A Business History of Soy

Japan's Modernization and the Rise of Soy as a Global Commodity

Midori Hiraga

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A colonial strategy and a means of business survival

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Introduction

Once soy had become a capital-intensive mechanical-industry, the mass-production structure required continuous mass-sale of soy products. The Japanese soy-crushing companies, the origins of today's major edible oil suppliers, invested huge amounts of capital in large-scale soy-crushing factories. The special demand that arose during WWI provided them a timely opportunity to boost their development. After WWI ended, however, the companies faced an oversupply of their products. Soy oil, especially, had no market in Japan to begin with, and the fertilizer market was turning to chemical inputs over soy meal. The companies desperately needed to create markets for new soy products in order to survive, propelling a wave of research and development. The colonial institution of the South Manchuria Railway (SMR) also needed the soy-industry in Manchuria to support its mission as an agent of Imperial Japan. This chapter explores the efforts of SMR and these Japanese companies to develop versatile usages of soy and to expand soy's markets in non-food manufacturing and military supplies, as well as some food-processing, in the interval between the two world wars. These efforts were supported by advances in oleochemical technologies and protein engineering, and by the political economy of the 1930s, as Japan pursued further military conquests in Asia and the Pacific.

The relationship between capital investment and oil-extracting methods

Before exploring the development of various soy products, this section briefly outlines different oil-extracting methods, which produce different qualities of soy meal and oil, and their relationship with capital investment.

In general, animal fat is easy to use even for an individual—it just has to be cut from the meat. A few oil crops, like oil palm and olive, have soft-fleshed fruits that are relatively easy to squeeze for oil. It is more difficult to extract

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oil from harder oilseeds. Some of the harder seeds, like sesame, perilla, and rapeseed, have such a high oil content that the oil can be extracted efficiently enough with simple, human-powered oil-pressing tools, and several of these have been used as oil sources since the premodern era. Soy, in contrast, contains much less oil (less than 20%) and the beans are hard, so it is natural that soy was traditionally considered a food rather than an oilseed in Japan and China.

In northeastern China, people had begun crushing soy some time before modernization (as discussed in Chapter 1). About 30 oil-pressing factories were reported in the Manchurian port city of Yingkou around the end of the 19th century. They used animals to pull millstones to crush the beans and manually operated wedge-presses to squeeze the oil out. This method was not very effective, and these mills produced low volumes of oil and still-oily meal, which, according to the report published by SMR, *On Soy Processing*, "could not meet the quality level necessary for export to the global market, so their market was limited to China" (SMR 1924a, 311). Figure 3.1 shows how soy meal and soy oil were transported around the 1930s in the northern China.

The British Swire Group is said to be the first to build a modern machine-driven oil-pressing factory in Yingkou, in 1896, which used steam power to operate presses with spiral steel-rollers. After the Russo-Japanese War (1904–1905), Japanese companies built more machine-press factories in Manchuria. KOTERA Sokichi (小寺壮吉) built such a factory in Yingkou, and Nisshin Oil built another, with the Okura *zaibatsu*'s support, in Dalian. Nisshin Oil's Dalian factory had the largest daily production capacity of 7,000 sheets of soy meal (about 200 tons), when local factories were producing about 100 or 200 sheets per day (SMR 1924a; Honen Oil 1944; Nisshin Oil 1969).

Before WWII, solvent-extraction methods were a cutting-edge technology. While the oil-pressing methods crushed soy to physically squeeze the oil out, solvent-extraction methods used chemical solvents (benzine or alcohol in those days) to extract the oil, efficiently producing high-quality soy meal containing little residual oil. However, building a factory that used solvents required a much larger capital investment. By 1924, the only factory using a solvent-extraction method in Manchuria was the Japanese Honen Oil's factory in Dalian, which was built by SMR's Central Laboratory and was expanded with the investment of Suzuki Shoten, the largest *zaibatsu* in those days (see Chapter 2 for details) (Honen Oil 1944, 2).

More efficient oil-extracting technologies were important to produce more soy oil, of course. But they were also important to produce higher-quality soy meal. To be useful as fertilizer, the meal should contain little oil residue, as oil hinders the growth of plants. Soy meal was the main product of the Japanese soy-crushing companies, as discussed in Chapter 2. Table 3.1

