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## **Contracting for Terroir in Sake**

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Abstract: Over the course of the last half century, Japanese consumers have steadily lost their taste for sake. A few large producers dominate the mass market through economies of scale, but the regional brewers have gradually gone out of business. In this environment, a small group of enterprising regional brewers began to create a market for premium sake with the environmental variations so important to French terroir.

To produce the delicate and subtle terroir sake, brewers must convince local farmers to grow the high-risk and high-cost varieties of rice optimized for premium sake. The challenge presents contractual problems with unusually complex incentive and informational requirements. I explore the arrangements by which brewers have addressed these problems. Some have decided to grow the rice themselves -- "solving" the contractual problem through vertical integration. Others have constructed deceptively simple arrangements that elicit the requisite information, bind the firm to the community through social capital, and (by paying a sufficiently high price) give the brewer the right to intervene directly in the farming.

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Three aging train cars creaked along the weed-covered single track and wended their way up the Nagano valley toward the station. If a train were to come from the opposite direction, it would have stopped in the station while the other passed. But that rarely happened. Trains in either direction barely came once an hour. Mostly, they served high-school students commuting from the scattered hamlets to the central school a few train stops away.

After cresting the mountain range, the train stopped at Kurohime station. The station served several of the hamlets in the Shinano village. In 1960, 13,700 people lived in Shinano, and 60 percent of them farmed. By 2015, barely 8,500 lived in Shinano anymore, nearly 40 percent of them were 65 or older, and barely 760 of them farmed (Shinano 2019).

Were a traveler to leave Kurohime station, he would walk past one shuttered building after another -- windows broken, siding unhinged, and front rooms littered with trash. Never mind the distance to the sea, but a sushi restaurant operated during the booming 1980s. Tokyo vacationers came in their BMWs back then. No longer. An electrical appliance shop once did business. So did a bakery, a supermarket, a pottery shop. The stores are all closed now. With no demand for the land, owners have no incentive to clear the buildings. Instead, they have boarded them up, and left them to rot. Today, tattered Communist Party posters hang from the walls.

A mile down the highway, past more abandoned storefronts, the traveler would pass an apparently booming pachinko gambling establishment. He would pass a similarly booming funeral home. On the other side of the street from the gambling parlor, he would locate the one remaining supermarket. And behind the supermarket he would find a small complex of buildings. Some are small, with faded creosoted wooden paneling. The rest are sheathed in slowly rusting metal siding. This is the town brewery, the creator of Matsuo sake.

If the traveler came with an appointment, the firm president Takahashi, son of the chairman of the board Takahashi, would proudly meet him in the entryway. Everything about the young president contrasts with the environment. Heir to the 150-year-old family brewery, he is young. He is energetic. And he is extraordinarily articulate. He will happily offer a visitor tastes of several of the firm products. Ask him questions, and he will begin to describe his firm's philosophy of "terroir" (he uses the French word). He happily explains the arrangements he has negotiated with several farmers in the tiny hamlet of Arasebara on the foothills of Mt. Madarao. They grow sake rice varieties optimized for Nagano. And with that Arasebara rice, he has fashioned a sake that he hopes captures the character of the mountainside hamlet. Six times, he has won the national sake championship (junmai daiginjo and daiginjo divisions).

Sixty kilometers away in Nechi valley sits the Watanabe brewery. But 60 km only as a crow or drone might fly. The 2,500 meter Mt. Myoko lies between. Were a traveler to attempt the trip by train, he would spend 2-1/2 hours, and find the rails single-tracked at the Nechi end as well. On an average day in 2018, only four people used the Nechi train station. Were the traveler to try to drive, in winter and spring he would find the roads closed by snow. Headed by Yoshiki Watanabe, 6th generation head of the family firm, the Watanabe brewery uses its own local rice to showcase the terroir of the tiny Nechi valley hamlet. It too focuses on sake-optimized rice

varieties, but also distinguishes its bottles by vintage. In 2010, it won the champion sake award (junmai ginjo division) at the London International Wine Challenge.

Over the course of the last century, Japanese consumers have gradually lost their taste for sake. A few producers in Kobe dominated the mass market through economies of scale. The smaller regional brewers steadily went out of business. In this environment, ambitious (and perhaps desperate) brewers like Takahashi and Watanabe have tried to create a market for unambiguously delicate and subtle high-end sake that showcases environmental variation. To create their terroir sake, however, they must convince local farmers to grow the high-risk and high-cost varieties of rice optimized for premium sake. The resulting contractual problems involve extraordinarily complex incentive and informational requirements. In the article below, I explore the deals brewers have used to address those problems. Some have started to grow the rice themselves -- "solving" the contractual problem through vertical integration. Others have constructed deceptively simple arrangements that elicit the requisite information, bind the firm to the community through social capital, and (by paying a sufficiently high price -- the contractual equivalent of "efficiency wages" in economics) give it the right to intervene directly in the farming.

I begin by explaining the history of sake and the process by which to brew it (Section I), and the state of the industry (Section II). I describe the way that innovative regional brewers created a market for premium sake (Section III). Finally, I turn to the contractual problems created by the move to develop terroir sake (Section IV).

## I. Sake

### A. The Drink:

At least some version of sake dates to pre-history. Migrants from Korea or Sakhalin (no one knows which) brought wet rice agriculture to Japan sometime around the third century BCE. Probably Japanese began to drink a fermented rice drink soon thereafter.

In the two millennia since, sake has played a prominent role in Japanese culture. The 7th and 8th century poets in the Man'yōshū anthology sang praises to it. The 15th century bakufu elites paired the "Way of tea" with a Zen'ish "Way of sake." No one knows how it tasted back then, but everyone drank it. Farmers drank it, merchants drank it, swordsmen drank it.

Over time and across the country, the brewers doubled as bankers. Fans of classic cinema will remember Mifune playing off the village brewer against the village brothel owner in Kurosawa's 1961 Yojimbo. In premodern villages, the sake brewers were often among the richest. They financed paddies, irrigation networks, and entrepreneurship more generally.

