Looking Back on Soy Sauce Brewing History through Technical Books in the Collection of Kikkoman Institute for International Food Culture

Takashi Yamaguchi, Company History Compiling Group, Kikkoman Institute for International Food Culture

The Kikkoman Institute for International Food Culture, KIIFC, was established in 1999 as a commemorative project celebrating the 80th anniversary of Kikkoman Corporation. At KIIFC, roughly 12,000 books on the history of soy sauce development, and literature related to food and food culture, are displayed on open shelves. The books have been put into a searchable database on the KIIFC homepage. (https://www.kikkoman.co.jp/kiifc/index.html)

Among these, 30 technical books on soy sauce brewing written during the Meiji, Taisho and Showa eras (1868–1989) were selected to show changes in brewing techniques that reflected the changing times the soy sauce industry faced.

Manufacturing methods and types of soy sauce today are defined by Japanese Agricultural Standards (JAS). The five recognized types are *koikuchi* (common), *usukuchi* (light-colored), *tamari*, *saishikomi* (refermented) and *shiro* (extra light-colored). Roughly 84% of soy sauce production in Japan is koikuchi, while 12% is usukuchi, with the remaining 4% shared by the other three. The three manufacturing methods are *honjozo* (regular/traditional fermenting), *kongo jozo* (semi-fermenting), and kongo (mixing). Honjozo is Japan's oldest traditional method; the action of koji mold, lactic acid and yeast is used to make soy sauce from soybeans and wheat. The other two methods contain hydrolyzed vegetable protein (HVP), which is soybean protein hydrolyzed with hydrochloric acid. They spread rapidly nationwide after WWII, when there was a shortage of materials.

Traditionally brewed soy sauce like we have today is said to have been started during the Edo period (1603–1868). Although the fermented grain paste introduced from China is thought to have improved its taste during its unique evolution in the Japanese climate, miso and soy sauce were not really differentiated until Japan's medieval era. There was a seasoning similar to soy sauce that was an extension of miso. In Early Modern Japan (roughly 1550–1850), wheat and other grains came to be used as ingredients, in addition to soybeans. The employment of fermentation and aging processes using lactic acid and yeast at the *moromi* mash stage led to the completion of koikuchi soy sauce, which featured an aroma, umami, and smooth and distinct flavor similar to that of today's koikuchi soy sauce. This soy sauce brewing method started around the mid-Edo period. It was manufactured in homes on the fringes of big cities, where soybeans, wheat and salt could be easily obtained. These were the early days of the soy sauce industry that began in the late Meiji era. Written around this time was (1) *Tsuzoku Nichiyo Kagaku Zensho, Dai 11- hen, Miso Shoyu hen* (Complete Books of Popular Daily Chemistry, Book 11, Miso and Soy Sauce). The book describes how soybeans came to be imported from China and Korea, how the soybeans were steamed in a cauldron and wheat was roasted in a flat pan. It also states that koji starter was homemade, using good koji extracted from a previous production as there were no suppliers, and the pressing process used the ancient method of a lever handle. It was after 1904 (the 37th year of the Meiji era) that the brewing laboratory established by Noda Shoyu Jozo Kumiai (Noda Soy Sauce Brewers Association) started distributing purely cultured koji starter and analyzing the ingredients and products. Boilers and other equipment were introduced to only a limited number of breweries. Thus, this book was compiled on the eve of the modernization wave of soy sauce brewing.

Due to WWI, which broke out in 1914 (the 3rd year of the Taisho era), the heavy industrialization of Japanese industries progressed. Income levels improved and the population increased. In line with these changes, soy sauce demand increased; the production equipment grew in scale, and mechanization advanced. To produce the capital needed for modernization, brewers merged or incorporated throughout Japan. In 1917, eight brewing families in Noda and Nagareyama merged to establish Noda Shoyu Co., Ltd. The books written at that time were (2) *Saishin Shoyu Jozo-ron, Zoho 8-han* (Latest Soy Sauce Brewing Theories, 8th Expanded Edition) and (3) *Tsuzoku Kowa Shoyu Jozo-ho, Zoho 6-han* (Common Lecture on Soy Sauce Brewing Methods, 6th Expanded Edition). The former recommends soy sauce brewing as an industry and mentions a 4-story factory, an automatic koji production machine, and a concrete fermentation tank. The latter is a textbook intended for chief brewers and employees.