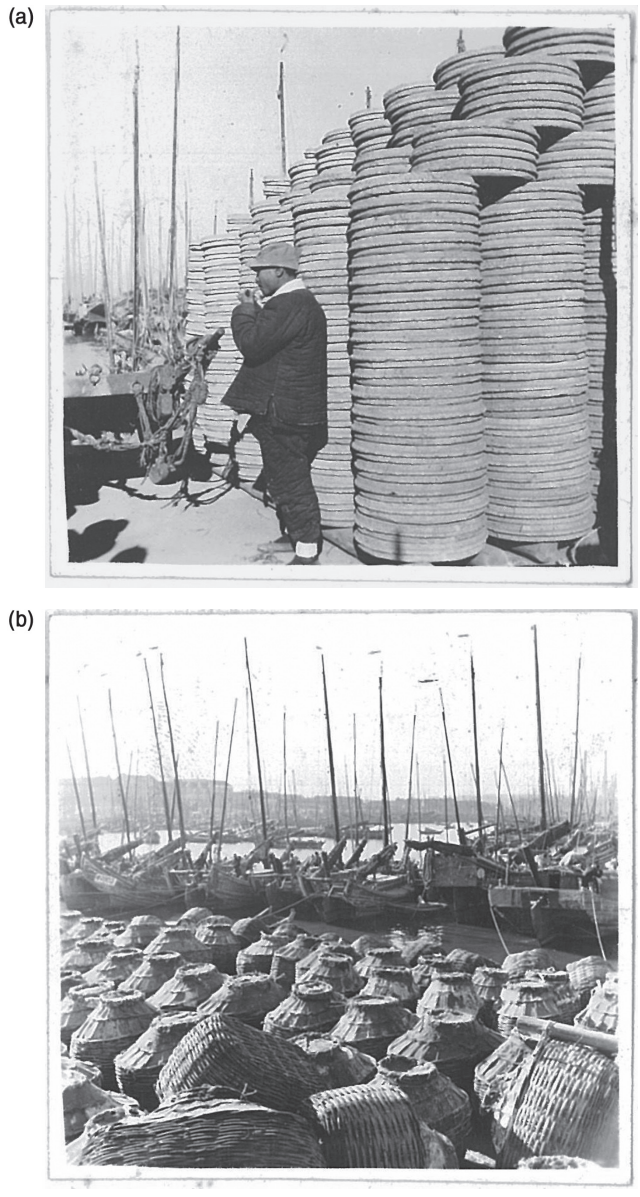

Figure 3.1 Shipping soy meal (a) and soy oil (b) at Tsingtao Small Island port in 1939. (Photograph courtesy of the North China Railway Archive [The North China Railway Archive Committee], (a) photo number 3705-026739-0; (b) photo number 3705-026737-0, available at https://codh.rois.ac.jp/north-china-railway/).

Table 3.1 Differences in soy meal quality according to the different oil-extraction methods

Shape of soy meal	*Oil press/extract methods*	*% of oil yield*	*% of meal yield*	*% of oil residue in soy meal*	*% of oil protein in soy meal*
Round meal	Pressure (600–700 pound)	About 10	About 86	8	40
Square meal	Pressure (1700–2000 pound)	About 12	About 84	5	43
Flake meal	Extract with benzine	About 15	About 80	1	45

Source: Compiled by the author based on data from Masuno (1942, 159).

shows the different amounts of oil content remaining in soy meal according to the different oil-extracting methods, based on a study conducted in the 1940s. In those days, soy meal produced by different methods took different shapes and forms. An old-fashioned oil press powered by humans or animals produced soy meal pressed into round sheets, so people called it "round meal." The machine-powered oil presses produced square sheets, so people called it "square meal." The solvent-extraction method produced not sheets but flakes because the meal was not pressed physically, and hence it was known as "scattered" or "flaked meal" (this book calls it "flake meal").

In this way, although soy-crushing had begun in Manchuria before the British or Japanese came at the end of the 19th century, it was these foreign capital that developed soy-crushing into a mechanical-industry that could mass-produce soy meal and soy oil to meet the volume and quality required for global trade.

The South Manchuria Railway's R&D for the soy-industry

The SMR was a semiofficial "national policy corporation" and its Central Laboratory functioned as a Japanese colonial institution with the mission of researching and developing the industrial possibilities of agricultural products in Manchuria. The development of the Manchurian soy-industry and soy trade was important to support SMR's colonial operations, and thus Japan's empire-building. Its soy-related R&D included oil-extraction technology with benzine, which was used by Suzuki Shoten (later Honen Oil); oil-extraction technology with alcohol, which was used by the Manchuria Soy-Industry Company (満洲大豆工業); and hydrogenation of soy oil (solidifying liquid soy oil into hardened oil), which was used by the Dairen Oil Industry Corporation (大連油脂工業), among many others.

The hydrogenation of liquid vegetable oil to make solid fats, better known today as trans fats, was important in those days because large amounts of hardened oil were demanded as industrial raw materials. The SMR Central Laboratory is said to have been the first to industrialize the hydrogenation of soy oil in Manchuria, in 1916. SMR established the Dairen Oil Industry Corporation to manufacture hydrogenated soy oil, using nickel as the catalyst to allow hydrogen gas to be added to the fat. The company had the capacity to annually produce 7,200 tons of industrial material for manufacturing soap and candles, and 1,100 tons of edible material for manufacturing shortening, artificial tallow, and lard. As part of its oil- and fats-related research, the SMR Central Laboratory also developed high-quality alcohol and "artificial petrol" out of soy oil (Masuno 1942, 168–169).

Soy protein, which is another name for soy meal, was also important as an industrial material at the time. Before the use of petrochemicals became widespread, plant- and animal-based raw materials were commonly used for industrial purposes. Protein engineering was developing rapidly in the West, and SMR researchers learned from the Western innovations. The SMR Central Laboratory researched technology to manufacture paint and plastic out of soy protein. For example, one of the Laboratory's researchers, SUZUKI Tsuneo (also known as Yasuo, 鈴木庸生), registered a water-based paint made out of soy protein, named "Solight," in 1913, and another, SATO Sadakichi (佐藤定吉), succeeded in manufacturing plastic out of soy protein, naming it "Sato-light," in 1915 (SMR 1924a, 516–524).

Manchurian soy became more and more important as an industrial raw material in the 1930s and 1940s, as Japan continued to militarize and expand its colonization of Asia and the Pacific. Japanese researchers focused on the vegetable and fish oil resources available in Japan's occupied territories in Asia. In this context, the SMR Central Laboratory in Manchuria was a significant player in Japan's empire-building.