Sake brewing is easy to describe, but enormously hard to execute well. Through the fermentation process, yeast turns sugars into alcohol. Yet rice contains no sugar. To create the sugar, brewers need first to add mold (koji) to a small amount of steamed rice (koji mai). The mold then transforms the starch in the kernel into a sugar. To this starter, the brewers add additional rice (shubo mai, or moto mai) and yeast (kobo). This creates a culture (shubo), to which the brewers will add more mold, steamed rice (kakemai), and water. They take this last step multiple times. They precipitate out the solid particles. And they typically close the process by heating the mixture to kill the active ingredients.

### B. The Industry:

Before the 1868 Meiji coup, most sake production was local. Most major towns (and many small ones) had their local brewer. Out of the local rice, the brewers brewed the sake for their local customers.

For a few years after the coup, production remained local. In 1876, brewers operated 26,000 breweries (Ninomiya 2012, 58; Suzuki 2015, 71). Soon, however, this changed -- as the incipient transportation network allowed the most efficient producers to exploit economies of scale. By 1899, nearly half the breweries had disappeared, and only 15,000 remained. By 1942, the number had fallen to 7,000, and by 1958 to 4,000. In 2017, barely 1,378 still survived (Osake N.D.).

Today's 1,378 breweries vary enormously. The 11 largest each brew more than 10,000 kl of sake. Together, they employ over 4,300 employees and produce 47.5 percent of all sake (2017 data). Another 838 firms brew less than 100 kl each. Together, they employ 7,600 people and produce only 5.1 percent of all sake. Indeed, 830 of the breweries are seasonal firms that run only during the winter.<sup>1</sup>

Most of the biggest brewers operate from the Nada area of Kobe or the Fushimi area of Kyoto (see Figure 1). Now a center of 1.5 million and the capital of Hyogo prefecture, Kobe also serves as port to the massive city of Osaka to its east. Nada lies along the eastern coast of Kobe, where the brewers enjoy access to an unusually clear stream of underground water. They traditionally bought their rice inland, brewed it with that local water, and -- even during the Tokugawa period -- shipped the sake to ports as far away as the Edo (now Tokyo) capital (Ninomiya 2012, 51-53). Other large breweries operated out of the inland city of Fushimi, slightly to the west of Kyoto.

[Insert Figure 1 about here.]

Nada and Fushimi remain the base for the very largest producers. In Table 1, I give the market shares of the ten largest modern firms. Of these ten, only Koyama honke does not operate from either Nada or Fushimi.

[Insert Table 1 about here.]

### C. The Rice:

Japanese farmers grow about 8.6 million tons of rice a year (Norin N.D.). Most of this they grow as table rice, and for 35.9 percent of the table rice use the variety known as koshihikari. It is an enormously popular rice. Even the second and third most popular varieties are koshihikari derivatives. Farmers grow the largest amount of table rice in Niigata prefecture along the Japan Sea coast (Okome 2016; K.K. Kaneko 2016).

For their high quality sake, brewers use more expensive rice varieties optimized for the drink. This sake rice is not a different species. Like the table rice, it still falls within the Japonica rice used in Japan, Korea, and China. But within Japonica, the varieties that farmers grow specifically for sake will not double for food. Sake rice simply is not a vegetable that consumers would choose to eat. (Suzuki & Takada 2017, 140).

For their very best sake, brewers use only this sake-optimized rice. Difficult to raise and producing only a smaller yield, sake rice costs substantially more than table rice. Because of this cost, brewers sometimes skip the sake rice entirely for their cheapest sake. Given that the taste of the sake depends most critically on the first steps in the process, even brewers who use some sake rice may use it only for the initial starter (as koji mai) and culture (as shubo mai). They then add cheaper table rice for the rest of the process (as kake mai; this is 70 percent of the total).<sup>2</sup>

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<sup>1</sup> Kokuzei cho (2018b) (fiscal 2018 survey). The cool temperatures lower the risk of sake spoiling during the course of production. See Suzuki (2015, 10-11, 29).

<sup>2</sup> Koike (1995, 162); Maikoku (2014, 12).

In 2018, Japanese farmers grew only 93,000 tons of sake rice. Sake rice has a relatively large kernel (which brewers need in order to remove the outer layers that muddy the taste). Sake rice will absorb the mold (koji) into the heart of the kernel more readily than table rice, and will often contain a large starchy (shimpaku) core. It will have low levels of fat and protein.<sup>3</sup>

Yamada nishiki is the koshihikari of sake rice -- indeed, 36.8 percent (34,059 tons) of all sake rice (Norin 2018). It is particularly hard to grow. Developed in the 1930s, it is unusually vulnerable to disease, and with a long stem is especially vulnerable to late season typhoons.

Yet where koshihikari grows well across most of the country, yamada nishiki thrives only in a few areas. By latitude, the main islands of the Japanese archipelago stretch roughly from San Diego to Portland. The northern island of Hokkaido contains enormous ski resorts; the southern island of Kyushu was once a semi-tropical tourist destination. The island chain is relentlessly mountainous, and the area near Nagano hosted the 1998 winter Olympics. Rain falls massively on the western side as the winds sweeping off Siberia pick up moisture over the Japan Sea and then drop it when they hit the mountains. The eastern side is dryer. Given that the mountains are essentially volcanic, soil content varies widely.

Yamada nishiki grows best in Hyogo prefecture (not coincidentally, near the Nada brewers). It needs moderate temperatures -- ruling out both the northeast and the south. It does best in valleys (ideally, positioned East to West), with good sun exposure, with a large temperature variation from day to night, with good drainage, and with a clay base (Takeyasu 2018, 69). More than any other prefecture, Hyogo offers these conditions and in 2018 Hyogo farmers grew 58.5 percent of the yamada nishiki crop (Norin 2018).

Outside of Hyogo, farmers grow other varieties of sake rice. At 21,000 tons (22.7 percent of the total), gohyakuman goku is the next most common sake rice. Farmers in Niigata prefecture produced 46.1 percent of the variety. Miyama nishiki (6,000 tons, 6.9 percent), of which Nagano farmers produced 61.0 percent, is third (Norin 2018).

