological Transitions as Evolutionary Reconfiguration Processes: A Multi-level Perspective and a Case-study, in: Research Policy 31/8–9 (2002), 1257–1274; Frank W. Geels/Bruno Turnheim, The Great Reconfiguration: A Socio-Technical Analysis of Low-Carbon Transitions in UK Electricity, Heat, and Mobility Systems, Cambridge 2022, 8–12.

a multitude of transition pathways. These pathways may be successful, but they may also fail if the previous regime succeeds in restabilizing.¹³ According to the MLP framework, the US and Soviet cases represent two contrasting pathways in the transition (sometimes referred to as the “great transformation”) of the global agro-food regime from the mid-1920s to the mid-1940s. However, they also deliver empirical evidence for adapting this theoretical approach.¹⁴

Soy expansion in the USA

Niche formation

Soy emerged in the USA as a crisis winner during the economic and military turmoil between the 1920s and the 1940s. The dynamics of the First World War, the Great Depression, and the Second World War opened up a window of opportunity for the ‘miracle bean’ from the Far East to take root in North American soils. As early as 1916, William Morse, together with his boss Charles V. Piper, predicted that the soybean’s properties “give this crop a high potential importance and assure its greater agricultural development in America.”¹⁵ This vision materialized over the following decades. Between 1924 and 1945, the area under soybean cultivation in the USA increased almost eightfold from 0.7 to 5.6 million hectares (Figure 3). Soybean growing changed not only in quantity but also in quality, however – from a farm input in the form of seed and animal feed to a farm output in the form of soy oil and soy cake as cash crops for domestic and world markets. In this way, soy emerged as a key commodity of agro-industrial capitalism.¹⁶

The Corn Belt in the US Midwest became the centre of gravity of the American soy expansion, despite Morse’s initial expectation that the crop would flourish in the south of the country.¹⁷ This regional development reflected global dynamics. During the British-centred agro-food regime from the 1870s onwards, the US Midwest served as a settlement space for European farming families and an agricultural production area for grain and meat shipped to the urban and industrial centres on the East Coast and in Europe. The closing of the “American Frontier” after its expansion from east to west not only displaced indigenous human, animal, and plant communities but also changed the direction of agricultural development

13 Ernst Langthaler/Maximilian Martsch/Gabriel Tober, Conceptualizing Historical Commodity Studies: The Case of Soy, in: Juan Carmona-Zabala (ed.), *Commodities in History. Theoretical Reflections and Empirical Case Studies*, Rethymno 2023, 25–60.

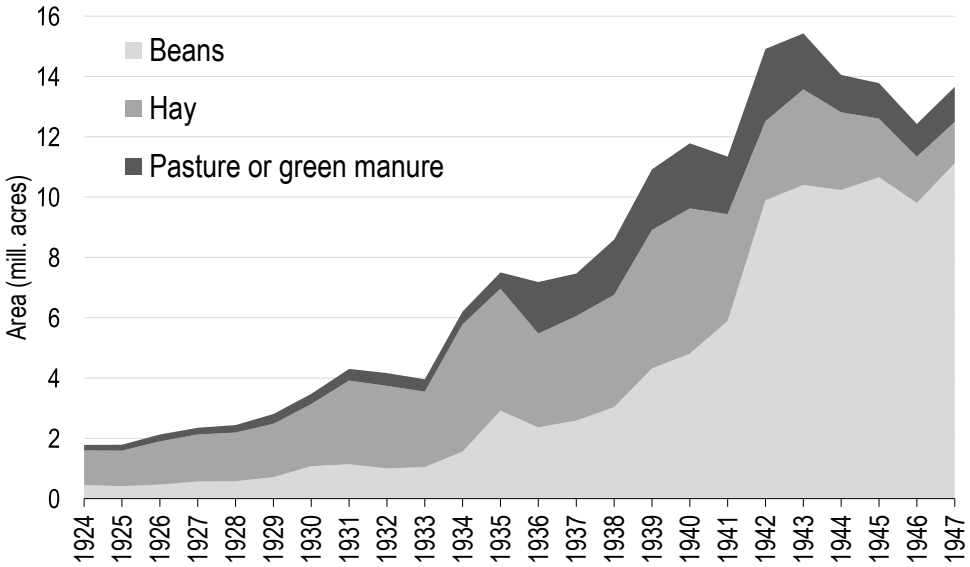
14 On the period from the mid-1920s to the mid-1940s as an agro-food transition from a comparative perspective on the USA, the USSR, and Germany, see Ernst Langthaler, *The Great Depression as Great Transformation? Global Food Regime Crisis and (Inter)National Transition Pathways, 1925–39*, in: Gérard Beur/Francesco Chiapparino (eds.), *Agriculture and the Great Depression: The Rural Crisis of the 1930s in Europe and the Americas*, London/New York 2023, 21–38; Ernst Langthaler, Soy, in: Jeannie Whayne (ed.), *The Oxford Handbook of Agricultural History*, Oxford 2024, 304–324.

15 Charles V. Piper/William J. Morse, *The Soy Bean, with Special Reference to Its Utilization for Oil, Cake, and Other Products*, USDA Bulletin 439, Washington, D.C., 1916, 7.

16 Ernst Langthaler, *Die wundersame Krisengewinnerin: Sojaexpansion im US-amerikanischen Maisgürtel in der ersten Hälfte des 20. Jahrhunderts*, in: Wolfgang Meixner/Gerhard Siegl (eds.), *Regionale Wirtschafts- und Sozialgeschichte im Zeitalter globaler Krisen*, Vienna 2023, 141–164.

17 Piper/Morse, *Soy Bean*, 8.

Figure 3: Acreage of soybeans in the USA, 1924–1947



Source: Strand, *Soybeans*, 55. Calculations by the authors.

under the auspices of the USDA: from extensive European-style mixed farming to more (land- and labour-)intensive agriculture. During the urbanization and industrialization of American society, family farms in the temperate Corn Belt specialized in the commercial production of corn and pigs. However, from the turn of the nineteenth to the twentieth century, overexploitation and overproduction caused soil fertility and product prices to stagnate. Moreover, family farms dependent on investment loans faced mounting debt. Many farming families responded to these adversities with self-exploitation, that is, by decreasing consumption standards and increasing production efforts, thereby exacerbating the agricultural crisis. The regional shift towards monoculture corn cultivation for pig fattening, which had fuelled prosperity until the turn of the century, gradually led to a dead end.¹⁸

The key to solving the structural crisis of Corn Belt agriculture emerged from a powerful biotechnological package: hybrid corn and soybeans. Corn is a cross-pollinating plant, which facilitated hybrid breeding techniques pioneered from the 1920s onwards by crossing different inbred lines. Hybrid corn achieved maximum yields in the first generation in combination with nitrogen fertilizers (heterosis effect). Due to the steep decline in yield in subsequent generations, farmers had to purchase new hybrid seeds every year, thereby opening up a lucrative business area for seed and fertilizer traders. In other words, the adoption of hybrid corn transformed formerly self-reproduced seeds into a marketable commodity.

18 John C. Hudson, *Making the Corn Belt: A Geographical History of Middle-Western Agriculture*, Bloomington 1994, 151–172; Ines Prodöhl, *Globalizing the Soybean: Fat, Feed, and Sometimes Food, c. 1900–1950*, London/New York 2023, 138–150; Matilda Baraibar Norberg/Lisa Deutsch, *The Soybean through World History: Lessons for Sustainable Agrofood Systems*, London/New York 2023, 138–146.

The advertising messages of agribusiness promised that the additional yield generated by the technological package of hybrid seeds and nitrogen fertilizers would exceed the additional costs, thereby increasing the profitability of the farm business.¹⁹

Hybrid corn and soybeans established a multi-functional symbiosis in the Corn Belt. Until the turn of the century, soybeans only existed in the USA in the niches of agricultural research, religious minorities, and Asian immigrant communities. In the early twentieth century, they emerged as a key crop for the Corn Belt farming system due to multiple functions: as a legume, the soybean improved the cereal-heavy cultivation ratio; as a nitrogen-fixing plant, it improved nutrient management of the soils; and as a protein-rich crop, it provided cheap feed for pigs and cattle. Since the self-pollinating soybean is not suitable for hybridization and associated commercialization, seed breeding was promoted by the state-led knowledge network under the auspices of the USDA rather than by private companies. Soy's connection to non-commercial breeding efforts gave agrarian experts in public service, such as Morse, a powerful role in the diffusion of this innovation. The USDA organized collections of soy seeds in East Asia (like the Dorsett-Morse expedition from 1929 to 1931), selected site-adapted varieties in trial fields, and provided high-yielding seeds to innovative farmers.²⁰ At the Arlington Experimental Farm in Virginia, close to the USDA's headquarters in Washington, D.C., Morse was in charge of testing soybean plants introduced mainly from East Asia before distributing them to experimental stations in different US states. Within the agrarian knowledge network, he and his colleagues in the USDA's Bureau of Plant Industry were the nationwide brokers of soybean seeds.