The corporate efforts to create new markets for soy meal

The market for soy meal, which had once been Japanese soy-crushing companies' main product, shrank drastically after WWI, because Japan's heavy chemical industry had developed enough to supply cheaper ammonium sulfate for fertilizer. In addition, the prices of rice and silk fell in the post-war recession, significantly reducing the ability of Japanese rice and silk farmers (who must grow the mulberry leaves that silkworms eat) to purchase fertilizer (Sakaguchi 2003). The business reports of soy-crushing companies in the latter half of the 1920s repeatedly discuss the shrunken soy meal market because of the decreased demand for fertilizer. For example, in 1928, Nisshin Oil reported that

> Japanese farmers, the main consumers of our soy meal business, have been suffering from the continuous depression of prices, so they are reducing the amount of fertilizer they purchase, or choosing cheaper chemical fertilizers, thus reducing demand for soy meal.
>
> (Nisshin Oil Business Report for FY August 1928 to July 1929)

The fertilizer market was the company's "lifeline," said Honen Oil, the main beneficiary of SMR Central Laboratory's benzine oil-extraction technology (Honen Oil 1944, 45). However, the flake meal Honen Oil produced with the solvent-extraction method was a new and unfamiliar product in those days, and Japanese farmers preferred their accustomed pressed soy meal (either manually pressed round sheets or machine-pressed square sheets). Thus, Honen Oil trained its attention on selling, developing new marketing methods that it applied to all of its products, not just meal. For instance, they began branding and promoting specific soy products for different purposes and established their own retail networks to sell these products. Honen Oil's brand names included "Yutaka Mame" (rich bean) for the fertilizer market and "Sakura Mame" for the raw material of miso and soy-sauce manufacturing. The company also approached government-affiliated institutions like agricultural experiment stations and fertilizer testing stations, agricultural committees in each of the Japanese prefectures, and respected farmers in each area to promote Honen Oil's flake meal. In addition, the company utilized the available media of the day, publishing posters and leaflets, as well as advertisements in newspapers and magazines. They even organized lotteries, prizes, and gifts for their customers (Honen Oil 1944, 78–82).

The corporate effort to sell soy protein as an edible material

The Japanese term meaning "soy meal" is *mame kasu*, and *kasu* can have the connotation of "leftovers" or "dregs"—not very attractive for product names. Due to corporate efforts, the general name for soy meal was gradually changed to a term that translates as "soy protein." Today, it is often called "defatted soy," especially when it is used as a food ingredient.

In fact, although soy protein (or defatted soy) is a very common ingredient in many kinds of processed food today, it was difficult to persuade Japanese food processors to accept it as an edible ingredient at first. The president of Honen Oil related an episode that illustrates the difficulty the company faced. Honen Oil asked a government fermentation testing station to test their soy meal, and they obtained evidence that soy meal could be used just as whole soy beans were to make soy sauce. Still, Kikkoman, the major soy sauce company, was reluctant to use soy meal as an ingredient, because they feared it would damage the company's image if consumers found out that

Kikkoman was using *kasu* (leftovers or dregs) to make their soy sauce. In the end, they agreed to use soy meal only for making the starter for their soy sauce production. Even for that, Kikkoman asked Honen Oil to erase the words *mame kasu* (soy meal) from their packages when they delivered to Kikkoman's factories (Sugiyama 1957, 170–171).

Despite these corporate efforts, it took a natural disaster to popularize soy meal as an edible product among Japanese people. When the Great Kanto Earthquake struck the Tokyo area in 1923, the city needed emergency food, and soy meal was provided to feed people in the disaster area. According to a memoir of the Nisshin Oil company, "This made people acknowledge to some degree that soy meal was food" (Nisshin Oil 1969, 81).

As these episodes suggest, soy meal did not just naturally become part of the Japanese diet. Instead, it took active corporate efforts to persuade people to accept soy meal as a food ingredient—even in Japan, where people had eaten soy foods for centuries. This history of the soy-industry also indicates that its development was neither initiated by consumer demand nor an intentional step toward national food security.

Around the same time, the potential of using soy meal for manufacturing monosodium glutamate (MSG) was investigated. Ajinomoto[1] had been using wheat as MSG's main ingredient, but their laboratory research found that soy protein could be used to manufacture MSG at a commercial production level. Based on their innovation and trial production in the 1920s and 1930s, Ajinomoto built their own soy-crushing company as a subsidiary in 1933 (宝製油株式会社) and began using their own soy meal to manufacture MSG (Ajinomoto 1971, 291, 307–311). Ajinomoto and Honen Oil eventually consolidated into J-Oil Mills, which sells its edible oil products under the brand name of Ajinomoto today.

The corporate effort to develop the soy protein industry

While a corporate effort was needed to sell soy meal as a food ingredient, soy's use in non-food products was also being explored vigorously. For Japan, which lacks petroleum resources and had little animal production in those days, soy protein became important as a raw material for making many industrial materials such as glues and plastics. Japanese companies, as well as SMR and the military, were very interested in R&D with soy meal.

Soy casein, for example, was one of the new products that drew a great deal of attention. In those days, milk casein, made of milk protein, was used to manufacture glue (as a kind of agglutinative agent). However, this was before Japan began full-scale livestock development, so its production of milk casein was very limited, with only 50 to 60 tons produced annually in

the 1940s. Therefore, Japan imported about 5,000 to 6,000 tons of milk casein annually from Australia and Argentina. Such bio-based casein was an important industrial material before the age of petrochemicals being used to manufacture glue, paint, plywood, and artificial fiber, as well as military supplies.

Honen Oil needed to create more soy meal markets, and the company realized that industrial and military demand was increasing, so they strengthened their soy protein R&D. The company began producing their patented soy glue as "Honen glue" in 1933 (Honen Oil 1944, 117–119; 1963, 48–49）.