## II. The Sake Market

### A. The Relative Decline:

As the 21st century opened, Japanese were drinking less alcohol. In 1990, they had drunk 100.1 liters per adult capita per year. By 2000, they drank only 95.5 liters, and by 2010 only 82.3. Middle-aged men and women drink more than younger men and women, but they also drink more than the elderly. As Japanese aged, the fraction in middle-age declined, and with it fell per capita alcohol consumption (Kokuzeichio 2018a).

Of what they were drinking, Japanese drank less sake. For over a century, they had been steadily switching from sake to beer (Table 2). In 1902, they had drunk 92 percent of their alcohol as sake, and only 2 percent as beer. By 1952, they drank 31 percent as sake and 34 percent as beer. By 2000, they drank only 10 percent of their alcoholic beverages as sake and 71 percent as beer.<sup>4</sup> Some urban professionals were beginning to drink wine, and some were returning to the traditional drink of shochu (once a distilled rotgut for impoverished peasants and factory hands) as a mark of

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<sup>3</sup> Daiginjo (2014, 2); Kadono, et al. (2011); Koike (1995, 161); Saito (2015, 2).

<sup>4</sup> Beer falls from 71 percent to 44 percent over the next decade. This shift large constitutes a shift toward a new supermarket drink category loosely called liqueur. It is not what Westerners think of as liqueur. Rather, these are sweet and fruit-flavored, easy-to-drink and cheap canned cocktails.

retro-cool. Having peaked in 1973 at 1.4 million kl, sake consumption fell by 2012 to 439,000 kl.<sup>5</sup>

[Insert Table 2 about here.]

The decline hit brewers everywhere. As noted earlier, across the country as a whole the number of brewers fell from 4,000 in 1958 to 1,378 in 2017. In Nada itself, the number fell from 67 breweries in 1973 to 29 firms in 2011. In 1973, those 67 had made 582,000 kl. In 2011, the remaining 29 made only 163,000 kl (Nihon 2013).

## B. Historical Context:

1. Introduction. -- Tastes change. Over the course of the last 150 years, Japanese consumers have adopted Western dress. They listen to Western music. They watch Western movies. And they have learned to drink Western beverages.

But the story is not just one of drinking fashion. It is also a story about science and politics. It is a story that involves technological progress on the one hand, but military aggression and regulatory pressure on the other.

2. The science. -- During the early Meiji decades, the most entrepreneurial brewers studied and incorporated modern science. Tokugawa brewers had not understood the biology of fermentation. They did not understand yeast, and did not add it. Instead, their rice fermented because of the yeast in the environment -- because of the fungi that happened to live in the air, and grew on brewery surfaces themselves.

Once brewers learned the biology of fermentation, they began to approach yeasts deliberately. Rather than rely on haphazard environmental cultures, they searched for yeasts that had produced successful drinks in the past. They cultured those yeasts, and began to add them with care. In the process, they lowered the fraction of batches that failed, and raised the quality of the sake they produced (Suzuki 2015, 114).

Brewers also learned to accelerate the creation of the initial fermentation culture (the shubo). In the traditional process (called kimoto), brewers let the environmental yeast grow in the rice-mold-mixture and turn the sugars into alcohol (Ozeki 1996, 560). The yeast initially competed with other bacteria in the mixture. As the (naturally occurring) lactic acid bacteria steadily multiplied, however, they eventually killed the other bacteria and let the fermentation proceed. This process took about a month. By deliberately adding lactic acid at the outset, the brewers found that they could halve the time necessary to finish the culture.<sup>6</sup>

In 1941, brewers also discovered that they could increase the amount of sake from a given quantity of rice by adding brewer's alcohol (Suzuki 2015, 167-68). Many (perhaps most) brewers still do. They note that the alcohol stabilizes the sake, and helps to prevent spoilage. Some protest that they are not adding a chemical from an antiseptic modern factory, but instead the traditional shochu distilled drink. They argue that the alcohol enhances the taste of the sake, and that pre-Meiji brewers had done something like this as well. All this may be true, but critics point out that the mid-20th century brewers (working in Manchuria, no less) did not add the alcohol for any of these reasons. They added it because rice was expensive, and adding alcohol cut the cost of production (Yamakata 1997, 344-45).

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<sup>5</sup> Ono (2019, 13); Maikoku (2014, 2).

<sup>6</sup> Ozeki (1996, 560); Suzuki (2015, 111-16).

3. Regulatory constraints. -- Social tensions rose steadily during the interwar years, and the government responded by increasing control.<sup>7</sup> As they had since the late 19th century, peasants continued to abandon the farms and move to the cities. There, they crowded into newly created slums. Some rioted, and in 1918 they rioted over the price of rice. Within this environment, political entrepreneurs organized communist and anarchist cells.

As the Tokyo government worried about the leftist cells, the army expanded its territory over the continent. It evaded efforts by Tokyo politicians to control it. It created a massive colony in Manchuria. And by the late 1930s, it had dragged the country into a war it could not win.

The government responded to the fiscal strains by adopting increasingly stringent controls over an ever-wider swath of the economy. Central to this program, it began to control the market for rice. As it moved the country increasingly to a war footing, it relentlessly intensified this control.<sup>8</sup>

The Allied (effectively American) occupation government continued much of the prewar control structure. Although Shigeru Yoshida dismantled much of the program when he replaced socialist Tetsu Katayama as prime minister in 1948, he retained many of the controls over rice. During the next two decades, the government allocated rice among the brewers by quota. It had begun the quotas in 1938, but continued them after the war. A brewer could use the rice allocated to him or her, but (unless he or she bought another brewer's quota) could acquire no more.<sup>9</sup>

### C. The Nada-Fushimi Response:

Deregulation would eventually come, but only after sake brewers had so badly depreciated sake quality as to alienate most of their sophisticated potential customers. It was not until 1969 and 1974 that the government finally dismantled the regulatory strictures on the sake and rice markets.<sup>10</sup> Over the four decades preceding decades, brewers had learned to weather regulatorily created rice shortages. Now they needed to survive in a competitive market. For that, they would find their learned strategies badly mismatched.