In close connection to hybrid corn, a more-than-human network emerged around soy from the 1920s onwards, which opened up a sustainable niche for this crop innovation. Various groups of actors worked together: the public research, education, and extension system, which generated, applied, and disseminated specialist knowledge; the American Soybean Association (ASA), which promoted internal communication between soy farmers and represented their interests externally; and the regional oil-crushing industry, which stimulated private and public willingness to invest through marketing incentives. The central human in this more-than-human network was perhaps Morse, who combined his professional affiliation with the USDA with leading positions in the ASA, including three terms as its president. Soy's commodity web encompassing beans, oil, and cake spread out from Illinois and proved its viability across the Corn Belt.²¹

Crisis management

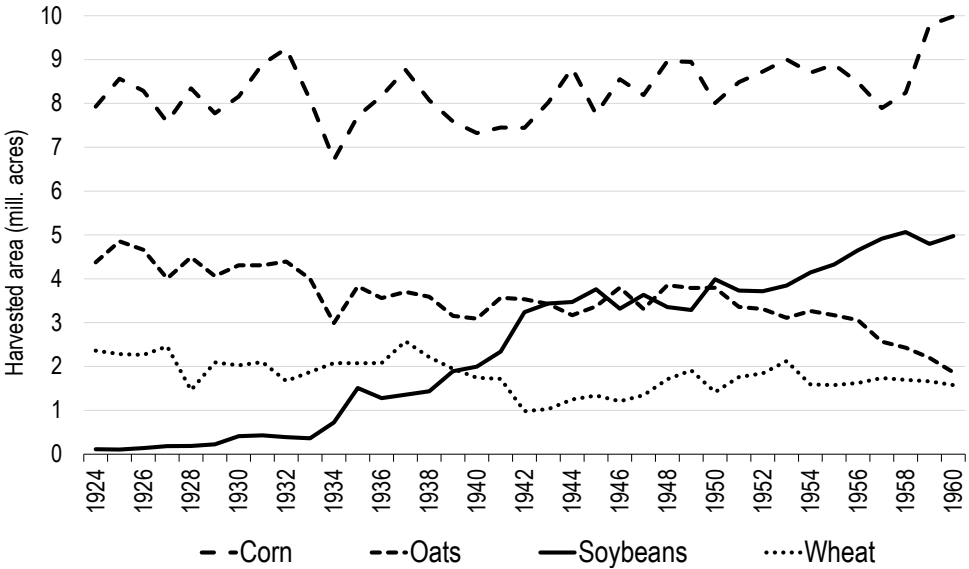
Attempts to address the multiple agricultural crises in the Corn Belt opened a window of opportunity for soybean expansion in the 1930s. From 1929 onwards, the Great Depression pushed the price of corn, which had already come under pressure during the world agricultural crisis since 1925, to a level that threatened the livelihoods of farming fami-

19 Jack R. Kloppenburg, *First the Seed: The Political Economy of Plant Biotechnology, 1492–2000*, Madison 2004, 91–129.

20 Christine M. Du Bois, *The Story of Soy*, London 2018, 53–70.

21 Matthew Roth, *Magic Bean: The Rise of Soy in America*, Lawrence 2018, 62–85; Shurtleff/Aoyagi, Morse, 560.

Figure 4: Harvested area of the main arable crops in Illinois, 1924–1960



Source: USDA, Quick Stats, <https://quickstats.nass.usda.gov>. Calculations by the authors.

lies. The vulnerability of family farms was exacerbated by the catastrophic wind erosion in the so-called Dust Bowl, caused by the large-scale conversion of grassland to fields since the mid-nineteenth century and triggered by an exceptional drought in the mid-1930s.²² The crisis management by the ruling Democratic Party under Roosevelt was based on state intervention: Production controls and price supports for agricultural products produced in excess under the Agricultural Adjustment Act (AAA) were intended to raise farm incomes. Moreover, the government promoted the replacement of nutrient- and water-consuming grains with soil-conserving crops. These interventions institutionalized price stabilization through supply management, which served the interests of the cotton–wheat–corn coalition of farmer lobbies for decades to come.²³

State-led agricultural regulation in the 1930s did not limit itself to short-term crisis management, but also pursued a long-term modernization project: the generalization of agrarian industrialization across the country, including the medium-sized farms of the Corn Belt, that had been pioneered in specific regions as early as the 1920s, notably by large wheat farms on the Great Plains. Accordingly, agricultural politicians, economists, and engineers – and increasingly also educated and affluent farm owners – conceived the farm as a factory run by the farmer as a businessman. The USDA, with Morse as its soybean expert, stood at the forefront of this ‘factorization’ of the farm. It supported the adoption of productive technology such as fuel- and electrically powered machinery. However, the Soviet lesson with

²² Donald Worster, *Dust Bowl: The Southern Plains in the 1930s*, Oxford 2004.

²³ Bill Winders, *The Politics of Food Supply: U.S. Agricultural Policy in the World Economy*, New Haven 2009, 51–74.

forced industrialization of state and collective farms taught that this transition should be implemented smoothly rather than too harshly.²⁴

Although the agricultural policy of the New Deal did not directly promote soybeans, the new crop benefited indirectly from the expanded room for manoeuvre (Figure 4). First, soy spread as a product not covered by the AAA on the set-aside areas formerly planted with corn. Second, soybean cultivation for hay production or green manure was promoted as a soil conservation measure. Third, the accelerated mechanization through the adoption of motorized machinery opened up areas formerly used to grow forage for draught animals for alternative uses such as soybeans. Fourth, the combine harvesters purchased for corn cropping were also suitable for soy plants. Fifth, soybeans were not only the most lucrative alternative in absolute terms but also an increasingly profitable alternative relative to corn itself. Sixth, the growing supply of soybeans fuelled demand from the processing industry and the Chicago Board of Trade.²⁵ At the ASA's annual meeting in 1936, Morse praised soy's rise in the USA as "one of the most remarkable agricultural developments of recent times." On the eve of the country's entry into the war, soy in the USA was already on its way from a niche to a key commodity.²⁶

Regime building

The state regulation of strategically important commodity chains during the Second World War finally established soy as a key commodity in the Corn Belt. The Pacific War interrupted imports of tropical oils and fats from Southeast Asia, which were essential for the armaments industry. As a result, the US government launched a production offensive for protein and oil crops, including soybeans, by sending material and non-material signals to farmers. The government's 'soybean battle' expanded the commodity frontier, as indicated by expanding acreages and crop yields. The supply-driven expansion was also closely linked to a demand-driven expansion: Soy oil, as the main product, flowed into the food and other industries; soy cake, as a by-product, went to the growing cattle fattening complex (Figure 5). The rapidly expanding oil-crushing industry fuelled the upsurge of soy production and consumption in the Corn Belt.²⁷ This glorious soy boom taking off during the war also cast its light on Morse, who was honoured as the "father of the soybean" upon his retirement from the USDA in 1949. However, the marketization of soy oil and cake by agribusiness was quite different from Morse's enthusiasm for home-grown green beans, called *edamame*.²⁸

Soy established itself as a key commodity of the emerging US-centred agro-food regime in the postwar period. The agro-industrial technology package of high-yielding seeds, motorized combines, and efficient herbicides promised to simplify and cheapen soybean cultivation in the core area now known as the Corn-Soy Belt. The stabilization of producer prices at a high level generated surplus supply, for which new channels of demand were opened up in the

24 Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture*, New Haven/London 2003, 184–190.