Another major oleochemical company, Nippon Oil & Fats (日本油脂), also succeeded in producing soy casein, and rapidly increased the scale of their production under military protection and with military promotion (NOF 1967, 344–345). By the 1940s, when Japan was fighting the Pacific War, several other companies produced soy casein, which was used in the manufacture of automobiles, airplanes, and military products. Thus, the Japanese government, military, and big business worked together to improve the quality of soy casein and rapidly increase its production (Masuno 1942, 198–199). Soy casein was also used as a pesticide adjuvant, so the Ministry of Agriculture and Forestry of Japan also promoted using soy to manufacture agricultural spreading agents (NOF 1967, 347), while the production of a soy-protein-based artificial fiber to replace wool reached the commercial level by the end of the 1930s. A newspaper article at the time praised soy meal as the most important source of protein for Japanese manufacturing industries (Taiwan Daily News 1938).

The importance of soy meal for military projects

The business necessity to expand the markets for soy meal became a national and military project as Japan continued to mobilize for war. The progress of the soy-industry was supported by concurrent scientific and technological development in the protein industries, and by the increasing importance of soy protein as a military material to substitute for petrol. In 1940, an industry association of soy protein manufacturers was established (日本大豆蛋白質製品組合). The industry continued R&D of soy casein, soy glue, soy plastic, soy fiber, and other soy protein products, with the support of Japan's Ministry of Commerce and Industry. An expert on the soy-industry at the time, MASUNO Minoru, recommended that the industry should aim to develop soy protein products as its main business, while also improving the quality of soy oil (Masuno 1942, 205), indicating that soy meal for industrial and military usage was the more important part of the business in those days.

The corporate effort to promote soy oil as an edible oil

Soy meal and soy oil are twin products: the modern soy-industry that mass-produced soy meal also mass-produced soy oil, and thus they also needed to find sufficient markets for the oil. Because there was very little demand for soy oil in Japan, Japanese soy-crushing companies first exported the oil to Western countries. However, the drastic increase of soy oil imports from the Far East during WWI led Western countries to encourage their own soy-crushing industries. As we saw in Chapter 2, European countries began importing more soy beans (a raw material) to process themselves and reduced their imports of soy oil (a product) from the latter half of the 1920s to the 1930s. This move shrank the soy oil export market for Japanese companies; now, the Japanese soy companies needed to create a new market to sell their soy oil domestically.

Expanding the Japanese market for vegetable oil: The precedent case of rapeseed oil

Traditionally, Japanese people pressed vegetable oils from perilla, rapeseed, or cottonseed, mainly for lighting oil (as discussed in Chapter 1). Before modernization began, the production of rapeseed oil with water-powered tools had reached commercial levels, supporting domestic trade from Western Japan to the capital of Edo (today's Tokyo). The need for vegetable oils for lighting, however, drastically shrank with modernization, because of the introduction of gas lamps and electricity. Significant amounts of fossil fuels were already being imported by the end of the 19th century (Tokyo Oil Wholesaler Market 2000; Nakajima ed. 1967, 493).

Luckily, rapeseed oil has high lubricity. A method of mixing ash into oil to refine it (*shirashime-yu*) had been developed, and this refined rapeseed oil was found to be suitable for lubricating machinery and for hardening (quenching) steel (Tsujimoto 1916, 331). Japan's industrial development and military expansion rapidly increased the use of steel and machinery, in turn increasing the demand for lubricating oil and quenching oil, especially after the Sino-Japanese War (Tokyo Oil Wholesaler Market 2000). Rapeseed oil was used for lighting fuel on trains too. So the military and the government offices like the Railway Bureau became large buyers of rapeseed oil in modernizing Japan (Ooura and Hirano eds. 1948, 26). As Japan fought in the Sino-Japanese War and the following battles with Russia and China, the Japanese army, navy, arsenals, and railway bureaus gave huge orders for rapeseed oil, which saved rapeseed traders, according to Yoshihara Shoten, a major oil trader that mainly dealt in rapeseed oil in those days (Hirano 1973, 33). In this way, rapeseed oil was able to find a new market.

The corporate effort to create markets for soy oil

Soy oil had no market in Japan to begin with. Honen Oil "really needed to make painstaking efforts to make soy oil popular among Japanese," recalled its corporate history (Honen Oil 1944, 48). Cheaper soy oil was sometimes mixed into more expensive sesame oil or rapeseed oil to add volume, but it was difficult to attract customers for soy oil itself.

In order to create a new market for soy oil, Japanese soy-crushing companies turned their efforts to refining it to make it edible. With this goal, Honen Oil learned an advanced oil-refining technology from the rapeseed oil industry, invited PhD-holding engineers to work with the company, and invested in new machinery. It began selling its "Refined Soy Oil" (Soy *Shirashimeyu,* 大豆白絞油) in the Japanese food market in 1923 (Honen Oil 1944, 48–50). Having no previous connection with the food industry, Honen Oil had to establish sales channels from scratch. According to the corporate history, even after its edible soy oil products went to market, "there was very little interest in soy oil among Japanese consumers, and we really needed to conduct more research and promotion for soy oil" (Honen Oil 1944, 95).

Nisshin Oil purchased new refining machines, invited an expert from Germany, invested 127,000 yen to build a new factory (Nisshin Oil 1969, 83–84), and, in 1924, launched sales of its first edible soy oil product: Nisshin Salad Oil. This remains the company's major product to this day. Like Honen Oil, Nisshin Oil had no connection with the food industry and hence needed to create a completely new sales channel. In order to promote its soy oil products in the Japanese food market, the company tried to introduce soy oil to the dormitories of the Imperial Household Agency, or to the home economics classes at a women's college. The company also held events to demonstrate how to make tempura, organized special sales with cash vouchers, and published newspaper advertisements for their products (Nisshin Oil 1969, 306–310).