The brewers had focused almost entirely on making sake as cheaply as possible. In 1922, a chemist had developed a synthetic sake that used very little (if any) rice.<sup>11</sup> With this technology, brewers had developed what would become the infamous "treble sake." Although they started with rice, mold, and water, they added a variety of other ingredients that let them treble the amount of drink they could produce from a given quantity of rice.<sup>12</sup>

Synthetic sake remains on the market, and is often used for cooking. The treble-sake drink it spawned constituted a massive part of the market in the 1950s and only disappeared in 2006. It

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<sup>7</sup> Note that during the late 19th and early 20th century, the tax on alcohol was the single largest source of government revenue. Suzuki (2015, 102-03).

<sup>8</sup> Ozeki (1996, 426); Ninomiya (2015, 470); Ito (1981); Furuichi (1996).

<sup>9</sup> Ono (2019, 22); Shibuya (2020, 89); Nishinomiya (1989, 226-27, 263); Suzuki (2015, 147-55, 164-82); Ono (2019, 22).

<sup>10</sup> Ono (2019, 22, 25); Ninomiya (2015, 492); Ito (1981); Ozeki (1996, 425-26); Suzuki (2015, 199); Sando (2018, 2019).

<sup>11</sup> Ishiguro (2015a); Ono (2019, 23); Ninomiya (2015, 472).

<sup>12</sup> Ishiguro (2015a); Ninomiya (2015, 472, 482); Ono (2019, 23); Yamakata (1997, 344).



had been the very worst sake. By 2006 too few people wanted to drink it to warrant production anymore.<sup>13</sup>

In this desultory market, the Nada and Fushimi brewers did have name recognition. When during the 1950s and 60s they lacked high-enough rice quotas to meet the market demand, they simply filled the resulting shortage by buying additional sake. They bought it from less well known regional brewers in bulk, and resold it under their own names (Ono 2019, 24). They did not buy this bulk sake from brewers with whom they maintained long-term relations. Instead, they merely bought the available sake on the spot market: one brewery needed more sake, another had more than it could sell. In 1975, the Nada giant Hakutsuru brewed 109,000 koku of sake; it sold 404,000.<sup>14</sup>

Note the obvious implication of these bulk-sales: by mid-century, cheap sake was everywhere the same. By deliberately controlling the chemical transformations involved -- standardizing yeast quality, introducing lactic acid, adding alcohol, and scientifically controlling quantities and timing -- brewers had eliminated nearly all random variation. In the course of shifting to mechanized and sanitized processes, they had cut most of the variation not only in their own output, but from brewer to brewer as well (Ninomiya seishugyo 2015, 473, 490).

Although the government deregulated much of the rice and sake markets in the early 1970s, the Nada-Fushimi brewers continued to position their sake as a low-cost mass-market beverage. They focused first on price. Japan had not been rich in 1960, and they had positioned their drink as a low-cost drink for ordinary Japanese. By the 1970s, Japanese were no longer poor, but the mass-market brewers continued to make the same drink.

In fact, the Nada-Fushimi brewers kept this strategy through the end of the century. The number two Gekkeikan firmly controlled a solid presence as the Budweiser of Japanese sake: ubiquitous, cheap, and defiantly working class (see generally Kawaguchi & Fujimoto 2007). The number four Ozeki found its own niche for cheap sake in a one-drink-quantity bottle that it distributed the country over: "One Cup Ozeki," they called it. In 1965, One Cup was 0.9 percent of Ozeki output. In 1967, Ozeki loaded the One Cup into vending machines, and by 1991, it constituted 34.0 percent of Ozeki output (Ozeki 1996, 334-35).

Consistent with this mass-market strategy, in the 1970s the Nada makers began to sell sake in milk-like paper cartons. Ozeki introduced its first paper-carton sake in 1976. By 1983, carton sake constituted 18.7 percent of its output (Ozeki 1996, 368). Gekkeikan introduced paper cartons in 1980 (Gekkeikan 1987, 178). By 2000, paper carton sake was about 40 percent of all sake volume; by 2016, it constituted more than half (Osake Sutatisutikkusu).

### III. Craft Breweries

#### A. Introduction:

As Japanese grew wealthier, many consumers developed a taste for premium alcoholic drinks. Tariffs came down (Ishiguro 2015c), and good scotch and cognac offered a complexity lost in most other distilled drinks. French and Napa wines presented subtleties that the Nada-Fushimi brewers had long since erased from sake.

In the competition for mass-market alcohol, the regional sake brewers could not win. The contest rewarded investments in the large-scale equipment that generated economies of scale. The

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<sup>13</sup> Ishiguro (2015b, 2015c); Nishinomiya (1989, 264-5).

<sup>14</sup> Yamakata (1977, 390); Ninomiya (2015, 488).

Nada-Fushimi brewers brewed a drink that differed little from maker to maker, and competed mostly by price. Unable to beat that price, the local brewers steadily disappeared.

It was within this rapidly deteriorating market that a few local brewers gambled on premium sake. They gambled big.

## B. The Premium Niche:

1. The formula. -- As local brewers began to shift their efforts up-market, they focused first on three elements. They stopped adding brewers' alcohol. They removed more of the kernel's coarse-tasting outer layers. And they used costly sake rice varieties for a larger fraction of their rice.

a. Junmai. Pivotal to the rediscovery (or perhaps invention) of premium sake was the concept of junmai (meaning "pure rice"). By mid-century, Japanese brewers had learned to cut costs by adding brewers' alcohol to their sake. In doing so, they could use less rice, and routinize, stabilize, and mechanize large-scale production.