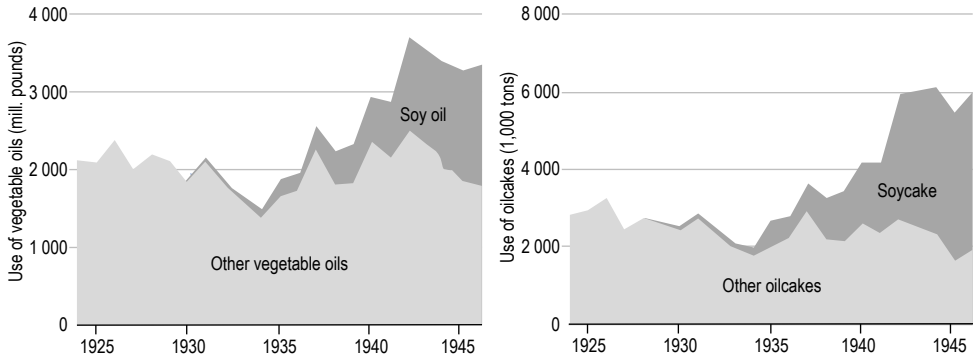
25 Edwin G. Strand, *Soybeans in American Farming*, Technical Bulletin 996, Washington, D.C., 1948.

26 Shurtleff/Aoyagi, Morse, 469.

27 Roth, Bean, 118–134; Prodhöhl, *Globalizing*, 155–165.

28 The Washington Post, 30 November 1949, 10.

Figure 5: Use of vegetable oil and oil cake in the USA, 1924–1946



Source: Strand, *Soybeans*, 1948, 45.

interests of soy farmers and agribusiness: Soy oil as a raw material for margarine, vegetable oil, and other high-fat foods; soy cake as protein-rich animal feed. As a versatile, though hidden, ingredient of prestigious oil- and meat-rich diets, soy thus nurtured middle-class lifestyles.

During the Cold War, cheap soy from North America also served as a geopolitical weapon to contain both world hunger and world communism through US-style economic development. Under the General Agreement on Tariffs and Trade (GATT) of 1947 and the European Recovery Program (ERP) of 1948, the USA exported surplus soy cake at preferential tariffs or subsidized prices. It was used as animal feed by the growing livestock complex in Western Europe and Japan, where middle-class families adopted meat-heavy diets as part of the 'American way of life.' Surpluses of soy oil flowed to food-deficient countries in the 'Third World' on a price-supported basis as part of the Food for Peace Program of 1954. These trade policies served the interests of the soy–corn coalition that organized farming and corporate interests in the US parliamentary and governmental domains. The postwar agro-food regime integrated soy into a mode of production and consumption based on unequal political and economic relations. However, soy played a paradoxical dual role in this framework as both a protagonist and an antagonist: On the one hand, cake as an animal feed and oil as an industrial raw material were inserted into the agro-industrial mainstream; on the other hand, whole beans served as a nutritional symbol of social movements in counter-cultural niches.²⁹

29 Bill Winders, *The Global Ascension of Corn and Soybeans: From Managing Supply to Expanding Production in the United States and the World*, in: *Agricultural History* 98/3 (2024), 470–480; Winders, *Politics*, 129–159; McMichael, *Regimes*, 32–39; Ernst Langthaler, *The Soy Paradox: The Western Nutrition Transition Revisited, 1950–2010*, in: *Global Environment* 11 (2018), 79–104.

Soy expansion in the USSR

Niche formation

Soybeans were known in the Russian Empire since the 1860s due to the Tsarist government's attempts to colonize the northeastern provinces of China ("Manchuria"), where the crop was native and expanded tremendously. Moreover, the Russo-Japanese War from 1904 to 1905 contributed to the imperial interest in soy. The Russian defeat was attributed to the worse provisioning of the Russian army, including its food rations as compared to the Japanese ones based on soy foods.³⁰ Furthermore, Russia benefited from transporting soybeans along the Chinese Eastern Railway (CER) as global trade began taking off before the First World War. Finally, the Russian colonists in the Amur region in the Far East learned how to grow and use soybeans from Korean immigrants and Chinese living on both sides of the border river.³¹

In the late nineteenth and early twentieth centuries, imperial agents in Manchuria established a diverse knowledge network around soy. The Imperial Russian Academy of Sciences, the Bureau of Applied Botany under the Ministry of Agriculture and State Property, and the largest Russian landowners sent their representatives to Manchuria or acquired networks of agents who supplied agro-botanical knowledge about soy. Representatives of diplomatic authorities and trading companies were also involved in knowledge accumulation, since the soybean was seen as a driver of economic growth. The CER established three departments for plant trials. Initially, their purpose was to provide "peaceful colonization" of Manchuria – that is, to disseminate Russian seeds and agro-technical knowledge to local people and facilitate the relocation of Russian peasants. But it soon became clear that the effectiveness of plant departments would increase if they accumulated knowledge about soybeans. At the experimental stations and laboratories, Russian specialists studied the botanical, chemical, and climatic features of soybeans.³² The CER collection of soybean seeds was later transferred to the genetic bank established by Nikolai Vavilov as President of the VASKhNIL and became the base for Soviet experiments.³³

The Manchuria-based knowledge network fostered experiments with soybeans by large landholdings, public agronomists, and peasants in other parts of the Russian Empire. Agronomists at landholdings in Kherson, Podolia, Grodno, Volyn, Chernigov, Voronezh, and other

30 On the role of soybeans in the Russo-Japanese War, see Du Bois, Story, 7–10.

31 On knowledge exchange between Russian colonists and Korean and Chinese inhabitants in the Amur River basin, see Natalia Ryzhova, 'The Failure of the 'Soybean Revolution' in the USSR', in: *Ab Imperio* 22/1 (2022), 191–222.

32 An overview of the work carried out by CER staff is presented in the paper: Petr F. Konstantinov, Raboty Sel'sko-Khozyaystvennoy Laboratorii Zemel'nogo Otdela KVZHD v Oblasti Issledovaniya Soyevykh Bobov [Work of the Agricultural Laboratory of the Land Department of the Chinese Eastern Railway on the Study of Soybeans], in: *Vestnik Man'chzhurii* 5 (1926), 40–55.

33 Information on the CER's contribution was obtained thanks to analysis of the collection of the Vavilov Institute and is described in the paper: Irina V. Seferova/Margarita A. Vishnyakova, Vklad sel'skokhozyaystvennykh opytnykh uchrezhdeniy Kitaysko-Vostochnoy zheleznoy dorogi v formirovaniye kollektzii soi VIR i v razvitiye yeye selektsii v SSSR [The Contribution of the Agricultural Experimental Institutions of the Chinese Eastern Railway to the Formation of the VIR Soybean Collection and to the Development of Its Breeding in the USSR], in: *Vavilovskiy zhurnal genetiki i selektsii* 18/3 (2014), 572–577.

agrarian provinces were among the most grateful recipients of soy knowledge.³⁴ At the turn of the century, these landholdings were already beginning to shift to capitalist production, therefore acquiring high-quality land and animal feed. Knowledge about the properties of soy often came from researchers in Central European countries (like Austria), but for seeds, educated agronomists went to Manchuria, including the CER's trial stations.³⁵

Public and private attempts to transfer knowledge about soybeans into practice yielded considerable success in the Russian Far East. Large landowners and even ordinary peasants in these regions, who had witnessed the incredibly rapid economic development of Manchuria, were already well aware of the commercial potential of soy in the 1910s. Experiments conducted near the Amur and in the province of Primorye aimed to obtain varieties and technologies that would reduce the required amount of manual labour, the scarcest resource in recently colonized regions.³⁶ Russians needed to either create a predominantly mechanized technology, along with appropriate varieties, or exploit the manual technique of the Chinese or Koreans as wage labourers or leaseholders. State agronomists struggled to follow the first option, but the second one was spreading, as illustrated by rising exports of soybeans and oilcake from Primorye to Manchuria.³⁷ However, the informal leasing of land by the Chinese and Koreans ran counter to the Russian Empire's plans for the colonization of the region.

The combined efforts of scientific, state, and commercial actors in late-imperial Russia established a polycentric and multifaceted network that provided soy with a promising niche. Many imperial agents visiting Manchuria siphoned knowledge and collected seeds; large commercial farms in the black earth regions used soybeans to improve the land; and Far Eastern farms, including peasant holdings, tried to develop the commercial potential of soybeans.