It was the time that the marketing of new products via newspapers, magazines, and posters first became popular. Japanese vegetable oil companies took advantage of these media to promote not just their products but soy oil and vegetable oil in general. They needed to increase the habit of eating more oil and fat among Japanese people before they could sell their edible oil products. Despite such corporate efforts, the average daily consumption of edible oil remained less than 3 g before WWII, and "it was only after WWII that soy oil was fully disseminated and became a daily foodstuff for Japanese people" (Honen Oil 1963, 31, 34).

The development of hardened oil and the oleochemical industries

Oleochemistry, the study of plant-, animal-, and marine-based oils and fats, developed rapidly in the West around the end of the 19th century and the

beginning of the 20th century. As the science and technologies developed, it became easier to substitute oils/fats of different origins for each other. The technology of hardening liquid oil into hydrogenated fat that stays solid at room temperatures was also developed around that time, and hardened oils became important raw materials in the manufacturing of a wide variety of products. The range of industrial uses for oil/fat products also continued to expand. Concurrently, soy- and oil-related companies transformed from businesses based on craftwork and manual manufacturing into capital- and resource-intensive businesses. A Japanese industry association described this shift: "the industry used to employ manual workers who had craftsmanship, like soap-making craftsmen, but now it became a world-level oleochemical industry with university graduates in advanced science" (JOPA 1972, 41). Some of these university-educated technical experts began to lead the industry as the executive managers of key companies. This section focuses on how soy produced in Manchuria and fish taken from the seas around the Korean Peninsula became important raw materials of these oil-related industries, and how the production of hardened oil was developed especially for the military supply industries as Japan entered the wars of the 1930s–1940s.

The production of hardened or hydrogenated oil (now better known as trans fats) in Japan was also initially geared to export to Europe, especially to take advantage of the rapid increase of demand during WWI. The British company Lever Brothers was the first to begin producing hardened oil in Japan. Lever Brothers chose Amagasaki (near Osaka) as their foothold for the expansion of their business in East Asia. They built a large-scale factory that could process oil crops and manufacture soap, glycerin, hardened oil, and other oleochemical products. The factory began supplying hardened oil in 1913 (JOPA 1972, 43). Around the same time, Japanese university-educated engineers at a government laboratory in the Ministry of Agriculture and Industry developed original methods of producing hydrogenated oil and established a company in 1914 to produce hardened oils.

These two pioneering companies, however, failed in later years. Thus, the company that actually laid the foundation for today's Japanese hardened oil industry was Suzuki Shoten, the largest *zaibatsu* of the time, whose oil section (which later became Honen Oil) was the leader in the soy oil industry. Along with its processing of Manchurian soy, Suzuki Shoten exported fish oil to Europe, first as liquid oil, and then, after 1915–1916, as hardened oil. The company conducted research on the manufacturing of hardened oil at its Hyogo factory and also built a few more factories for this project. Some records indicate that Suzuki Shoten invested more than half a million yen, huge investment at the time, in its hardened oil project. Later, it bought up various other pioneering projects in hardened oil in Japan, becoming the leading company in this field, which later became Nippon Oil & Fats (linked to today's NOF Corporation).

Table 3.2 Uses of hardened oils in Japan in 1936

	Volume (ton)	*%*
Laundry soap	45,000	37.7%
Face/body soap	10,000	8.4%
Vet for spinning	3,000	2.5%
For making candle	12,000	10.0%
Edible oil/fat	4,800	**4.0%**
For making oleic acid, stearin	2,500	2.1%
For export	39,350	32.9%
Glycerin from decomposed fatty acid	2,800	2.3%
Total	119,450	100.0%

Source: Compiled and the percent calculated by the author based on data from Kubota (1937, 372–379).

Note: Bold letter and value are emphasis by the author.

The technology for hardening oils is the same for making margarine or shortening. The main aim of the newly emerged Japanese hardened oil manufacturers, however, was to supply non-food industrial raw materials. As an industry expert said, "hardened oil was a matter of soap and glycerin for Japan" (Kubota 1929); only 4% of the hardened oil produced in 1936 was destined for edible products, while more than 40% was used to make soap, and more than 30% was exported (Table 3.2).

It was only after WWII that hardened oil was produced more for edible purposes in Japan; by 1955, edibles accounted for over 20% of the hardened oil production (NOF 1967, 455–457). When margarine became popular among Japanese people in the post-WWII era, the industry was dominated by a few large companies that had established their businesses on non-food products during the war.

Military motivations to expand the hardened oil market

Similar to the soy oil industry, the Japanese hardened oil industry owed its initial development to special orders from European countries during WWI, so it also faced the loss of the export market after the war ended. The Japanese companies that had overexpanded their production capacity for hardened oil also needed to create a new domestic market after WWI. In that corporate effort, a conflict occurred between the Japanese oil companies that manufactured hardened oil from Manchurian soy and from fish from the seas around the Korean Peninsula, and the Japanese soap companies that mainly used imported beef tallow and coconut oil to manufacture soap.

