

# Soy Sauce Brewing on the Kii Peninsula and Shodoshima Island —Wooden Barrels: Contrasting Tradition and Change

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## Introduction

In the early Edo period, the commercial center of Japan was in Kyoto, with nearby Osaka flourishing as a shipping base. To the south on the Kii Peninsula are the towns of Yuasa, Yura and Gobo, and west along the Sea of Harima, we find Tatsuno (FOOD CULTURE No. 28, p5-8, 2018) and Shodoshima Island. Here, soy sauce brewing was influenced by the extensive salt-farming areas, including Ako, along the Seto Inland Sea, and sake-brewing technology in Fushimi and Nada, including the use of wooden barrels (*kioko* and *kidaru*). Unique characteristics of this entire area from the eastern end of the Seto Inland Sea to the coastal areas of the Kii Channel, with Osaka Bay in the middle, were highly significant in the development of early modern *koikuchi* and *usukuchi* soy sauces.

Distinguishing features of soy sauce making in the adjacent Shikoku Region include preparation in wooden barrels on Shodoshima Island, and the sweet-type *kongo* (mixture method) soy sauces of Ehime Prefecture and western Kochi Prefecture (FOOD CULTURE No. 26, p12, 2016). We also see developments in soy sauce-based products such as ponzu, taking advantage of unique citrus fruits such as yuzu and sudachi found in Kochi, Tokushima, and Ehime prefectures.

In this paper, I report on traditional soy sauce making in the Kishu region (current Wakayama Prefecture), as well as Shodoshima Island in Kagawa Prefecture, which underwent continuous development from the late 1800s and throughout the 1900s. I also touch on present-day preparation of soy sauce in wooden barrels.

## 1. Kii Peninsula Soy Sauce Production

Today, in Yuasa Town and Nishi-Gobo in Wakayama Prefecture, there still exist breweries that maintain Edo period soy sauce production methods. Yura Town, known as the birthplace of Kinzanji Miso, is sandwiched between Yuasa and Gobo. While soy sauces from both towns are thought to have been shipped to the capital Edo during the Edo period, different currents in the Kii Channel are believed to have affected the markets for each town's products. From the Gobo side, a strong current flows towards the southern tip of Tokushima and joins the Kuroshio Current, simplifying a journey from Nishi-Gobo to Edo. Calmer waters on the other side, where Yuasa is located just above a slightly protruding cape, are thought to have made it easier to head north to Osaka. Yuasa was home to more than 90 breweries in the Edo period, and one of the reasons its soy sauce became so well-known was this advantageous position close to the Osaka market with good maritime transport.



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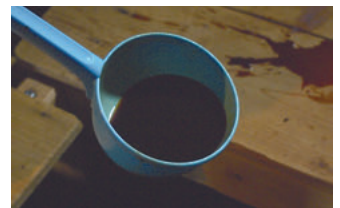
Breweries on the Kii Peninsula are scattered around Wakayama Prefecture and in inland areas such as Yoshino in Nara Prefecture. Many capitalized on koji-making techniques to brew miso as well, and it is thought that in addition to serving locals, many products made their way to Kyoto and Osaka thanks to this area's proximity to a busy highway.

While some theories point more to the late 16<sup>th</sup> century, records on the website of the oldest soy sauce brewery in Yuasa state that in 1535, brewer Akado Umataro brewed 100 *koku* (approximately 18,000 liters) of soy sauce and shipped it to Osaka's Zakoba fish market. Later in 1591, a descendant called Akado Saburogoro was apparently granted permission by Toyotomi Hideyoshi to operate a large vessel, which he used to ship soy sauce. Big, lightweight cedar barrels proved useful for loading large volumes of soy sauce onto the ship.