From the late Taisho era (1912–1926) to the early Showa era (1926–1989), Japan suffered from the Great Kanto Earthquake (1923) and Showa Depression (1929), resulting in a bad turn of the economy. The timing of the economic crisis was unfortunate. Just when the modern factories that had been aggressively pushed forward were completed, the soy sauce industry saw an oversupply and was plagued by a drop in prices. Written during that time were the three books of (4) to (6). *Anka Genryo Shoyu Jozo-ho* (Soy Sauce Brewing Methods Using

(1) Tsuzoku Nichiyo Kagaku Zensho Dai 11-hen, Miso Shoyu-hen

(2) Saishin Shoyu Jozo-ron Zoho 8-han

(4) Anka Genryo Shoyu Jozo-ho

Inexpensive Materials) describes the use of inexpensive substitutes such as defatted soybeans and corn in place of soybeans and wheat. *Jicchi Shoyu Seisei-ho* (Practical Soy Sauce Production Methods) makes no reference to the brewing methods of soy sauce, but is devoted to the quality improvement of lower grade soy sauce that uses soy sauce cake, which is generally inferior in taste.

When Ajinomoto's process patent for monosodium glutamate expired in 1929 (the 4th year of Showa), the crude HVP that was so effective in improving soy sauce umami appeared. Frenzied marketing of soy sauce spread to provincial areas in search of untapped markets, and local manufacturers with inferior product quality and brands started improving the taste of their products by adding crude HVP. The collection has nine books written in those times, from (7) to (15). These books characteristically describe the use of crude HVP and its manufacturing methods. The first half of the books treat crude HVP as a processing material for brewed soy sauce. The latter half of the books use words such as "chemical soy sauce" or "artificial soy sauce" to denote sauces using crude HVP as a mother liquid. As the quality of chemical soy sauce greatly depends on the quality of the mother liquid, some ideas to alleviate decomposition odors peculiar to HVP can be found. One example is adding carbohydrate materials in the last step of the protein decomposition procedure that uses hydrochloric acid, which is called sugar-containing HVP.

(15) Shoyu oyobi Miso

When the Second Sino-Japanese War (1937–1945) broke out, wartime controls in Japan were strengthened. Chinese soybeans, which had been used until then, became difficult to obtain, and other materials were scarce as well, with raw material prices steadily rising. The manufacturers tried to raise prices, but national policy would not allow it. The measures the national government adopted around that time included an official price system that set the grade standards lower than the actual quality criteria and set the selling prices by grade. Initially set total nitrogen standards had upper and lower limits within which soy sauce brewing was instructed to remain. Material shortages worsened as the war intensified, finally peaking just after the war. In 1949, the allied forces GHQ gave out soybean meal as relief supplies for use in soy sauce production, and the extreme material shortages became less critical. Eleven books (16) to (26) were written around this time, and have many descriptions of substitute materials. They include materials that are unimaginable or unfamiliar today, such as sweet potatoes, potatoes, copra cake, wheat bran, mackerel, silkworm chrysalis and locusts. Additionally, there are descriptions of *shinshiki* soy sauce and *kosei* soy sauce that soy sauce manufacturers developed. While the material supplies were worsening, soy sauce was made from soy sauce cake containing some protein residue, which the brewing technology of the time could not entirely make use of, by using the action of microorganisms after the soy sauce cake was chemically treated with diluted hydrochloric acid, etc. This method played a major role in the improved utilization of raw materials, shortened brewing time and improved the supply of quality soy sauce. Particularly, the *shinshiki-ni-go* (new style No. 2) soy sauce manufacturing method that Noda Shoyu developed is said to have saved the traditionally brewed soy sauce industry from the postwar crisis.*1 Noda Shoyu developed and released this patented process for the free use of other manufacturers.