According to the Kao Soap company (today's Kao Corporation), the modern soap industry in Japan was established using imported beef tallow and coconut oil as their main raw materials. The soap industry persuaded the Japanese government to repeal a tariff on beef tallow to reduce the cost of raw materials and to encourage soap and glycerin production. The Japanese companies that manufactured hardened oil, led by Suzuki Shoten and Asahi Denka (linked to today's ADEKA), opposed this action. They emphasized the importance of producing glycerin from raw materials that could be sourced from the territories under Japanese control. The oil companies also submitted reports to the Navy Explosive Factory in Kanagawa in which they claimed that the quality of glycerin made from hardened oil and from beef tallow was the same (Kao Soap 1940, 578). The soap companies objected, arguing that the domestically produced hardened oil was inferior to imported beef tallow in quality, volume, and price. In the end, the Japanese Navy changed their policy to approve hardened oil in addition to beef tallow as raw materials for manufacturing glycerin in 1924. The Japanese government also agreed to readjust the import tariff on beef tallow in 1926 (Kao Soap 1940, 585). As this episode demonstrates, the oil companies used a discourse of national security to expand their market. They emphasized the importance of Japan being self-sufficient in glycerin for military purposes, and they even requested that the government protect the Japanese domestic oleochemical industries and the oil resources available in Asia.

As Figure 3.2 shows, domestic glycerin production increased rapidly from the middle of the 1920s, while the import of glycerin stagnated. With Japan's military escalation, the importance of the Japanese oil-related companies became a national security issue rather than purely a matter of business.

The concentration of oleochemical industries with **zaibatsu** *capital*

As they competed over the domestic glycerin market, the Japanese oil companies that had processed soy or fish began making soap, and the Japanese soap companies began making hardened oil. As a result, various oil-related businesses, including soy-crushing, oil-pressing, fish oil-processing, soap-manufacturing, and hardened-oil-manufacturing, merged into a more consolidated oleochemical and petrochemical industry. Advances in oleochemical science and technologies supported this development by making it easier to switch among the different oil/fat resources and their wide range of products. In a competitive market, through mergers and acquisitions, an oligopoly emerged, with a few dominant large companies. In the hardened oil industry, three companies, Nippon Oil & Fats (日本油脂), Asahi Denka

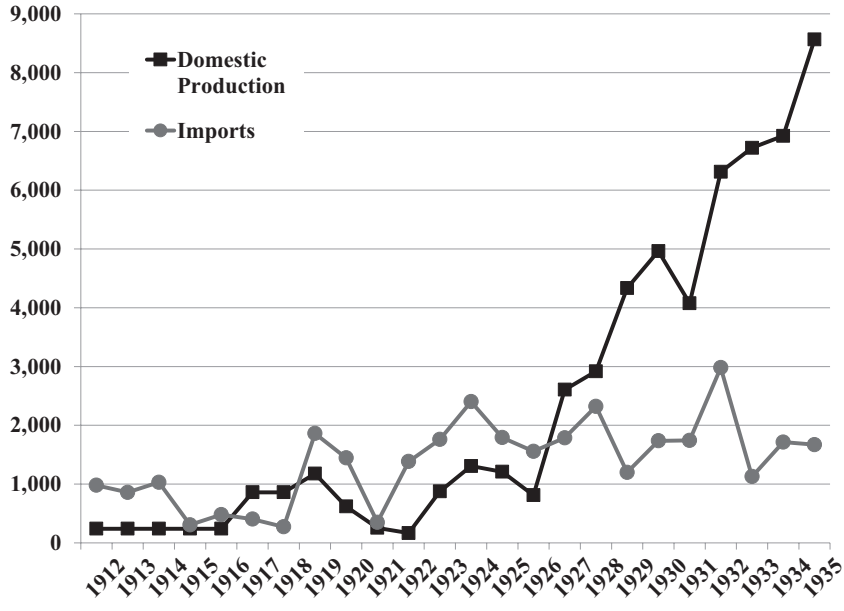

Figure 3.2 Imports and domestic production of glycerin in Japan, 1912–1935 (unit: ton).

Source: Produced by the author based on data from NOF (1967, 59).

(旭電化), and Oxyhydrogen Oil (酸水素油脂), collaborated to dominate most of the market (Ueno 1953), while the soap companies came together to form a national industry association in 1925 (全国石鹸製造業連合会) (Kao Soap 1940, 632).

As the industry consolidated, it attracted larger capital investment. While some of the established *zaibatsu* remained powerful, some new *zaibatsu* also emerged and became active in investing more in the new arenas of the chemical and military industries. "It was like a storm of mergers and acquisitions by monopoly capital taking over the industries," as one commentator described the situation in the latter half of the 1930s (Kao Soap 1940, 637). In addition to Suzuki Shoten, the Okawa *zaibatsu*, the Furukawa *zaibatsu*, and the Nisso *Konzern* invested in the hardened oil companies (NOF 1967, 158). Nippon Chisso and Nippon Sangyo, groups that had dealt in fish oil from the seas around Korea, actively invested in the oil-processing industry and developed their oleochemical business based on fish oil. Japan had annexed the Korean peninsula in 1910, and the colonial government advised Mitsui to consolidate the Korean oil and fertilizer business (Kao

Soap 1940, 678; NOF 1967, 159). The Nippon Sangyo group (Nissan *Konzern*) emerged under the leadership of AIKAWA Yoshisuke (also known as AYUKAWA, 鮎川義介). The group expanded its fishery business into the fish oil-based oleochemical industry, merging with several other companies, including the remains of Lever Brothers' Amagasaki factory and hardened oil factories related to Suzuki Shoten. These companies were consolidated into Nippon Oil & Fats Co. (日本油脂株式会社) in 1937, which became the leading oleochemical company in Japan.