The thriving sake breweries of nearby Fushimi (Kyoto) and Nada (Hyogo) employed craftsmen who made different styles of wooden barrels using Yoshino cedar. In addition to wooden barrels designed specifically for soy sauce brewing, large wooden tubs and barrels that had previously been used for sake were sold on to soy sauce breweries for the production of soy sauce and miso. Many of those old wooden barrels are still in use today at long-standing breweries in Shodoshima Island, Wakayama, Nara, and Kyoto. Critical elements in the regional characteristics of soy sauce from eastern Seto Inland Sea to the Kii Channel, produced with large amounts of saltwater and *shoyu koji* (soybean and grain base), were an abundant supply of both raw materials like salt, wheat and soybeans, and the wooden barrels in which it was all prepared.

## 2. Inheriting Brewery Traditions

One Yuasa Town brewer founded in 1841 maintains age-old brewing techniques: a wooden implement that acts like a sieve is sunk into the *moromi* mash, prepared and aged over two to three years in wooden barrels, to separate the *kiage* raw soy sauce. Called "Yuasa-



Rich, deep-colored *kiage* ladled out of wooden drawing equipment. Photo taken at Kakucho Co., Ltd.

tamari", because the liquid is not pressed in a bag, it is thick and rich in the traditional flavor of soy sauce, as indicated by the addition of the word "nigori", meaning unrefined, in the product name. The brewery also makes *koikuchi* soy sauce pasteurized in *Sanshu-gama* iron cauldrons heated over wood-burning fires of red pine. We know that soy sauces from Kyoto and surrounds, called *kudari-shoyu*, were prized by citizens of Edo. The existence of both tamari and *koikuchi* soy sauces, produced by different methods and passed down for generations in Yuasa, suggest that the soy sauces sent to Edo via Sakai (Osaka) took on multiple forms. In Nishi-Gobo, about 20 kilometers south of Yuasa, one brewery continues to focus on making *koikuchi* soy sauce based on traditional techniques with as little machinery as possible. Founded as a shipping agent in 1688, it served the



Soy sauce koji on shallow wooden trays on fourth day (above left). Koji preparation room, temperature controlled by wood-burning fire (above right). Wheat roasted in a pot over wood-burning fire (below left). Freshly roasted wheat (below middle). The position of boards laid across barrels has not changed for generations. Kaiire, mixing the mash with a wooden paddle is done from above these boards (below right). Photos taken at Horikawayama Nomura.

Kishu Domain – the seat of power for one of three branches of the Tokugawa clan – shipping goods on the Kuroshio Current towards Edo, such as locally produced mandarin oranges and timber, as well as salt from the Jusshu Enden salt farms along the Seto Inland Sea and other products. The company began making soy sauce and miso as souvenirs for customers, but after a 1756 maritime accident it switched its business entirely to brewing, to which it has been devoted ever since.

Of the traditional techniques inherited over many generations, the two adhered to most faithfully here are manual koji-making and heating over a wood-burning fire. From cooking soybeans to roasting wheat, pasteurizing the *kiage*, and everything in between, heat is provided by either pine, cedar, or cypress firewood, and traditional iron cauldrons are used for simmering soybeans and pasteurization (FOOD CULTURE No. 28, p11, 2018).

The manual koji-making process is repeated three times a week, or 70 times, in the production season from October to May. Each time, 150 kilograms of simmered soybeans and roasted wheat are mixed with koji mold, before being spread over 100 shallow wooden boxes to incubate for four days in a koji room. The room temperature is controlled by a wood-burning fire, and a small window is opened if humidity levels get too high. On rainy days, opening the window won't reduce humidity, so brewers keep a close watch on the weather forecast and make small adjustments like boiling the soybeans slightly less than usual. Filling a 30 *koku* (approximately 5,400 liter) tank with mash requires the addition of koji six to nine times during preparation. The results of soy sauce koji-making differ every time, and once the mold spores propagated so much they clouded the air preventing brewers from seeing right in front of them. But preparation in wooden barrels brings it all back into balance. While miso can be made at home on a small scale, commercialization of soy sauce brewing in large tanks by specialized craftsmen took place early on, one of the practical reasons being that preparation in large barrels helped homogenize the variations born in manual koji-making.