Crisis management

In the 1920s, the Bolshevik government faced two acute shortages: oil-bearing raw materials for various industries and protein sources for human and animal nutrition. The shortage of vegetable oils emerged during the First World War, but it was only overcome on the eve of the Second World War. A wide range of crops were considered as potential sources of vegetable oils – both those traditional for Russia, such as flax and sunflower, and new ones such as soybeans. In 1919, the acreage of oil crops amounted to only 54 percent of the level in 1917. Although it eventually exceeded the prewar benchmark by 70 percent by 1925, supplies of

34 Anastasiya K. Leshchenko, *Kul'tura Soi* [The Cultivation of Soy], Kyiv 1978.

35 The life and work of Ivan Ovsinski, a Ukrainian agronomist of Polish origin, serves as a good illustration of this point: Dmytro Korzun, *The Repressive Policy of the Russian Empire Authorities towards the Agronomist-Innovator, I. Ye. Ovsinsky (1856–1910)*, in: *Evropský Filozofický a Historický Diskurz* 6/4 (2020), 31–37.

36 One of the most significant mass experiments with soy was the one commissioned by steamship owners and conducted under the direction of agronomist Rubinsky near Blagoveshchensk: Vladimir I. Rubinskiy, *Otchet o proizvedennykh v 1915 g Amurskoy agronomicheskoy organizatsiyey opytakh po kul'ture maslinichnoy soi v usloviyakh Amurskoy oblasti* [Report on the 1915 Experiments on Cultivating Oil Soybeans under the Conditions of the Amur Province by the Amur Agronomic Organization], Blagoveshchensk 1916.

37 For more details, see Ryzhova, *Failure*, 206–207. Statistics on export volumes from the Ussuri region in 1911: Vladimir D. Pesotskiy, *Khun'-Chun'skaya dolina* [Khun-Chun Valley], in: *Vestnik Azii. Zhurnal obshchestva russkikh oriyeentalistov* 1 (1913), 9–27.

vegetable oils were still insufficient for both food and industrial purposes.³⁸ This was due to shifts in the structure and scale of demand for vegetable fats: On the one hand, consumption of animal fats was declining; for instance, butter was in short supply and prohibitively expensive. On the other hand, new industries such as soapmaking, paint and varnish production, and food processing were demanding ever greater volumes of oils.

The shortage of proteins in particular, and of foodstuffs in general, developed later than the oil deficit, but it proved no less acute.³⁹ Soviet citizens lived in conditions of chronic undernourishment, and food technologists began inventing various alternative products including soy milk, soy sausages, and soy-based meat substitutes. Soy appeared to be an ideal solution. A newspaper article citing research by botanists and nutritionists claimed that “one kilogram of soybeans can yield twelve glasses of sour milk.”⁴⁰ The use of soy-based products for mass consumption had first been discussed during the Russo-Japanese War, but soy was still regarded as the “meat of the poor” at the time.⁴¹ The wave of innovations that emerged in the 1920s, drawing on experiences from Austria, Hungary, Manchuria, and the United States, was relatively effective. Although the new foods tasted bland and it was difficult to eliminate the soybean odour, there was at least something to eat.

In the face of the oil and protein crises, the Bolshevik government sought not only to mitigate shortages but also to reconfigure the political and economic order by restructuring knowledge infrastructures. Soviet administrative bodies made use of imperial-era networks and expertise: The Oil and Fat Syndicate dispatched representatives to Japan and Manchuria to study soybean cultivation and processing,⁴² while simultaneously organizing geographical experiments that enlisted peasants for soybean production.⁴³ Agronomist Vsevolod Zolotnitsky was assigned to the Amur experimental station, a site of extensive pre-revolutionary trials, to initiate breeding trials with soybeans. Later on, this station was visited by Vavilov.⁴⁴ These initiatives illustrate the broader transformation of knowledge networks around soy, and cash crops in general, as Soviet institutions sought to integrate international expertise with domestic imperatives.

38 Viktorin A. Popov, *Soyevyye boby i syr'yevaya problema zhirovoy promyshlennosti* [Soybeans and the Raw Material Problem of the Fat Industry], Moscow/Leningrad 1927, 54–59.

39 Nataliya Lebina, *Sovetskaya povsednevnost': normy i anomalii. Ot voyennogo kommunizma k bol'shomu stilyu* [Soviet Everyday Life: Norms and Anomalies. From War Communism to the Grand Style], Moscow 2015, 45–48.

40 Dorogu zamechatel'noy kitaianke [Give Way to the Remarkable “Chinese Lady” (Soybean)], in: *Povolzhskaya pravda*, 27 April 1930.

41 Yaponskaya soya (ili „myaso bednyakov“), samyy pitatel'nyy produkt rastitel'nogo tsarstva i pitatel'nyy kofe iz soi, prigotovlennyy v m. Kvirily [Japanese Soybean (or “Meat of the Poor”), the Most Nutritious Product of the Plant Kingdom, and Soy Coffee Prepared in Kvirila], Tiflis 1910, 27; Anatoliy Y. Vuchino, *Soya kak odin iz luchshikh pishchevykh i kormovykh produktov rastitel'nogo tsarstva* [Soy as One of the Best Food and Fodder Products of the Plant Kingdom], in: *Dokl. S'yezdu deyatley po sadovym kul'turam*, Tiflis 1901, n.pag.

42 Popov, *Soyevyye boby*, 3.

43 Vladimir D. Blagorazumov, *K voprosu o raionakh vozmozhnogo vozdeystviya soevykh bobov na Amure i v smezhnykh oblastyakh DVK* [On the Regions Suitable for the Cultivation of Soybeans on the Amur and in Adjacent Areas of the Far Eastern Krai], in: *Soya na Amure, Blagoveshchensk* 1930, 47–55.

44 Ol'ga O. Kletkina, *K 125-letiyu so dnya rozhdeniya Vsevoloda A. Zolotnitskogo – vydayushchegosya dal'nevostochnogo uchenogo-selekttsionera* [On the 125th Anniversary of the Birth of Vsevolod A. Zolotnitsky – an Outstanding Far Eastern Breeder], in: *Vestnik DVO RAN* 2/186 (2016), 20–23.

The Soviet networks of plant knowledge production were to be further extended as well as becoming more centralized. Regional branches and small experimental stations were instructed to carry out all work exactly according to the authorities' assignments, sending collected knowledge to the centre as well as facilitating the local implementation of decisions taken by the planning bodies.⁴⁵ This system was in place by the 1930s and existed – with cosmetic changes – for the next seven decades. The All-Russian Institute of Plant Protection, directed by Vavilov, maintained central control together with two specialized institutes, the Institute of Soy and Special Crops and the Institute of Oilseeds.

The Soviet model of large-scale production and centralized knowledge acquisition promoted techno-scientific exchange with the USA, which was a forerunner of industrialized and state-supported agriculture. Despite the fundamental differences between socialist and capitalist modes of production, Soviet scholars and technocrats were convinced that the US model required only minor adaptation to work in the USSR. The main feature that the Bolsheviks sought to copy was the replacement of a great diversity of plants with few industrialized specimens.⁴⁶ Soybeans, as a source of industrial oils, animal feed, and edible proteins and fats, had an important role to play in this regard. Despite the modest volumes of soybean production in the USSR, scientists from both countries – through personal correspondence as well as via the Bureau of Applied Botany opened by Vavilov in New York in 1921 – exchanged seeds, scientific literature, and personal observations. By the mid-1930s, however, free academic exchange, and therefore effective scientific enquiry, had become more difficult under Stalinist rule.⁴⁷

Regime building

The “soybean revolution” was implemented in the late 1920s and early 1930s in the framework of state-enforced collectivization, which replaced peasant family farms and villages with centrally planned collective and state farms to boost grain output for domestic consumption in industrial districts and export to technology-supplying countries. The means to this end included suppression, expropriation, displacement, starvation, and even execution of large numbers of rural dwellers suspected to be hostile *kulaks*.⁴⁸ The political, economic, and social turmoil induced by the forced collectivization both enabled and limited the expansion of the soybean as a crop innovation on Russian soils.