The newer "emerging zaibatsu*"*

As Japan went deeper into war, especially after the Manchurian Incident in 1931, the Japanese government increased the military budget and promoted military-related industries. Some capitalists, middle-sized companies, and scientific research institutions entered the military-related industrial sectors to gain budgetary support. They rapidly developed into the "emerging *zaibatsu*"(新興財閥), including Nissan, Nisso, Mori, Nitchitsu, and Riken. The corporate groups in hierarchy structures, including old and new zaibatsu in the 1930s and 1940s, are sometimes labeled as *Konzern* ("concerns"), following the German cases. While the older *zaibatsu* like Mitsui and Mitsubishi dominated the heavy industries, these "emerging *zaibatsu*" more actively invested in the newer industrial sectors of military supply and electrochemical industries, and they rapidly developed by receiving profitable military orders under the protection and promotion of the government and the military (Tamaki 1976, 371–373). The oil- and fat-related industries, including the manufacturing of hardened oil and glycerin, had become an attractive sector for such emerging *zaibatsu*. The Nissan *Konzern* included Nippon Oil & Fats, which produced hardened oil, and Nippon Suisan, which processed seafood. They developed groups of companies that manufactured hardened oil, glycerin, soap, fish oil, and seafood based on resources from Manchuria and Korea.

The older zaibatsu*: Dominating trade in the Japanese food industries*

The older *zaibatsu* traders remained active in the trading sectors of oilseeds and oil-related products. In addition to Mitsui&Co., which led the international trade of Manchurian soy bean and soy products, Mitsubishi Corporation, the trading sector of the Mitsubishi *zaibatsu*, began full-scale trading of soy products in 1919. Mitsubishi established their Oil and Fat Section in Kobe in 1920, bought up the factory of Dalian Oil and the Fat Industry Corporation (大連油脂工業会社) in 1921, and utilized these assets to trade Manchurian soy products (bean, oil, and meal) to Japan and the world. The international trade of Manchurian soy products remained

one of the main profit-makers among Mitsubishi Corporation's oil/fat and fertilizer sectors (Mitsubishi Corporation 1986, 188–189).

Some *zaibatsu* groups, including Mitsui and Mitsubishi, also became strong players in the modern food system of Japan, especially in supplying basic ingredients like wheat flour, sugar, and edible oils. While the recession in the 1920s drove Suzuki Shoten into bankruptcy, it also "provided a wonderful arena for *zaibatsu* capital to expand, as they had established the *Konzern*s by then" (Shibagaki 1968, 7). The hard times for many people and smaller businesses offered opportunities for bigger capital to buy up companies and dominate the markets. Oil-related and food businesses became embedded in these complexes.

A great deal of research is published in Japanese on the *zaibatsu* and *sogo-shosha*. Most of the previous *zaibatsu* literature focuses on their influence in the fields of finance or heavy industry, with much less attention to food or bio-based oils. However, the influence of *zaibatsu* in the Japanese food system was significant, especially in the early modernization period. SASAMA Yoshifumi, who compiled a history of the Japanese food industry up to the 1960s, argued that domination of the Japanese food industries by the *zaibatsu*-led oligopoly was established by the end of WWI, especially in the primary processing industries such as flour-milling, oil-refining, and sugar-manufacturing (Sasama 1979, 377). By the 1930s, two companies, Nisshin Seifun (of Mitsubishi) and Nipon Seifun (of Mitsui), controlled about 80% of flour-milling in Japan. Japanese sugar production in those days was based on sugar from occupied Taiwan, and the government traders were deeply involved there, thus Taiwan Seito (of Mitsui), Meiji Seito (of Mitsubishi), and Dainippon Seito (of the Fujiyama *Konzern*) dominated the sugar markets (Nakajima ed. 1967; Sasama 1979). Another study on *zaibatsu* calculated their part in the food industries around 1937, as shown in Table 3.3. Soy and oil industries are overlooked in this previous *zaibatsu* research, but they were dominated by Suzuki Shoten and the Okura *zaibatsu*, as this book demonstrates.

Soy's transformation into a military raw material

Before petrochemical industries flourished, animal-, fish-, and plant-based oils were important raw materials for industry and military sectors, especially during and after WWI. As more machines, such as combat vehicles, tanks, and airplanes, were used to wage war, more oil and fat were needed to keep them running smoothly, and the vegetable oil industry developed by collaborating with the government to pursue its modern wars.

MURAYAMA Takeshi, who researched the global situation of the oil-related industries in the 1930s, commented that bio-based oil and fat in those days

Table 3.3 Major Japanese flour mills and sugar manufacturers and their related *zaibatsu*, around 1937

Flour mills	Nisshin 日清製粉	Nippon 日本製粉	Nitto 日東製粉
Daily production capacity (barrel)?	26,500	20,800	5,000
Its % in domestic market	about 38%	about 30%	about 7%
Zaibatsu group	**Mitsubishi**	**Mitsui**	**Mitsubishi**
Sugar manufacturers	Taiwan 台湾製糖	Meiji 明治製糖	Dainippon 大日本製糖
Its % in domestic market	27.8%	20.2%	26.4%
Zaibatsu group	**Mitsui**	**Mitsubishi**	**Fujiyama**

Source: Compiled by the author based on data from Takahashi and Aoyama (1938, 250–253).
Note: Bold letters are emphasis by the author.

> had important roles, as they were essential military supplies that were required to wage wars, because glycerin made of various ingredients was a raw material for explosives, as was castor oil for aviation oil, rapeseed oil as lubricant for ship engines, and rapeseed and whale oil as quenching oil to harden steel, among others.
>
> (Murayama 1941, 1)

Modern warfare required huge amounts of steel and machinery as well as explosives; hence, the demand for oil and oil crops surged as crucial resources for the manufacturing of glycerin, lubricant, glue, casein, substitutes for other oils and for rubber, and many other products. As the producers of such military supplies, the oil producers and oleochemical companies gained new importance for governments preparing to wage war.