Propagation of koji mold in the soy sauce koji-making process is complicated by the nature of the materials being combined – hot simmered soybeans with high water content, and dried, room temperature roasted wheat. In addition to maintaining overall humidity in the koji room, daily adjustments like switching the position of boxes are essential because, for

example, evaporation occurs at a slower rate in the lower boxes. In winter, koji cools down too much if not divided among boxes quickly, and in spring there is a risk of overheating. The owner believes that these responses to changes in the daily environment represent the true shape of brewing.

Pasteurization begins at 4 a.m., and the temperature is gradually raised over two to three hours and adjusted based on the development of a layer on the surface. The final temperature is 85-90°C but no thermometer is used. Soy sauce that has been pasteurized has an unexpectedly bright kind of reddish translucency. The condition of the firewood and how it is placed affects how a fire lights, and today's brewers say, the fact they use more firewood than their predecessors is a sign there is still room for improvement. It's a process of accumulated enhancements and corrections made through daily interactions with the soy sauce and conversations with nature.

### 3. Preparation in Wooden Barrels

Originating in China, fermented seasonings made from soybeans and grains can be found in various countries across Asia. Korean fermented soybean products *ganjang* (liquid) and *doenjang* (solid) are prepared from a single process combining 100% soybean meju – a fermenting agent – with just saltwater in ceramic pots (FOOD CULTURE No. 24, p14-, 2014; No. 25, p14-, 2015). Japanese liquid soy sauce and solid miso, in contrast, are each made through unique processes from different raw materials, and prepared with soybeans and koji made from grains in large wooden barrels.

On Shodoshima Island, described in detail below, there are many wooden barrels, and several Wakayama breweries besides the two we visited continue to brew with wooden barrels. Of the 19 soy sauce breweries in Nara Prefecture today, six brew their soy sauce mash in wooden barrels. Together, these six companies cultivated a premium soy sauce market with the launch of a gift set of soy sauces brewed in wooden barrels (10,000 yen excluding tax). We heard that at one Nara brewery where preparation in wooden barrels has ceased, the next-generation young successor is interested in returning to brewing in the traditional style.

Soy sauce is known around the world today as the taste of Japan, but the volume of soy sauce produced in wooden barrels has fallen to as low as one or two percent. My travels around the soy sauce breweries of Wakayama and Nara left me with the sincere hope that this traditional style of soy sauce production may be carried on well into the future.



[[Nara] Kioke Shoyu Gensen Gift Kiwami]  
Yoshino cedar wooden box gift set of white ceramic jars holding soy sauce produced in wooden barrels  
Photo provided by Inoue Soy Sauce Co., Ltd.

### 4. Shodoshima Soy Sauce

Soy sauce making on Shodoshima Island tells us much about the development of *koikuchi* soy sauce production and is characterized by extensive use of wooden barrels. Located in the eastern part of the Seto Inland Sea, Shodoshima was on shipping routes for *kitamaebune* cargo vessels bound for Shimonoseki via Osaka, part of the greater Kyoto-Osaka commercial center. Similar to other soy sauce producing areas nationwide, the island was in a convenient location for receiving raw materials and shipping finished products,



but Shodoshima differs on two key points: the more than 1,000 soy sauce wooden barrels still used today, and the development of a soy sauce making cooperative.

Various stories exist on the origins of soy sauce making in Shodoshima. The first holds that around 1500, a ship captain delivering salt from the island to Osaka brought back techniques for making soy sauce with him. Around this time, the Akamatsu family who ruled over the regions of Harima and Bizen, ran the salt industry, making salt according to traditional techniques in the Seto Inland Sea and on Shodoshima. If soy sauce production really did commence at this time, it would probably have been in a more rudimentary form, such as the low volume tamari liquid that seeped out during miso-making, or an early tamari soy sauce – ladled out from barrels as a by-product of miso production. Another story tells of the late 16<sup>th</sup> century when Shodoshima flourished as a quarry for building Osaka Castle, and the assumption that samurai working there brought soy sauce with them. It became known among locals, some of whom are said to have visited Yuasa, Wakayama Prefecture, to learn how to make it. Whether the *koikuchi* soy sauce production methods then were the same as today are unclear. But we do know that the soy sauce industry developed throughout the 17<sup>th</sup> century in the Tatsuno, Yuasa and Shodoshima areas surrounding Osaka Bay, supported by the production of wheat and innovations in salt-making on the Seto Inland Sea, and by access to the huge consumer markets of Kyoto and Osaka.