In the late 1920s, the Bolshevik government announced a “soybean revolution” to overcome the twofold shortage of oils for the emerging industry and of protein and fats for human and animal nutrition. The idea of introducing soybeans was actively discussed in

45 On the changes in selection management, which were not only about soybeans, see Ol'ga Y. Yelina, *Ot tsarskikh sadov do sovetских poley: Istoriya sel'skokhozyaystvennykh opytnykh uchrezhdeniy* [From Tsarist Gardens to Soviet Fields: The History of Agricultural Experimental Institutions], Moscow 2008.

46 It is no coincidence that many similarities can be found between the selection systems in the USSR and the USA: Courtney Fullilove, *The Profit of the Earth: The Global Seeds of American Agriculture*, Chicago 2017, 14.

47 Peter Pringle, *The Murder of Nikolai Vavilov: The Story of Stalin's Persecution of One of the Great Scientists of the Twentieth Century*, New York 2008, 150–157.

48 Scott, *Seeing Like a State*, 201–218.

the press, at government meetings, at scientific events, and at assemblies of collective farm members. Soybeans even made their way into children's literature: Lev Kassil wrote a short propaganda piece entitled *Fried Eggs without Eggs*,⁴⁹ and Soviet satirical writers Il'ia Ilf and Evgenii Petrov mocked the craze surrounding the crop.⁵⁰ Propaganda materials continued to report on the success of soybean introduction, even when it became clear that the "revolution" was stalling: "The best collective farms of the region, which this year achieved soybean yields of 30 centners per hectare, show that the Far East can and will become a land of high Stalinist harvests."⁵¹ Brochures on soybean production, published in the United States and imported into the USSR, were fully translated from English into Russian and apparently used in preparing printed materials for propaganda and training.⁵²

Despite the propaganda for voluntary adoption of soy, this crop innovation was also imposed via directives from the central planning bodies. A striking example of such a directive, with demotivated peasants and intellectuals, is the sowing of soybeans in the Caucasus and Ukraine from 1928 to 1932. In 1930, Leonid Bordakov, professor at the All-Union Institute of Plant Industry, had to inspect disastrous soybean and cotton sowings in the northern Caucasus and eastern Ukraine. He reported on countless mistakes, negligence, and disregard for local labour and climatic conditions. Despite his detailed analysis, his recommendations were neither published nor acted upon, and mass sowings in the Caucasus and Ukraine continued for two more years. Bordakov himself was executed in 1938 as a suspect person.⁵³ According to the five-year plan, soy was to be introduced in all territories suitable in terms of the number of sunny days. In some cases (like Semirechye in Kazakhstan), the Soviet authorities undertook scientific experiments, testing agro-techniques, analysing water and climatic conditions, and, most importantly, selecting regionally suitable seeds. In other areas like the Azov-Black Sea region, however, they simply sowed mixed varieties of unadjusted seeds across huge territories, causing crop failures and contributing to repeated famines.⁵⁴

Besides disregard for social and natural conditions in the rural areas, the soy experts themselves came under scrutiny by the authoritarian state. The repression machine worked to equalize all specialists, ensure their obedience, and preclude potential criticism of irrational decisions. The agrobotanist Irina Savich,⁵⁵ who bred the Primorskaya 529 cultivar used as the main seed in the Primorsky region until the end of the 1970s, was executed in 1938. Her encounter with the repressive apparatus began earlier, however, with her husband already having been arrested in 1933. Despite disagreeing with this repressive treatment, Savich had

49 Lev A. Kassil, *Yaichnitsa bez yaits* [Fried Eggs without Eggs], Moscow 1931.

50 Il'ia A. Ilf/Evgenii P. Petrov, *Kak sozdavalsya Robinzon* [How Robinson Was Created], Moscow 1933.

51 *Chrezvychainyi VIII S'ezd Sovetov. Stenograficheskii otchet: 25 noiabria – 5 dekabria 1936* [Extraordinary VIII Congress of Soviets. Verbatim Report: 25 November – 5 December], Moscow 1936, n.pag.

52 Vladimir I. Geymer, *Sortirovka i poluchenie uluchshennogo semennogo materiala* [Sorting and Obtaining Improved Seed Material], Moscow 1932; *Soya (soevye boby): Kak vozdel'vat' soiu v Armavirskom okruge Sev.-Kav. kraia* [Soy (Soybeans): How to Cultivate Soy in the Armavir District of the North Caucasus Region], Armavir 1930.

53 <https://istmat.org/node/36515> (10 October 2025).

54 Ryzhova, *Failure*, 216–217.

55 Irina N. Savich, *K voprosu o klassifikatsii soyevykh bobov* [On the Classification of Soybeans], in: *Vestnik Mankzhurii* 11 (1929), 20–35.

to continue breeding – but her effective work did not prevent her later arrest.⁵⁶ Similarly, Ivan Zolotnitsky, later awarded the Stalin Prize for his soybean breeding, was arrested in 1937 and remained imprisoned for two years. He lived under pressure for the rest of his life.⁵⁷ Even Vavilov, one of the most enthusiastic promoters of the “soybean revolution” and founder of the Soybean Institute, was gradually dismissed from the mid-1930s onwards and finally died of starvation in a camp in 1943.⁵⁸

Despite all hopes, soy failed to become a significant source of industrial oils, foodstuffs, and animal feed, and thus a key resource in the Soviet planned economy.⁵⁹ During the first five-year plan from 1928 to 1932, the planners initially envisioned a sevenfold increase of arable land under soybean cultivation to 358,000 hectares, with these figures eventually even being doubled to 720,000 hectares.⁶⁰ The actual cultivated acreage amounted to 50,000 ha in 1928, 140,000 ha in 1930, 468,000 ha in 1931, 300,000 ha in 1932, 170,000 ha in 1937, and 290,000 ha in 1940. Soviet statistics must be treated with caution, of course; the final figure in particular seems unreliable, since another source reported 25,100 hectares for 1938.⁶¹ The broader pattern is clear, however: At first the planned targets consistently exceeded reality; then, after a short-lived boom in the early 1930s, soybean cultivation contracted rapidly. The targets first articulated in 1928 eventually appear to have been met as late as 1962, when the acreage expanded to 825,000 hectares.⁶² In other words, the announced “soybean revolution” – a significant and lasting increase in soy production and use – did not happen in the USSR. Its champions – above all, Vavilov and his associates – failed to achieve the goals they had set. The Soviet state did eventually manage to achieve the proposed goals, but only much later and with serious losses in efficiency. Thus, the Soviet “soybean revolution” remained a floundering attempt that can be classified neither as a total success nor as a complete failure. In any case, the Soviet Union clearly failed to replicate the US soy expansion it had tried to emulate.

The outcome of the Soviet “soybean revolution” was man-made. The planning authorities preferred large-scale, mechanized monoculture production – an approach that required appropriate technology, such as machinery, along with crop varieties suitable for industrial production and processing. Criticism by agricultural experts was disregarded and even prosecuted by the authorities. The Soybean Institute was closed, some experimental stations shifted to other crops, and mass soybean experiments were curtailed. The Oil and Fat Syndicate, a centralized body acting on behalf of the state, terminated the financing of the “soybean revolution” in favour of sunflower, flax, and other oilseeds. Obstacles emerged not only on the production side but also on the consumption side of the fragile commodity chain: Consumers regarded soy foods as inferior substitutes and therefore replaced them with more prestigious dishes after the era of crisis and war. Moreover, demand for soy as

56 Elena V. Vasil'eva, *Stanovlenie sovetskoi nauchnoi intelligentsii na Dal'nem Vostoke Rossii* [Formation of the Soviet Scientific Intelligentsia in the Russian Far East], in: *Revue des études slaves* 71/1 (1999), 35–57.

57 Kletkina, 125-letiyu so dnya, 121.

58 Shurtleff/Aoyagi, Morse, 701.

59 Ryzhova, Failure.

60 *Seĭskoye khozyaystvo SSSR: K pyatiletke 1927/28–1932/33* [Agriculture of the USSR: For the Five-Year Plan 1927/28–1932/33], Moscow 1927, 23.

61 *Posevnyye ploshchadi*, 20–23.