The Japanese oil-related industries collaborated with the military-government (although the extent to which they did so willingly or were forced to do so is uncertain). Honen Oil, for example, built their own research institute, Sugiyama Industrial Chemistry Laboratory (杉山産業化学研究所), where they conducted research on soy oil and soy protein for what they called "soy patriotism" (大豆報國)" (Honen Oil 1944, 3). This was the case not only for the soy-industry. Yoshihara Oil, which mainly handled non-soy oils, such as rapeseed oil and cottonseed oil, recognized that the Japanese vegetable oil industry had developed, thanks to military demands since Japan's modernization. Yoshihara Oil also traded castor oil, an important lubricant for machines and engines, to the Japanese Army and Navy (Hirano 1973, 54).

By the 1940s, soy had become indispensable to Japan: "Soy and war are indivisible. Soy is an essential resource in both peacetime and wartime" (Masuno 1942, 1). Honen Oil, one of the original components of

today's dominant edible oil company, J-Oil Mills, wrote that the soy oil industry "had developed into a world-level large-scale industry that supplies raw materials to food, feed, fertilizer, fermenting, confectionary, medical, painting, soap, and other non-food and military manufacturing" (Honen Oil 1944, 1). In the 1940s, soy and other oil crops came under the management of the Japanese military, as Chapter 4 will demonstrate in detail.

Discussion

Once they had established soy-crushing as a large-scale capital-intensive mechanical-industry, the oil-related companies desperately needed to expand soy's versatility to create new products to sell in any possible market in order to maintain both Japanese big business and Japan's colonial power.

Mass-produced soy oil and meal: Products and markets

Today, Japan's self-sufficiency rate for vegetable oil is about 2–3%, and a frequently offered explanation for why Japan imports so much soy and rapeseed is that people want to eat more oily food when their income increases. Yet the history shows that the soy-crushing and oil-refining industries had already established a large production capacity relying on the overseas oil crops before ordinary Japanese people began eating oily food. In fact, as foods, both soy oil and hardened oil were new for Japanese people, and there was no demand for them to begin with. When the export market for soy oil and the fertilizer market for soy meal shrank dramatically after WWI, the Japanese soy companies, which had invested heavily in large-scale mechanical factories, urgently needed to create new selling outlets large enough to match their established mass-production capacity for soy meal and soy oil. Thus, they poured enormous efforts into research and development to expand the versatility of soy and to create new soy products to sell in any possible market. They even found it a challenge to sell soy meal to the Japanese food market, although the nation had eaten whole soy bean products for centuries. Instead, the main markets that the modern soy-industry could expand into were non-food industrial manufacturing, including soy-based glues, plastics, and paints, among others. The concurrent advancement of oleochemical and protein science and technologies helped this process. As the technologies for manufacturing hardened oil became possible, solidified oil became a raw material for a widening range of oleochemical products. Along with these corporate efforts to create markets for their mass-produced soy products, a few edible soy oil products began to be sold in 1920s Japan. However, it was only after WWII that edible soy oil disseminated widely in the Japanese diet.

Soy and the "visible hands" of business and government

The oil-press and soap industries transformed from a work of craftmanship into a modern, capital- and resource-intensive big business led by university-educated technical experts and managers. The advanced oleochemical and protein technologies, more sophisticated machinery, and highly educated human resources required, and attracted, more capital investment. The technological development encouraged the consolidation of oil-related industries into comprehensive oleochemical and protein manufacturing business groups, which began producing a range of advanced bio-chemical products. Competitive market conditions and the post-WWI economic depression encouraged mergers and acquisitions, leading to the concentration of capital in a few dominant companies. In addition to the existing *zaibatsu* like Mitsui and Mitsubishi, smaller but emerging *zaibatsu* around the interwar period actively invested in the chemical industries and military industries, forming the corporate groups known as *Konzern*. They took advantage of the increased military budget and the natural resources that came under the control of Japanese forces in the expanding Japanese empire, including Manchurian soy and Korean fish. The SMR Central Laboratory also worked to maximize the use of natural resources in Manchuria by developing the related industries for the benefit of Japan.

The point to note here is that many of these big business survived to post-WWII era, and they became main players that supplied edible oil products in peacetime food markets.

The role of soy in food and capitalist history: Making soy flexible between the Food Regimes

Such concentrated industries were easily integrated into military complexes. As Japan pursued its wars in Asia and the Pacific, soy-related big businesses became embedded in important military complexes under the Japanese government. At the time, bio-based oil and protein materials were important for military supplies, especially for Japan, which lacked petroleum resources. This was also the transitional period between the First and Second Food Regimes. As we have seen, soy was being made into a "flex crop," a very versatile and important commodity for economic, political, and military purpose, which enabled it to become a key commodity of the following Second Food Regime under US hegemony. The United States increased its own cultivation of soy and manufacturing of soy oil and meal domestically, especially in the 1930s. By the time WWII ended, the United States had become the main world supplier of soy, replacing Manchuria.

Note

1 MSG was invented by a Japanese in 1907 out of kelp, and the company began its production in 1908. "Ajinomoto" was a product name, and the company that manufactured it was initially called Suzuki (a common family name in Japan), but is unrelated to Suzuki Shoten. The company was renamed Ajinomoto only after WWII. To avoid confusion, I refer to the company as "Ajinomoto," without reflecting the change of company names over time.

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