Local brewers offered a return to a conceptually simpler (but in practice more difficult) drink: sake made only with rice, mold, and water (and yeast). This was a costlier process. It required nearly twice as much rice and (if the brewers are to be believed) more patience, subtlety, and expertise. They were rediscovering the classical sake-brewing tradition. In truth, they brewed a sake that was almost certainly much better than anything in the 19th century. But never mind. They were returning sake to the premechanized, pre-adulterated pristine past.<sup>15</sup>

A mid-sized Fushimi brewer named Tamanohikari had made the first of the post-war junmai in 1964 (Ishiguro 2015b). It continues to proclaim that fact boldly on its company website. Steadily after the 1980s, local brewers began to focus on junmai sake. Many jettisoned their mass-market lines, and started producing only junmai.<sup>16</sup>

b. Ginjo. Local breweries also began to focus production on their ginjo and daiginjo offerings. To make sake, brewers do not directly steam the rice kernels. Instead, they first mill (grind) the rice to remove the germ and some of the outer layers. Those layers contain material that introduce unwanted flavors into sake. Mill the rice first, and the drink will present a cleaner taste. It will also cost more to produce.

To make ordinary sake, a brewer might grind off as little as 10 to 20 percent of the kernel. To make ginjo sake he (or she -- most are men) will remove 40 percent, and to make daiginjo (meaning "great ginjo") he will remove 50 percent. He will also need to ferment the rice at a lower temperature, and at a slower pace. The process is obviously more expensive. A sake that is both junmai (no alcohol added) and daiginjo (50 percent removed) will require six times as much rice as an ordinary sake.<sup>17</sup>

The ginjo (and daiginjo) sakes offer a cleaner taste than ordinary sake. Fans describe them as crisp, delicate, aristocratic, and clear. Note that the ginjo technique is relatively new. Several

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<sup>15</sup> Ishiguro (2015b); Tamanohikari (N.D.); Shibuya (2020, 83).

<sup>16</sup> Sando (2018); Akita (2019); Tamanohikari (N.D.).

<sup>17</sup> Shibuya (2020, 83); Kokuzeicho (N.D.); Suzuki (2015, 52-53).

Hiroshima breweries produced the earliest versions of ginjo near the beginning of the 20th century. A mid-sized Fushimi brewer, Tsuki no katura, produced the first daiginjo in 1966.<sup>18</sup>

c. Rice variety. The regional brewers also began to focus heavily on premium rice varieties. Recall that brewers add rice at three stages. They mix a small amount with the mold (koji mai), add a larger amount when they introduce yeast and start fermentation (shubo mai), and then add the majority in later stages (kake mai). For mass-market sake, brewers might use table rice for all three processes. Those selling into the middle-tier might use table rice for the third stage, but sake rice for the first two (Saito 2015, 1).

Those brewers selling into the premium market sometimes use only sake rice for the entire process. Recall that the sake rice varieties tend to grow only in limited areas, and that the yamada nishiki grows primarily in Hyogo. Some regional growers simply import Hyogo yamada nishiki for their sake. Others mix local sake rice varieties with imported yamada nishiki. And still others -- the terroir breweries described below -- will focus primarily or exclusively on distinctive local varieties.

2. The Dassai success. -- Asahi Shuzo's Dassai brand embodies the premium local-sake boom. As a success story, it has also inspired beleaguered small breweries the country over. The Asahi brewery had been founded in 1948 in Yamaguchi prefecture in south-western Japan. As sake consumption fell, it found itself in dire straits. Total sales had plummeted to 97 million yen.

In 1984, Hiroshi Sakurai took over as third-generation head of the family firm. He was 34, the firm was failing, and he gambled big. The firm had been making ordinary sake. He jettisoned the line, and over the next several years would develop a clear firm policy: he would make only junmai; he would make only daiginjo; and he would use only yamada nishiki. Not only would he only make daiginjo, he made history in 1992 when he introduced a daiginjo milled down to the last 23 percent.

As of 2005, Dassai still sold only 216 kl. By 2010 sales had trebled to 776 kl, by 2013 to 2,052 kl, and by 2018 to 6,270 kl. Some of its bottles now sell for close to 40,000 yen. By 2018, it was far and away the largest maker of premium sake (Table 1).<sup>19</sup>

At about the time that the third-generation Sakurai arrived at Dassai, the brewers trade association for Niigata prefecture made roughly the same collective gamble. Faced with the secular decline in sake consumption and the scale economies in Nada and Fushimi, the Niigata brewers together decided to move up-market (Ono 2019, 25). With a source for water with very low mineral content and the local gohyakuman goku sake rice, they have cultivated a distinctive Niigata taste, which they describe as tanrei karakuchi -- light and dry. Largely, they have succeeded. After Dassai, the two breweries producing the most premium sake are both Niigata firms (Table 1), and by total volume Niigata ranks third after Hyogo and Kyoto.

Akita prefecture hosts an unusually large number of very high-end breweries as well. Like Niigata, Akita provides low-mineral water, and distinctive local sake rice varieties: Akita sake komachi and miyama nishiki. When the Sake Time gourmet news ranked the top twenty bottles in 2020, five were from Akita (Zenkoku 2020). Three each were from Nagano and Fukushima, and none were from either Hyogo or Kyoto.

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<sup>18</sup> Ono (2019, 26); Ishiguro (2015b, 1966); Suzuki (2015, 89, 160-61).

<sup>19</sup> "Dassai" (2013); Yamaguchi (2018); Nihon (2018).

3. The industry transformation. -- Steadily, one-time local breweries like Dassai have begun to transform the sake industry. Overall, Japanese continue to drink less alcohol (Table 2). They also continue to drink less mass-market sake (Figure 2). From 2007 to 2018, sales of ordinary sake fell from 339,000 kl to 222,000 kl. Those of the intermediate category honjozo (described in Subsection C, below) fell from 67,000 kl to 35,000 kl.

[Insert Figure 2 about here.]

Over the same period, however, premium junmai and ginjo sales rose from 98,000 kl to 125,000 kl. This is growth that the regional breweries have driven. By total 2018 production, nine of the top 10 breweries were in either Nada or Fushimi (Table 1). Yet of the top producers of junmai ginjo sake, only four of the top 10 were from Nada or Fushimi, and none of the top 5.