62 <https://www.fao.org/faostat> (1 October 2025).

animal feed and as an industrial raw material was limited. Soviet soy may thus be seen as a symbol of the gap between plans and reality: On the one hand was the modernist vision of industrialized agriculture; on the other, the dire reality in which its implementation failed to work.⁶³ Due to the floundering of the envisioned “revolution”, the soybean only occupied a small niche in the Soviet agro-food system – whereas in the US, it became a pillar of a new global agro-food regime.⁶⁴

Soy expansions in comparison

The United States and the Soviet Union offer sharply contrasting cases among the world’s soybean producers. Between the late 1930s and the early 1950s, soybean acreage in the USA expanded nearly fivefold (+ 385 per cent), while in the USSR it increased by only about one-third (+ 34 per cent), well below the global average (+ 65 per cent). If USDA statistics can be considered reliable, the evidence is clear: The true “soybean revolution” as part of the state-regulated industrialization of privately-owned family farms unfolded in the United States, whereas in the Soviet Union, it was a faltering attempt within the dynamics of state-imposed land collectivization and agrarian industrialization (Table 1). To frame these development pathways in MLP terms: In the USA, soy was scaled up from a niche to the regime and became a pillar of the transformed agro-food system. In the USSR, despite attempts to incorporate soy into the regime, it only occupied a niche within the transformed agro-food system.

Table 1: Soybean acreage by countries, 1935/39–1950/54

Country	Average 1935/39 (1,000 hectares)	Average 1950/54 (1,000 hectares)	Change (per cent)
China (incl. Manchuria)	8,661	11,420	+ 32
USA	1,231	5,968	+ 385
Korea/South Korea	777	253	– 67
Dutch Indies/Indonesia	360	431	+ 20
Japan	329	421	+ 28
USSR	246	329	+ 34
European countries	36	36	– 1
Other countries	136	518	+ 281
World	11,776	19,376	+ 65

Source: USDA, *Agricultural Statistics 1948*, Washington, D.C. 1949, 152; USDA, *Agricultural Statistics 1960*, Washington, D.C. 1961, 138. Calculations by the authors.

63 For a similar gap using different empirical material (with soybeans also mentioned only in passing), see Jenny L. Smith, *Works in Progress: Plans and Realities on Soviet Farms, 1930–1963*, New Haven 2014.

64 For further information on the marginal role of soybeans in Soviet industry and the reasons behind it, see Thomas W. Bickerton, *USSR Oilseed Production, Processing, and Trade*, Washington, D.C. 1987.

The US and Soviet soy expansions involved factors that determined their outcomes, including ecological conditions, knowledge and technology, farmers' attitudes and networks, market dynamics, and regulatory institutions. Although these factors were intertwined in various ways, they can be assessed separately for comparative purposes. First, *ecological conditions* mattered because the soybean plant originating from East Asia had to be adapted through breeding efforts to the respective regional soils, climates, and day lengths. In the USA, the state-coordinated knowledge network of agricultural colleges and experimental stations under the auspices of the USDA organized seed collection, testing, selection, crossbreeding, and distribution in a concerted effort over several decades. Though centrally coordinated by the USDA, the agrarian knowledge network, with its decentred nodes in diverse states, was flexible enough to respond to regional obstacles and opportunities. While the first initiatives were centred in the Cotton Belt in the subtropical US South, the soybean finally experienced its breakthrough in the Corn Belt in the climatically moderate Midwest.⁶⁵ It also did not expand in the Corn Belt on its own, but rather in close connection with hybrid corn. The synergies mobilized by this inter-crop relation were crucial for the US soy expansion from the 1930s onwards. The annual corn-soy rotation became the dominant mode of using the region's previously depleted agricultural soils. It helped to restabilize the nutrient cycle in a plant-based fashion through the interplay of nitrogen deposition by soybeans and nitrogen extraction by hybrid corn. The dominance of this biotechnological package is reflected in the region's labelling as the Corn-Soy Belt by the 1950s.⁶⁶

In the USSR, soybean selection was organized in a highly centralized and standardized manner that rarely reflected the ecological conditions of the respective regions. Curiously, Soviet planning authorities initially believed that soybeans were suitable for arid climates and designated regions for cultivation based on this assumption. Due to a lack of understanding of agroecological conditions, centralized seed selection and the prescribed agricultural requirements were often far from the necessary conditions. All activities necessary for selection – seed collection, testing, and breeding – were coordinated from above, leaving little room for local initiatives. The rejection of scientific pluralism was a key factor in Soviet innovation failures,⁶⁷ and the case of soy illustrates this argument vividly. Dozens of trial stations in the peripheries were instructed to plant a limited set of centrally-selected varieties while also searching for potential local ones.⁶⁸ Yet, local varieties were often disregarded as unsuitable and could even vanish entirely, as happened with the Dungan soybean discovered by the Almaty station in 1931: Though described in a scholarly article, it soon disappeared without a trace.⁶⁹ Soybean plants were not integrated into an agroecologically sound crop rotation, and hybrid corn, as a potential partner, expanded in the USSR only after the Second World War.

65 Roth, Bean, 62–85.

66 Robert S. Loomis/David J. Connor/Kenneth G. Cassman, *Crop Ecology: Productivity and Management in Agricultural Systems*, Cambridge 2011, 459–467.

67 Loren R. Graham, *What Have We Learned About Science and Technology from the Russian Experience?* Stanford 1998.

68 Ryzhova, Failure; Tsentral'nyi gosudarstvennyi arkhiv nauchno-tekhnikeskoi dokumentatsii Sankt-Peterburga [Central State Archive of Scientific and Technical Documentation of Saint Petersburg], fond R-318, opis' 11, delo 558, 11.

69 Vladimir Yu. Lobanov, Dungsanska Soya [Dungan Soybean], in: *Prikladnaya botanika, genetika i selektsiya* 9 (1934), 85–86.

Second, although the necessary *knowledge and technology* were available in both countries, US and Soviet farms' access to it differed. In the USA, the state-coordinated research, education, and extension network was well-connected to the ASA, which organized the soy farmers. While the former generated, applied, and disseminated specialist knowledge, the latter distributed practical knowledge among soy farmers, either directly through personal communication (for example, annual field days) or indirectly through mass media like the monthly *Soybean Digest*. Once this techno-scientific network had created a stable niche for soybeans in the 1920s, the diffusion of innovations in farm technology driven by the government-led industrialization of agriculture paved the way for further expansion from the 1930s onwards. Most importantly, machinery for corn cropping, such as combines, was also applicable to soybeans.⁷⁰ While the techno-scientific network around soy was state-coordinated, its complementation with hybrid corn was organized by capitalist enterprises that exploited the associated profit opportunities. Whereas farmers could reproduce soybean seeds year by year, they had to purchase hybrid corn annually as a market product due to its biotechnological fixation on one-year yields.⁷¹

By contrast, in the USSR, the transfer of knowledge from academic elites and trained agronomists to collective farmers was weak, while at the same time planning authorities, often poorly educated, set unrealistic targets. In this context, neither breeders nor agricultural producers had much interest in maintaining close contact. When crops failed, responsibility was placed on agronomists or farmers rather than on the planners themselves, leaving farmers with little incentive to try new crops and breeders with little motivation to innovate. The political 'socialization' of scientists and breeders also contributed to the lower efficiency of the innovation process.⁷² Marginalization and repression of those trained in imperial Russia undermined professional standards and weakened resistance to ill-founded directives. As the cases of Bordakov, Savich, and Zolotnitsky show, soy experts were also prosecuted, imprisoned, and even killed in the turmoil of Stalinist political cleansing. Thus, the Soviet repressive apparatus was an obstacle to the emergence of an effective knowledge network around soy.