In the late 19<sup>th</sup> century, salt from the Jushu Enden salt fields on the Seto Inland Sea became a popular brand throughout Japan (see column). In my research, I often hear about the shift from sake-brewing, wholesaling, and shipping industries to soy sauce brewing around the country in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries, and in Shodoshima this shift saw many who worked in salt production move to soy sauce brewing.

## 5. Support for Food Industries on Shodoshima Island

Instrumental in the development of the soy sauce brewing and food production industries in Kagawa Prefecture have been the Kagawa Prefectural Industrial Technology Center Fermented Food Research Institute and the Shodoshima Soy Sauce Association, which has almost 120 years of history. We cannot forget Chujiro Kinoshita and Jujiro Shimizu, who were deeply involved in establishing

the brewing laboratory that was the forerunner to the food research institute. The following is a summary of that history, based on the 100-year history of the cooperative.

In December 1901, at the soy sauce brewing industry's peak, the Shodoshima Soy Sauce Manufacturing Industry Association was established by 158 companies across the island. Chujiro Kinoshita owned a large cargo vessel (*sengokubune*, 180-kiloliter capacity) and was doing a wide range of business from Hokkaido to Kyushu. But he felt a sense of crisis over the old-fashioned manufacturing methods in Shodoshima, having witnessed modernized soy sauce brewing in Kanto. He made moves to establish a brewing test laboratory in 1903, and after his ship fully loaded with Shonai rice from Yamagata Prefecture was seized by a Russian destroyer in 1905 during the Russo-Japanese War, he turned all his attention and efforts to the soy sauce brewing industry. That year, along with 47 supporters, he established the Noma Soy Sauce Association and built a cooperative test laboratory, on Kinoshita family property, of which he became plant manager. The laboratory became the Kagawa Prefectural Industrial Research Institute in 1910, and is now known as the Kagawa Prefectural Industrial Technology Center Fermented Food Research Institute. After a peak in 1907, Japan saw a nationwide decline in soy sauce breweries (FOOD CULTURE No. 28, p12, 2018), but Shodoshima's reputation as a soy sauce producer was lifted by the maintenance or improvement in quality throughout the island thanks to the establishment of the industry test laboratory.

Kinoshita was supported on technical aspects by Jujiro Shimizu, who majored in brewing and fermentation science at the Tokyo Imperial University Graduate School. As director of the industrial research institute from 1907 to 1928, he contributed to a number of technological innovations, such as remodeling of the koji preparation room, especially for the elimination of parasitic house flies, as well as isolation and cultivation of yeast and seed koji for distribution to brewers. In 1916, the Cooperative Soy Sauce Research Institute was established within the existing institute specifically to work on brewing methods and training for soy sauce technicians.

At that time, breweries in Noda and Choshi in Chiba Prefecture were modernizing their facilities and improving brewing methods, making it possible to supply large volumes of consistent quality soy sauce. The addition of

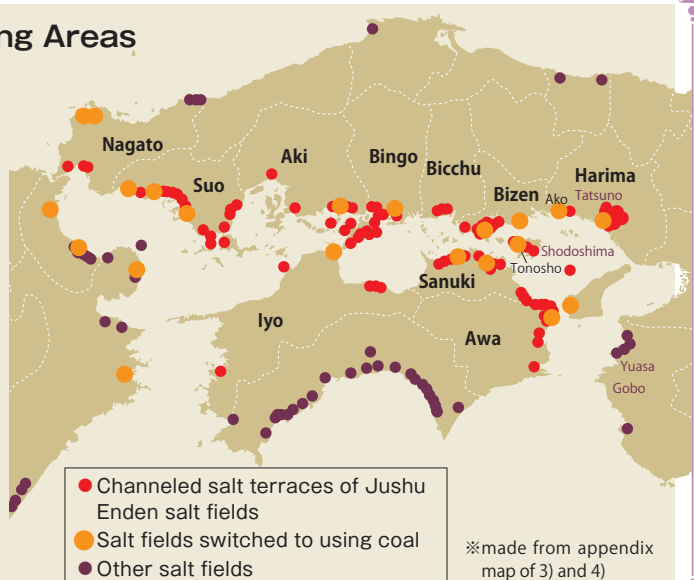
## Jushu Enden Salt Fields and Surrounding Areas