During the war-impoverished and heavily regulated mid-century, Nada-Fushimi breweries had cultivated a competitive advantage in low-cost production. Exploiting their economies of scale, they had focused on the mass-market sector. Hyogo producers still brew 85 percent of their sake as general (futsu or ippan) sake (2014 numbers). The Kyoto producers brew 90 percent as general. By contrast, in Dassai's Yamaguchi prefecture producers brew barely 21 percent of their sake as general.<sup>20</sup>

The regional brewers have deliberately crafted a new image. For decades, sake was a drink that middle-aged men (especially working class men) drank in dirty bars on their way home from work. They drank it heated in small ceramic cups. By contrast, the regional brewers have nurtured an image of sake drunk by urbane 30- and 40-something gourmets. They drink it cold, in long-stemmed wine glasses (Ono 2019, 13).

The regional brewers present sake as a distinctively Japanese drink, but one to be savored by these successful young professionals. On its website, Niigata brewer Kikusui describes sake as a drink for all seasons. There is a sake to drink when relaxing with friends at a restaurant. There is a sake for men to drink while flirting with a waitress. And there is a sake for women to drink while recalling their first crush, continues Kikusui, while commiserating with each other over the sadnesses that only women can know, and while (alluding to a well-known passage in the Tale of Genji) trashing the actual men in their lives (Kunifuda N.D.).

4. Extensions. -- Encouraged by the success of Dassai and its hundreds of competitors, entrepreneurial sake brewers experiment with a wide range of new approaches. Recall that since the Meiji period brewers have added lactic acid to eliminate competing bacteria and accelerate fermentation. Some regional brewers have returned to the earlier fermentation process (kimoto) and use no lactic acid at all.<sup>21</sup>

Some brewers experiment with other long-discarded techniques. One Akita brewer abandoned stainless steel containers for the earlier wooden vats. The vats require more work cleaning and repairing them, but they "bring a deeper taste to the sake," claims the brewer. Another brewer turned to the panoply of other wooden hand tools that brewers had discarded. Another abandoned added yeast and relies on the wild yeasts living in the brewery. Yet others -- like the Watanabe brewery in the Nechi valley -- are introducing the concept of vintages.<sup>22</sup>

Some brewers have revived discontinued local rice varieties. Despite the dominance of yamada nishiki, gohyakuman goku, and miyama nishiki, in 2019 farmers grew 119 different

<sup>20</sup> Yamagata (2015); see generally Shibuya (2020, 86).

<sup>21</sup> Sando (2018); Akita (2019).

<sup>22</sup> Akita (2019); Nihonshu (N.D.); Saito & Yamada (2017, 18); Bumu (2015).

varieties of sake rice. Many are new, experimental varieties. Others are varieties farmers discarded long ago as sake production centralized in Nada-Fushimi and brewers converged on homogeneous tastes.<sup>23</sup>

And still other brewers cater to the distinctly modern demand for "organic" and "sustainable" products. A wide variety of regional brewers include sake made from low- or no-pesticide and low- or no-chemical fertilizer rice. Kikusui advertises itself as "an environmentally friendly business" that donates a share of its revenue to the World Wildlife Fund (Kobayashi 2004). The Izumibashi brewery in Kanagawa promotes its "sustainable" production techniques.<sup>24</sup>

### C. Certification:

In 1990, the government introduced a standard certification regime for the terms junmai, ginjo, and daiginjo. It had graded sake for much of the mid-century, nominally by quality. It had also taxed the brewers according to those quality grades, however, so brewers began to manipulate the grades to lower their tax bill. By the end the 20th century the grades had ceased to reflect quality, and the government repealed the system in 1992.<sup>25</sup>

Under the new 1990 certification regime, the tax office defined several of the new premium categories.<sup>26</sup> The rules have changed modestly over the years, but as of 2020:

Junmai: sake with only rice and rice-based mold (koji).

Ginjo: sake in which each kernel is milled to 60 percent or less of its initial size, and in which any brewers' alcohol constitutes less than 10 percent of the weight of the rice.

Daiginjo: sake in which each kernel is milled to 50 percent or less of its initial size, and in which any brewers' alcohol constitutes less than 10 percent of the weight of the rice.

Honjozo: sake in which each kernel has been milled to 70 percent or less of its initial size, and any brewers' alcohol constitutes less than 10 percent of the weight of the rice.

Junmai offers classic 19th century-style sake. Brewers use it to showcase their distinctive flavors. Ginjo and daiginjo offer smooth, clear tastes. Because differences attributable to soil, weather, fertilizers, and rice variety tend to concentrate in the outer layers, however, ginjo and daiginjo offer less variation across breweries. A ginjo with no added alcohol would be called a junmai ginjo. Honjozo represents a sake intermediate both in quality and in price between the other certified sakes and ordinary uncertified sake (futsu or ippan shu).

## IV. The Invention of Terroir

### A. The Competitive Logic

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<sup>23</sup> Zenkoku (2019); Norin (2018).

<sup>24</sup> Kobayashi (2004); Sando (2019); Miyajima (N.D.); Sando (2019).

<sup>25</sup> Ishiguro (2015c); Ono (2019, 22); Iga (2008, 152). For much of the period, the quality designation turned on the level of alcohol (before and during the war, watered sake -- known as "goldfish sake" on the theory that it had so little alcohol that fish could live in it -- had been a problem) and the level of additives. Breweries could avoid the higher taxes by not submitting their sake for measurement, and taking the lowest grade. For more detail, see Suzuki (2015, 5; 147-58).

<sup>26</sup> The new certification standards were introduced in the National Tax Office order, Seishu no seiho hinshitsu hyoji kijun wo sadameru ken [Establishing the Display Standards for the Means of Production and the Product Quality of Sake], Kokuzeicho kokushi No. 8, Nov. 22, 1989. The order is issued under the Shuzei no hozen oyobi shuruigyo kumiai to ni kansuru horitsu [Law Regarding the Preservation of Liquor Tax and the Liguor Industry Organizations, Etc.], Law No. 7 of 1953.