Third, *farmers' attitudes and networks* played a decisive role in the US and Soviet "soybean revolutions". Both countries developed networks of interested agents who pursued personal benefits by participating in a shared undertaking. However, the guiding logics of these networks, oscillating between self-organization and subordination, differed. In the USA, the ASA interlinked soy farmers and tried to convince them both directly (via personal interaction) and indirectly (via print and audiovisual media) of the great benefits and low costs of the "miracle bean". Support from the state-coordinated knowledge network and the oil-crushing industry strengthened these efforts as early as the 1920s. Legal and financial incentives from the 1930s onwards further improved soy's reputation and profitability. Most importantly, soy cultivation became a target of federal policies in the New Deal era and the Second World War. Farmers were not only urged by agricultural extension and the mass media to grow soybeans for patriotic and agronomic reasons, but also incentivized to do so by attractive prices and bonuses. Moreover, the regionally concentrated but growing farmers' network organized by

70 Roth, Bean, 62–85; Strand, Soybeans; Fitzgerald, Farm, 184–190.

71 Kloppenburg, Seed, 91–129.

72 This phenomenon, as it concerns technical intelligentsia, was studied in Kendall E. Bailes, *Technology and Society under Lenin and Stalin: Origins of the Soviet Technical Intelligentsia, 1917–1941*, Princeton 2015.

the ASA created its own contagious dynamics for the diffusion of soy, especially in conjunction with hybrid corn: Early adopters among the farming community motivated their relatives and neighbours to adopt this promising crop innovation.⁷³

In the USSR, members of agrarian knowledge networks – including workers from academic institutions, the Oil and Fat Syndicate, and occasionally agrarian volunteers – were required to prioritize the interests of the socialist state. This pressure did not always negatively impact outcomes; for instance, collective farmers initially participated actively in academic geographical experiments, including those focused on soybeans. However, the general chaos of the early Soviet period, frequent shifts in goals and objectives, and most notably the economic demotivation typical of collective farms rendered these networks ineffective. This reservation was particularly strong in regions such as the Ukraine and Caucasus, where soy was introduced to replace familiar and income-generating crops. Since the plant innovation was conceived as a cash crop rather than a food crop, it was not suited as a source of self-provision during the widespread famines of the 1930s induced by the Soviet government's struggle with resistant peasant communities (*kulaks*).⁷⁴

In addition, the chronic gap between the ambitious plans according to the centre's political expectations and the actual infrastructural, ecological, and personnel capacities on the ground contributed to soy's floundering in the USSR.⁷⁵ A particularly telling example of the gap between plans and realities was the Soviet Korean case. The only region of the USSR where soybeans were produced on an industrial scale was Primorsky Krai, and the only ethnic group that had begun to cultivate the crop for Soviet industry in response to state incentives (fixed purchase prices and tax relief) was the Koreans. Yet, Soviet functionaries frequently claimed that the Korean method of manual soil cultivation did not conform to Soviet modernism and therefore had to be abandoned. In practice, Koreans combined their traditional knowledge (including soybean cultivation on raised beds) with the use of agricultural machinery whenever possible.⁷⁶ Almost every collective farm operated by Koreans, before their forced deportation to Central Asia in 1938, owned at least one tractor (some even had several), and the majority cultivated soybeans.⁷⁷ Although the available varieties could not be harvested mechanically, this did not prevent Koreans from steadily increasing production each year. Nonetheless, 'non-modern' techniques constantly irritated Soviet functionaries. As a result of the deportations, soybean production in the Primorsky Krai region collapsed almost entirely in the 1940s.

Finally, peasants' everyday resistance to innovations contributed to the faltering of the soybean expansion. Although the official reports must be read critically, they complain about widespread drunkenness in the villages, peasants' unwillingness to cultivate the crop, and the refusal of unfamiliar industrial techniques. One report even mentions popular songs about soybeans killing everyone around them, forcing people to flee the region, and causing them to refuse to work altogether, even though the Soviet government provided them with everything

73 Roth, *Bean*, 62–145; Strand, *Soybeans*.

74 Ryzhova, *Failure*, 216.

75 Smith, *Works*.

76 Boris L. Bruk, *Birsko-Bidzhanskii raion Dal'nevostochnogo kraia: Trudy ekspeditsii 1927 Birsko-Bidzhan* [District of the Far Eastern Krai: Proceedings of the 1927 Expedition], ed. Vasil'yi R. Vil'yams, Moscow 1928.

77 Natalia Ryzhova, Koryo Saram in Agriculture: 100 Years of Everyday Resistance, in: *Ojkumena Regional Researches* 4 (2023), 67–77, 71.

they needed for free.⁷⁸ Peasant resistance was a widespread phenomenon, of course – but in the early Soviet years, it acquired particularly distinctive forms.⁷⁹

Fourth, *market dynamics* – primarily shifts in demand from industry and consumers – also affected the soy supply. In the USA, the oil-crushing industry in the Corn Belt offered attractive market opportunities to soy farmers as early as the late 1920s. Increasing demand from the 1930s onwards, especially during the Second World War, channelled soy to the food and manufacturing industries. However, soy foods did not manage to break out of their small niche. For instance, full-fat soymeal produced for domestic consumers ended up as food aid for allied and neutral countries during the war. Rather than whole beans, their separated components – oil and cake – were increasingly marketed during and after the war. They were used as raw materials for the emerging food industry and thereby incorporated into agro-industrial commodity chains. Throughout the Corn Belt, the state-subsidized oilseed crushing industry expanded its locations and capacity. For consumers in postwar America and beyond, soy became a nearly omnipresent, though hidden, ingredient of emerging middle-class lifestyles.⁸⁰

In the USSR, the market situation was quite different. Despite the shortage of proteins and oils for nutrition and industrial use – especially in the prewar, wartime, and postwar years – soy-based products did not find their way to mass consumption.⁸¹ Contrary to the planners' hopes during the 1930s of introducing soybeans in most Soviet peripheral regions to generate a significant supply of this oil and protein product, they were actually produced in considerable amounts only in the Russian Far East. Even the tax reliefs and other incentives offered to soybean producers by the state from 1928 until the end of mass collectivization in 1935 were of particular interest only to Soviet Koreans. But besides supply, domestic demand was also limited. Despite enthusiastic newspaper reports about soy-based protein and fat substitutes,⁸² propaganda campaigns, and even the opening of several soy food factories, people were reluctant to consume the strange-tasting commodity. Only after the 1950s was soy lecithin more commonly incorporated into the formulation of Soviet sausages, candies, or chocolates. In this way, soy eventually became a hidden and permanent ingredient in the diet of Soviet citizens as well – with this 'hiddenness' in certain products being quite literal. Consumers were not always informed of, but often suspected, the presence of cheap and low-quality substitutes. Unlike domestic demand, international demand did not play a major role for the Soviet Union in the postwar era. While the USA became the world's leading producer and exporter, with Western Europe and Japan becoming major importers of soy, the USSR did not play a prominent role in world trade.⁸³ After 1950, with the development of the Council for Mutual Economic Assistance, the USSR attempted to take control of soybean variety

78 On the failure of mass soy experiments in Ukraine and the Caucasus, see Ryzhova, *Failure*, 216–217.

79 Sheila Fitzpatrick, *Stalin's Peasants: Resistance and Survival in the Russian Village after Collectivization*, New York 1994.

80 Langthaler, *Krisengewinnerin*.

81 Leбина writes about the communist fascination with soy foods in her book about Soviet everyday life: Leбина, *Sovetskaya povsednevnost'*, 45–48.

82 Kul'tura soi [The Cultivation of Soy], in: *Nauka i tekhnika* 15 (1928), n.pag.; *Interventsiia v polevodcheskii uklad nashei strany* [Intervention in Our Country's Field-Crop System], in: *Sel'skokhoziaistvennaia gazeta*, 28 March 1930, 3.

83 Ernst Langthaler, *Great Accelerations: Soy and Its Global Trade Network, 1950–2020*, in: Claiton Marcio da Silva/Claudio de Majo (eds.), *The Age of the Soybean. An Environmental History of Soy During the Great Acceleration*, Winwick 2022, 65–90.

selection and promote greater cooperation in soy utilization in food and other industries. Despite some progress in the expansion of cultivated area in several other socialist countries (Hungary, Yugoslavia, and Romania),⁸⁴ it was hardly noticeable against the background of the global leadership position of US soy.

Fifth, all the factors discussed above were, in one way or another, related to the *state-led regulatory framework* of the agro-food system – first and foremost, to government policies. In the USA, the crisis management efforts of the New Deal administration with production control, price support, and soil conservation in the 1930s opened up windows of opportunity for soy to scale up from a niche product to a mainstream commodity. In the 1940s, soy became a pillar of the US-centred global agro-food regime. The initial impulse in this direction was the wartime policy to replace scarce foreign oilseeds with domestic ones. The upscaling of soy was further amplified by the GATT and ERP frameworks during the post-war era. In this way, the US administration extended the market for soy products beyond its national borders and across the Atlantic and Pacific Oceans to include Western Europe and Japan. GATT negotiations to relieve tariffs provided the US soy business with free market access. By the 1950s, the USA had gained undisputed dominance in the world market for soy.⁸⁵ Despite the glorification of market forces vis-à-vis central planning in the Cold War discourse, the rise of soy as a key commodity of the US agribusiness was only secondarily driven by supply and demand factors. Its prime driving force was the interventionist federal government, which had to manage major economic, ecological, and military crises while also respecting the interests of farmers and agribusiness. In short, the state created the market conditions for soy to flourish.