Edo period salt fields along the Seto Inland Sea are collectively referred to as Jushu Enden, meaning "salt fields of the ten provinces" in the surrounding areas: Harima (Hyogo Prefecture); Bizen, Bitchu, and Bingo (Okayama Prefecture); Aki (Hiroshima Prefecture); Suo and Nagato (Yamaguchi Prefecture); Awa (Tokushima Prefecture); Sanuki (Kagawa Prefecture); and Iyo (Ehime Prefecture). Around the turn of the 17<sup>th</sup> century, channeled salt terraces (Irihama-type) for salt production developed and spread around the region. With the development of maritime transport in the 17<sup>th</sup> century, salt from Jushu Enden was distributed around the country. From the late 18<sup>th</sup> century onwards, coal fuel spread replacing firewood and pine needles, leading to improved efficiency and greater production volumes.

In addition to that from nearby Tatsuno and Shodoshima, salt from Aki in the eastern part of the Seto Inland Sea was transported to Edo and used as a raw material in soy sauce production in Noda and Choshi. Salt made in western parts of the region were loaded onto *kitamaebune* cargo vessels bound for Osaka, from where it made its way to many domains along the Japan Sea coast.

### References

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- 3) Tomioka, G., 1978, *Nihon no Shiomichi* (Japan's Salt Journey), Kokon Shoin, p. 38–45.
- 4) Hiroyama, G., 1997, *Shio no Nihonshi-Dainihan* (A Japanese History of Salt -2nd Edition-), Yuzankaku Publishing, p.123.



yeast to the mash was first undertaken in Shodoshima in 1907, and with the distribution of seed koji starting in 1910, Shodoshima achieved improvements in terms of quality, stability, and aroma. Collaboration with breweries was strengthened by the efforts of the above-mentioned test centers, and in 1922, Noma Village breweries gathered to form a tasting group led by Shimizu. Monthly tasting sessions and other activities continue to this day, even as the cooperative approaches its 120<sup>th</sup> anniversary.

Originally, Shodoshima's specialty was hand-rolled somen noodles. However, just as World War II ended, around September 1945, production of soy sauce—simmered sweet potato vines began, and this variety of *tsukudani* preserved food became a new island specialty. Some soy sauce makers expanded sales channels supplying soy sauce as seasoning for instant noodles invented in Osaka. There have been remarkable developments in soy sauce-based products like noodle and dipping sauces, the above-mentioned *tsukudani*, and also, with recent



Sweet potato vines *tsukudani* – the impetus for the soy sauce-preserved foods industry on Shodoshima Island

growth in olive cultivation, dressings including olive oil too. The existence of the Kagawa Prefectural Industrial Technology Center has played a major role in soy sauce brewers making impressive inroads into the processed foods industry.

## 6. Brewing Shodoshima Soy Sauce

The Soy Sauce Museum, near Kusakabe Port in southeastern Shodoshima Island, was built by the island's largest brewer, originally founded in 1907. As well as seeing large-scale facilities such as wooden barrels, pasteurization cauldrons, and pressing equipment, visitors can gain an understanding of the soy sauce making process around the turn of the 20<sup>th</sup> century through displays including wooden barrels for transportation, and valuable tools for barrel-making.

Currently, there are 20 companies producing soy sauce on the island of Shodoshima: two large companies not part of any cooperative; one company that belongs to the Kagawa Prefectural Soy Sauce Brewing Cooperative; and the remaining 17, who all belong to the Shodoshima Soy Sauce Cooperative, including three member companies from neighboring Tonosho Town.