(20) Daiyo Genryo Shoyu Seizo-ho

Triggered by the special procurement demand generated by the Korean War (1950–1953), the Japanese economy achieved rapid reconstruction. Various controls that had originated from the 2nd World War were gradually lifted and the soy sauce market opened up. As material conditions improved, the main issue facing soy sauce manufacturers was how efficiently they could produce good quality, traditionally brewed soy sauce in large quantities. Four books, (27) to (30), were written in this time. These books have descriptions of technologies developed with unconventional ideas, such as the N.K.-style processing method of protein materials and a production method of variant strain microorganisms, as well as the mechanization of processes that required proficient skills and considerable labor, such as the fluidized roaster for wheat and ventilation machine koji producing method. In 1963, Japanese Agricultural Standards established official soy sauce types, quality standards and labeling. Perhaps in line with this trend, the chapter Shoyu Bunseki-ho (Soy Sauce Analysis Methods) appears in the book *Shoyu no Jozo to Gosei-ho, Fu Sauce Seizo-ho* (Soy Sauce Brewing and Synthetic Methods, appx. Sauce Production Methods).

(29) Shoyu no Jozo to Gosei-ho Fu Sauce Seizo-ho

Looking at today's soy sauce varieties in various parts of the country, the one example of koikuchi soy sauce itself is rich in individual expression, ranging from smooth and distinct tasting Kanto soy sauce to sweet and thick soy sauce as represented by Kyushu. This is not irrelevant to the history of soy sauce we have looked at so far, although it reflects the industry and culture as it is in individual regions. We can see from these books that diverse varieties of soy sauce have been produced through technological innovation and ingenuity, one example being the use of substitute materials to cope with raw material shortages and other changes in the market environment, with regional circumstances also playing a role.

*1 Originally, the GHQ distribution policy for the soybean meal relief supply targeted 80% for the amino acid industry and 20% for the soy sauce brewing industry. However, as GHQ recognized the superiority of the *shinshiki-ni-go* soy sauce brewing method when it was completed, the ratio was changed to 70% for the soy sauce industry and 30% for the amino acid industry. If it hadn't been for this change, traditionally-brewed soy sauce would not have developed as much as it has.