In the USSR, the state-led “soybean revolution” aimed to replicate the US soy expansion already underway in the 1920s. This drive for soy production, initially dictated by the acute shortage of oils and fats, also involved an ideological impulse. Every five-year plan, all-Soviet meeting, or ministerial document – whether in 1930, 1950, or 1970 – contained the same statement: The USA is the world leader in soy production, but the Soviet Union has the potential to achieve no less, and perhaps more, successful utilization of this crop. However, all attempts to introduce soy in the USSR fell through due to technical and institutional problems resulting from the modernist project of large-scale, mechanized, and monocultural – and therefore putatively “efficient” – production. The various efforts largely disregarded or contradicted both human and non-human dynamics: In the 1930s, there was insufficient access to acclimatized soy varieties and suitable technologies; in the 1940s, there were no trained people who could master the new technologies; in the 1950s, there were no consumers demanding soy foods; and during the entire period, there were no enthusiastic collective and state farm chairmen willing to risk the prescribed plans for unfamiliar crops. The fact that Soviet soy experiments continued even in regions that were considered unsuitable (like Kazakhstan or Kyrgyzstan) was also due to state policy: Central planners always returned to soy when another crisis arose. The Academy of Sciences was ready to serve this transitory

84 Zoya F. Slavova et al., *Proizvodstvo, pererabotka i ispol'zovanie soi* [Production, Processing and Utilization of Soybeans], Kyiv 1977.

85 Langthaler, Krisengewinnerin.

interest by providing the results of sluggish and therefore ineffective experiments.⁸⁶ While agricultural planning was also part of US policies starting in the 1930s, Soviet planning differed in one major respect: It was planning conducted by a central elite of experts, backed – but sometimes also prosecuted – by the Stalinist dictatorship, which largely disregarded social and ecological dynamics in peripheral places. In contrast to its US counterpart, the Soviet soybean expansion was rather disembedded from rural communities and agro-ecosystems.

Conclusion

Our comparison of the soy expansions in the USA and USSR from the 1920s to the 1950s highlights how and why transitions of the agro-food regime may unfold or not. The US case represents a fully-fledged agro-food transition spanning several decades. It began with niche formation until the 1920s, when a state-led knowledge network organized by soybean enthusiasts such as William Morse, market opportunities provided by the oilseed industry, and the ASA, as a dedicated farmers' organization, established a soy commodity network. It continued with crisis management in the 1930s, when the New Deal administration, by managing the economic and ecological crisis, opened up windows of opportunity for soy – in alliance with hybrid corn – to enter the farming systems in the Corn Belt. It was completed with regime building in the 1940s, when the wartime government ramped up soy production, processing, retail, and consumption before institutionalized commodity chains under the postwar US-centred agro-food regime channelled American soybeans to domestic and overseas markets.

The Soviet case also represents a fully-fledged transition, at least with respect to the state-enforced transfer of peasant property rights to centrally controlled collective and state farms. However, the agro-food transition floundered concerning the proclaimed “soybean revolution.” This faltering transition began with niche formation until the 1910s, when a multi-local knowledge network around soy emerged, with an emphasis on the Far East. It continued with crisis management in the 1920s, when the Bolshevik government centralized the agricultural knowledge network and identified soy as a key resource for food, feed, and industrial processing. It was dynamized in the 1930s and 1940s, when agricultural collectivization transformed not only the distribution of landed property rights according to the model of industrialized agriculture but also destroyed the material, social, and symbolic foundations of peasant families and communities. However, the announced “soybean revolution” as a crucial part of the envisioned agro-food transition did not materialize. Despite the efforts of dedicated scientists such as Nikolai Vavilov, this goal was not achieved – mainly due to the contradictions between the general approach of ideologically and technocratically driven state planning and the particular logics of rural communities and agro-ecosystems. Unlike wheat, which could easily be produced in a standardized fashion with large-scale machinery, soybeans required more careful treatment by skilled workers – a commodity widely lacking on Soviet collective and state farms. Unlike its US counterpart, soy in the USSR was not

86 Curiously, the soy-related knowledge published in the 1970s under the heading “New in Engineering and Technology” repeats almost verbatim the contents of the brochures issued in the 1930s: Compare Slavova et al., *Proizvodstvo*; and Semen B. Vul'fon, *Kul'tura soi* [The Cultivation of Soy], in: *Sel'skoe khoziaistvo SSSR: Ezhegodnik* 1935, Moscow 1936.

upscaled to the Soviet-centred agro-food system, and instead was pushed back to its niches at least until the mid-twentieth century.

The different outcomes of these two soy expansions were not primarily caused by (dis-) functional markets, (un-)favourable ecosystems, or (in-)appropriate technologies; rather, the disparity was first and foremost determined by the state regulation of agriculture and food – not only in the USSR, but also in the USA. It seems reasonable, at least from the perspective of Cold War rhetoric, to assume that the systemic opposition between market capitalism and state socialism determined the different approaches to agro-food regulation in the USA and USSR. However, our comparative analysis suggests an alternative explanation: Since both governments shared the vision of agricultural modernization according to the model of the industrialized farm, it was their different forms of state intervention to realize this ideal that determined the outcomes of their soy expansions. The theoretical debate and empirical research on ‘modernization’ call for a pluralist notion of this singular, expressed as “multiple modernities” or “varieties of modernity.”⁸⁷ A crucial distinction can be made between societally and ecologically embedded or disembedded modernities:⁸⁸ On the one hand, ‘high modernism’ refers to the planned upheaval – implemented even in the face of resistance – of social relations by the power of a centralized state, driven by the utopia of techno-scientific progress.⁸⁹ On the other hand, ‘low modernism’ characterizes the restructuring of society by a coordinating centre not *against*, but rather *with* decentral actors and their socioecological relations, socioeconomic networks, and sociocultural traditions.⁹⁰ While high modernisms are primarily associated with (though not exclusively confined to) dictatorships, low modernisms also emerge beyond democratic orders.

The US and Soviet soy expansions occupy different positions in the spectrum between high modernist and low modernist approaches to industrialized agriculture, despite mutual exchanges of knowledge and technology between both countries. The US case shares many features of a low modernist transition, including democratic participation, evolutionary change, and socioecological integration. The New Deal’s approach to managing the agro-food crisis is a low modernist case in point: Farming families and rural communities received state support, market incentives, and opportunities for participation as potential allies of US-style modernization. Farmers who had regained trust in the state-managed agro-food system had enough reasons to adopt the new crop.⁹¹ The Soviet case reveals the imperatives of high modernism characterized by authoritarian decision-making, revolutionary change, and suppression of societal and ecological counterforces. The Stalinist collectivization of agriculture represents an extreme case of high modernism: Peasant families and villages were suppressed, expropriated, displaced, starved, and even executed in large numbers by state authorities as potential enemies of Soviet-style modernization. Distrustful peasants and

87 Volker H. Schmidt, Multiple Modernities or Varieties of Modernity?, in: *Current Sociology* 54/1 (2006), 77–97.

88 Mark Granovetter, Economic Action and Social Structure: The Problem of Embeddedness, in: *American Journal of Sociology* 91/3 (1985), 481–510.

89 Scott, *Seeing Like a State*.

90 Jess Gilbert, *Planning Democracy: Agrarian Intellectuals and the Intended New Deal*, New Haven/London 2015.

91 Gilbert, *Planning*, 80–112.

inexperienced managers of collective and state farms therefore had little interest in adopting a state-promoted and unfamiliar crop.⁹²

Our basic argument to explain the outcomes of the US and Soviet soy expansions prioritizes specific modernization pathways over general systemic properties. Rather than the politico-economic system per se, be it market capitalism or state socialism, it was the pathways taken by state-affiliated political, economic, and scientific elites towards agricultural modernization, along with the degree of societal and ecological embeddedness of these planned interventions, that largely determined the outcomes of the envisioned “soybean evolutions” – and of Morse’s and Vavilov’s shared dream.

92 Scott, *Seeing*, 193–222.