The local breweries had sparked a renaissance in sake. By cultivating a taste for quality, they had created a market where none had existed before. The Nada-Fushimi brewers had responded to the war-time regulatory regime by using technology to lower cost and generate consistent products, but ignored the potential market for premium sake. The smaller local breweries now exploited the resulting opportunity and succeeded.

Unfortunately for the local breweries, the Nada-Fushimi breweries can compete in the market for ginjo and daiginjo if they choose. They will need better rice. They will need to shift production technique. They will need expertise. But they already have sophisticated equipment. They have capital. And if they lack the requisite experience and technique, they can hire it.

They can, and they have. All of the top mass-market producers (see Table 1) have premium products. Ozeki still stocks its One-Cup Ozeki in vending machines, but it also offers an award-winning junmai daiginjo at 5,118 yen. Hakutsuru sells a 200 ml can of ordinary sake for 218 yen, but also offers an award-winning junmai daiginjo for over 10,000 yen. Gekkeikan sells its perennial working-class drink, but produces an award-winning junmai daiginjo besides. Takara offers enough varieties in cardboard cartons to fill a refrigerator, but sells a junmai daiginjo to boot.

What is more, a local brewery looking to move upscale will worry about more than Nada-Fushimi. It will face direct competition from Dassai and the Niigata-Nagano-Akita-Fukushima breweries that already dominate the "best sake" rankings. These breweries are local in name only. For the young Matsuo president in Shinano village, his competitors include the many premium breweries striving to replicate the Dassai success.

Crucially, the more successful two daiginjo rivals might be, the closer they will taste. Rice does indeed acquire flavors that reflect the mineral content of the water, the character of the soil, and the weather. But these differences are located almost entirely in a kernel's outer layers. Grind off 40 to 50 percent of the kernel, and rice loses most of that distinctiveness.<sup>27</sup> All too often, as one brewer cruelly put it, ginjo will be to sake what the "valedictorian" was to the high school class (Miyajima N.D.).

Hence the appeal of "terroir." If the Matsuo president in Shinano village and his peers around the country can convince consumers to distinguish and enjoy regional variation, they create a niche that the other breweries cannot readily fill. Perhaps small Niigata breweries like Watanabe can fashion a taste that reflects the windswept Nechi valley, the brutally cold winters, and the massive snow storms. Perhaps Matsuo can fashion a taste distinctive to the Arasebara hamlet (population 219) on the foothills of Mt. Madarao. To be sure, even connoisseurs of the best French and Napa wines show skepticism toward some terroir claims; many sake fans retain a similar suspicion too.

But what the Matsuo and Watanabe presidents and their allies hope to create is an appreciation for a wide variety of very different, but each appealing sakes. In New York, a connoisseur might choose a white wine one night, a red another. Among the reds, he might choose a pinot noir one night, a cabernet sauvignon another. Among the pinot noir, he might choose a Cote de Nuits one night, a Givry another. If the Matsuo and Watanabe presidents and their allies have their way, the sake industry will offer connoisseurs choices just as rich.

## B. Certification Problems:

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<sup>27</sup> Ninomiya (2014, 469-70); Sugihara (2012); Miyajima (N.D.); Bumu (2015).

Give him half a chance, however, and President Takahashi will complain about his certification problems. He (and others championing terroir sake)<sup>28</sup> would like to adopt something close to the French appellation d'origine controlee (AOC). Under AOC, a winery can advertise its offerings as coming from a given district -- a system in which, as Orley Ashenfelter (2007) put it in one of his well-known studies of wine economics, the "best wines of Bordeaux are made from grapes (typically cabernet sauvignon and merlot) grown on specific plots of land and the wine is named after the property, or chateau, where the grapes are grown." Under AOC, the size of the certified district can vary, depending on how selective the winery chooses to be. A winery can market its product as a Bordeaux wine, as a Haut-Medoc (within Bordeaux), or as a Pauliac (within Haut-Medoc). Some Nagano breweries sell distinctively Nagano sake. Matsuo offers a sake distinctive to Arasebara.

In fact, Takahashi would like to go farther, and certify rice variety as well. The French chateaux blend wines (in the Bordeaux, often cabernet sauvignon and merlot), but the AOC rules specify the grapes they can blend (e.g., Ashenfelter & Storchman 2016, 39-40). Premium California wineries usually specify the grape. For his non-terroir sake at the Matsuo brewery, Takahashi sometimes uses yamada nishiki from areas outside Nagano. But for his local sakes, he uses several different varieties. For some, he uses miyama nishiki, the standard Nagano premium sake rice. For others, he celebrates the more recent local alternative, sankei nishiki.

In 2015, the Ministry of Agriculture, Forestry and Fisheries (MAFF) bureau for northeastern Japan launched the "Tohoku Sake Terroir Project." The surviving local breweries in the region were trying to move into premium sake, much like the Niigata breweries had done four decades ago. The bureau hoped to facilitate their shift by encouraging a distinctively northeastern taste.

The MAFF bureau sponsored a study group. It met several times. It assembled a roster of 80 breweries that hoped to market sake with the new designation. Largely, however, it seems to have gone inactive.<sup>29</sup>

In any case, for breweries like Matsuo the project did not go far enough. To qualify under the project, a brewery had to use local water, to use at least 50 percent local (prefectural, or at least northeastern) rice, and to communicate directly with its supplying farmers (Tohoku N.D.). For advocates of a narrower terroir approach, this was far too broad. The project proposed certifying the sake's prefecture. Yet Nagano has a population of 380,000, more than the entire Bordeaux area (population 250,000). In effect, the project would preclude all of the finer AOC partitions.

When Japan joined the World Trade Organization, it adopted a completely separate, national program for geographical certification (Kokuzeicho 2020). As of mid-2020, it had haphazardly approved four sake designations under the program. In 2005, it had certified the sake from the town of Hakusan on the Japan sea coast: local breweries could use the designation if they used local water and only Japanese rice (i.e., rice from anywhere in Japan) of grade 1. In 2016, they certified sake from the prefecture of Yamagata: prefectural breweries could use the designation if they used local water and -- again -- Japanese rice. In 2020, they certified a much more finely partitioned designation for the Harima area of Hyogo: Harima breweries could use the designation if they used local water and yamada nishiki rice from Hyogo prefecture.