Among Shodoshima Soy Sauce Cooperative member companies, five possess somewhere between a handful and 100 wooden barrels for soy sauce brewing, and two major companies have about 500 and 200, respectively. There are thought to be a total of 2,000 to 3,000 wooden barrels nationwide, and the above numbers show that more than 1,000 of these are owned by companies in Shodoshima. We also know that Shodoshima is the only production area that distributes *kiage* raw soy sauce prepared in wooden barrels. Yeasts play a role in the aroma of brewed soy sauce, and each of the yeast varieties present in wooden barrels and warehouses result in distinctive aromas. I spoke with a cooper in Sakai who provides wooden barrels to breweries of sake, miso and soy sauce around the country. He said that back when sake was typically brewed in barrels, several *toji* chief brewers gathered in the large breweries of Fushimi and Nada and prayed for a job in a brewery with good potential, knowing that no matter how good their techniques were, good sake could not be brewed in a bad brewery. Such uncertain elements, like the character

of naturally occurring yeasts, were subsequently mitigated through modernization of facilities, allowing the brewing industry to consistently supply products of stable quality. Shodoshima's largest brewer has about 310 barrels in an area with no temperature control where the soy sauce is brewed through a natural fermentation process, and a further 200 barrels where temperature is controlled during fermentation. In the last 50 years, only about 3% of the natural process barrels have had to be boarded up due to deterioration, compared to about 12% of those in the temperature-controlled section of the brewery. The more rapid deterioration of the latter is because of artificially higher humidity in the room and the fact that the barrels are used in preparation more times in a year than in natural brewing. Deterioration occurring in the natural brewing section is simply a matter of the barrels gradually approaching the end of their life span.

The Shodoshima Soy Sauce Cooperative member brewery with the second highest prevalence of wooden barrels in Shodoshima built traditional style brewing buildings behind its factory around the year 2000. This brewery stocked the new facility with used barrels obtained from others on the island when those breweries ceased production. One such barrel is inscribed with the words "Meiji 38", indicating the year 1905. That means the barrel has been used continuously for over 110 years.

Soy sauce brewing barrels can be used for 100 to 150 years, and even close to 200 years if they are in good condition. In contrast, barrels for sake can only be used for 10 to 20 years because of the burden placed on them during the idle summer season when they are thoroughly washed and dried to prevent propagation of various bacteria. The preparation of soy sauce involves saltwater, and the mash is left to ferment for one to two years before pressing, so the burden is small. Countless brewing microbes propagate on the barrel walls, dissolving into the mash to create complex flavors and aromas.

The Shodoshima cooperative provides six varieties of barrel-prepared *kiage* raw soy sauce to its members including one made from domestic raw materials only, one from imported ingredients, an organic product, one made from black soybeans, and a *saishikomi* refermented soy sauce based on barrel-prepared raw soy sauce. By doing so, each member company can then produce variations of soy sauce, thereby successfully adding value. Some brewers use black beans as their key ingredient, while another makes gluten-free soy sauce from fava beans, and others focus on refermented soy sauce. These actions show that while soy sauce making in Shodoshima is about preserving traditions, it is also a process of continuous innovation.



Natural brewing warehouse with 112 wooden barrels of approximately 5,400-liter capacity neatly arranged in four rows. The glass wall allows tourists to see from outside and also prevents insects and birds from entering. The barrels are estimated to be more than 100 years old. The narrow distance in between makes rearranging and repairs difficult. Defunct barrels, the number of which increases slightly every year, are boarded over the top. Photo taken at Marukin Shoyu Co., Ltd.



At a brewery with about 200 of the large wooden barrels, three buildings remain (second building shown above right) beyond the enormous outdoor fermentation tanks (photo above left). When bamboo hoops become loose, they are repaired with metal belts (below left) that last for 50 years if the cedar planks are in good condition. Barrels marked with the year 1887 have been in use for 114 years (below right). Photos taken at Shimajo Co., Ltd.