Table 1 Technical books on soy sauce brewing written from Meiji to Showa eras

NO	Year	Book title	Author	Publisher
(1)	1899	*Tsuzoku Nichiyo Kagaku Zensho, Dai 11-hen, Miso Shoyu-hen* (Complete Books of Popular Daily Chemistry, Book 11, Miso and Soy Sauce)	Shintaro Ohashi	Hakubunkan
(2)	1921	*Saishin Shoyu Jozo-ron, Zoho 8-han* (Latest Soy Sauce Brewing Theories, 8th Expanded Edition)	Meijiro Togano	Nihon Takujo Kabushiki Kaisha
(3)	1924	*Tsuzoku Kowa Shoyu Jozo-ho, Zoho 6-han* (Common Lecture on Soy Sauce Brewing Methods, 6th Expanded Edition)	Asakichi Kinoshita	Shuppan-bu, Konno Shoten
(4)	1926	*Anka Genryo Shoyu Jozo-ho* (Soy Sauce Brewing Methods Using Inexpensive Materials)	Asakichi Kinoshita	Meibundo
(5)	1927	*Jicchi Shoyu Seisei-ho* (Practical Soy Sauce Production Methods)	Akesaburo Nagaki	Shuppan-bu, Konno Shoten
(6)	1927	*Kinsei Shoyu Jozo-ho* (Soy Sauce Brewing Methods in Early Modern Japan)	Torazo Nishimura	Meibundo
(7)	1928	*Shitsugi Oto Ban-Shoyu Seizo-ho* (Questions and Answers for Inferior Soy Sauce Manufacturing Methods)	Sadaharu Ito	Meibundo
(8)	1933	*Bankin Shoyu Jozo Kako-ron* (Recent Soy Sauce Brewing & Processing Theories)	Toushi Fukai	Tokyo Chomi Kenkyukai
(9)	1934	*Saishin Shoyu Miso Jozo-ho* (Latest Soy Sauce & Miso Brewing Methods)	Meijiro Togano	Jozo Hyoron-sha
(10)	1935	*Shitsugi Oto Shoyu, Miso, Aminosan* (Questions and Answers on Soy Sauce, Miso and Amino Acid)	Asakichi Kinoshita	Shuppan-bu, Kinoshita Jozo Kenkyu-sho
(11)	1935	*Shojo Kojin Hikkei, Zoho Daini-han* (Companion to Soy Sauce Brewers, 2nd Expanded Edition)	Hanbei Narahara	Shuppan-bu, Konno Shoten
(12)	1935	*Shoyu Jozo-ho* (Soy Sauce Brewing Methods)	Toushi Fukai	Koseikai Shuppan-bu
(13)	1936	*Shoyu Miso Seizo-ho, Jitsuyo Seizo Kogyo Sosho* (Soy Sauce and Miso Production Methods, Practical Manufacturing Industry Series)	Teijiro Uemura	Seibundo Shinkosha
(14)	1937	*Saishin Shoyu Seisei-ho, Fu Sauce Seizo-ho* (Latest Soy Sauce Production Methods, appx. Sauce Production Methods)	Hanbei Narahara	Shuppan-bu, Konno Shoten
(15)	1939	*Shoyu oyobi Miso* (Soy Sauce and Miso)	Toushi Fukai	Taiyokaku
(16)	1940	*Sogo Shoyu Joko Yoroku* (General Soy Sauce Brewers Digest)	Kenji Matsumoto	Shuppan-bu, Konno Shoten
(17)	1948	*Kan'i Sochi ni yoru Aminosan'eki Seizo-ho* (Hydrolyzed Vegetable Protein Production Method Using Simplified Device)	Ryuzo Harasawa	Chusho Kogyo Kijutsu Shido-bu, Diamond, Inc.
(18)	1948	*Shoyu, Tamari, Miso Jozo-ho* (Soy Sauce, Tamari and Miso Brewing Methods)	Kazuo Suzuki	Fuminsha
(19)	1948	*Jijo Yoketsu Shoyu, Miso* (The Key to Brewing Soy Sauce and Miso)	Seinosuke Hisada	Meibundo
(20)	1948	*Daiyo Genryo Shoyu Seizo-ho* (Soy Sauce Manufacturing Methods Using Substitute Materials)	Toushi Fukai	Sangyo Tosho Kabushiki Kaisha
(21)	1948	*Kagaku Shoyu Seizo-ho* (Chemical Soy Sauce Manufacturing Methods)	Toushi Fukai and Kazuo Iwasaki	Bunmeisha Shoten
(22)	1948	*Takeuchi Nogyo Saisho, Shoyu* (Takeuchi Pocket Book of Agriculture, Soy Sauce)	Motoi Onuki	Takeuchi Shobo
(23)	1949	*Aminosan Shoyu Seizo-ho* (Hydrolyzed Vegetable Protein Soy Sauce Production Methods)	Motota Sasaki	Fuminsha
(24)	1949	*Shoyu* (Soy Sauce)	Isao Umeda	Sankyo Shuppan Kabushiki Kaisha
(25)	1949	*Shoyu Miso* (Soy Sauce and Miso)	Masatoshi Mogi	Diamond, Inc.
(26)	1949	*Kindai Shoyu Jozo no Shinzui* (Essence of Modern Soy Sauce Brewing)	Kenichi Shimizu	Miyoshi Shobo
(27)	1952	*Zotei Shoyu Jozo-ho* (Revised and Enlarged Soy Sauce Brewing Methods)	Toushi Fukai	Sangyo Tosho Kabushiki Kaisha
(28)	1961	*Kaiko Shinban, Shoyu* (Revised New Edition, Soy Sauce)	Isao Umeda	Sankyo Shuppan Kabushiki Kaisha
(29)	1961	*Shoyu no Jozo to Gosei-ho, Fu Sauce Seizo-ho* (Soy Sauce Brewing and Synthetic Methods, appx. Sauce Production Methods)	Youhan Yokoyama	Tokyo Meibundo
(30)	1972	*Shoyu Jozo no Saishin no Gijutsu to Kenkyu* (Latest Technology and Study on Soy Sauce Brewing)	Toshio Nakahama	Brewing Society of Japan