Alas for terroir brewers like Matsuo, the government saved its ultimate insult for 2018. That year, under its WTO geographical certification, it designated "Nada Gogo." To advertise the

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<sup>28</sup> See, e.g., Nihonshu (2019); Miyajima (N.D.); Shibuya (2020, 94).

<sup>29</sup> Tohoku (N.D.); Matsuo (2017, 42).

certification, the Nada firms had to use local water. They had to use Japanese rice (again, from anywhere in Japan). And that rice had to be of at least grade 3 (rarely does anyone designate sake rice below grade 3).

Takahashi and his fellow terroir brewers have not constructed (either publicly through the government, or privately among each other) a certification program -- yet. But one should not try to explain too much. They want a program. They do not have one yet. And they have only begun to try.

#### IV. Contracting for Terroir

##### A. Introduction:

For terroir offerings, breweries cannot obtain rice through the usual routes. For high quality sake more generally, some breweries specify desired rice variety and quality grade, and buy it anonymously through intermediaries. For terroir sake, breweries cannot do this. They will need to contact local farmers and negotiate the transaction directly. In the process, they will encounter contracting problems common to buyers more generally -- whether Midwestern heavy industry manufacturers, Japanese car companies, or Silicon Valley tech firms. Consider separately the way most breweries acquire their sake rice (Section B), the way Nada breweries acquired premium rice before the war (Section C), and the way regional breweries have begun to acquire sake rice directly.

##### B. The JA Cooperative Network:

Most firms buy their sake rice through their local agricultural cooperative. More precisely, in recent decades sake brewers have been buying about 70 percent of their sake rice through their prefectural sake brewers' association and the JA, the national network of Japanese agricultural cooperatives.<sup>30</sup> Obviously, this involves no direct contract between the brewer and the farmer.

Under this arrangement, each year the brewers' association solicits rice orders from its members for the season two years hence. It then places the orders with the agricultural cooperative. And the cooperatives distribute the orders among their membership.<sup>31</sup>

The brewers will use this sake rice mostly for their initial steps. Recall that they add rice in three broad steps: they mix a small amount of rice with the mold (the koji mai); they add more rice with the yeast (the shubo mai); and after the fermentation has progressed they add the rest of the rice (the kake mai). Many (if not most) brewers use table rice for the third, high-volume step. They use this costlier sake rice primarily for the first two steps.

##### C. Muramai:

1. Classic. -- In their official histories, the Nada-Fushimi firms recount the way they had insured a supply of high quality rice before war. They had contracted directly with Hyogo farming villages, they write. Their problems had begun in 1874. That year, the government started collecting taxes in cash. The Tokugawa domains had collected their taxes in rice, and in Hyogo had carefully inspected the rice submitted. They had rejected low-quality rice and imposed penalties on those who had submitted it. Once the government adopted a cash tax, however,

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<sup>30</sup> Suzuki & Takada (2017); Nihon (2018); Saito (2015, 3); Hirogaru (2018); Keiyaku (2018).

<sup>31</sup> Hayashi (2017, 55); Koike (1995, 163); Maikoku (2014, 13).



farmers switched to low-quality rice that they could easily market. The brewers then found themselves without the high-quality rice that they needed for their sake.<sup>32</sup>

Somewhere around the turn of the century, Nada firms began contracting for high-quality rice from selected Hyogo hamlets. Muramai, they called the arrangements: "village rice." Some writers place the first muramai contract in the early 1890s with the Kamikume hamlet in Yoneda village. Others name the nearby hamlet of Ichinose in Yokowa village.<sup>33</sup>

By the early 20th century the major Nada-Fushimi breweries were buying large portions of their sake rice from a portfolio of hamlets. The details of the arrangements varied, but usually the brewery agreed to buy a hamlet's entire crop. In return, the villagers promised to work to improve rice quality. The firms obtained a steady supply of quality rice. The villages obtained a reliable outlet at a good price.<sup>34</sup>

The parties waited to decide the price of the rice until November or December, after its delivery. At that point, a hamlet representative, the brewer, and the rice broker (if one were involved) met to negotiate the price. Usually, they adopted a standard discount (or more rarely a premium) from the muramai contract price for the original Kamikume hamlet. Despite the obvious possibility of corruption, the other brewers and hamlets apparently took this price as an honest reference point.<sup>35</sup>

The Kamikume price similarly followed negotiations among a hamlet representative, the brewer, and a rice broker. Given its larger significance, however, the negotiations could take time. Generally, the parties looked to such factors as the previous year's price, to general economic circumstances, to fluctuations in the spot market for rice, and to the annual yield. Reflecting their higher quality, muramai rice tended to sell for a premium over other sake rice.<sup>36</sup>

Brewers and hamlets did not always renew the muramai contracts. Instead, villages apparently maintained their contracts only if they worked collectively and steadily to improve the quality of the rice they supplied. Those that did not, sometimes found their contracts terminated.<sup>37</sup>

2. Modern -- Some Nada-Fushimi brewers again maintain contracts with Hyogo hamlets, but these are not continuations of the earlier contracts. After the rice riots of 1918, the Japanese government had begun ever-more intrusively to regulate the market for rice. As the country drifted into war during the 1930s, the army had increased its control over the economy. During the earliest years of these rice-market controls, the Nada breweries had negotiated exceptions for their muramai contracts (Ninomiya 2014, 475-76).

Yet the regulatory exceptions for the Hyogo muramai contracts did not survive the war. Given that the government retained many of its earlier rice-market controls after the war, neither did they survive the early post-war years. Only in the 1970s did firms reacquire their ability to

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<sup>32</sup> See Ninomiya (2014a, 471-72); Nihon okome (N.D.); Hyogo (1961, 99-102); Daiginjo (2014, 4).

<sup>33</sup> See Ozeki (1996, 432); Hyogo (1961, 100); Saito (2015, 8); Saikamai (N.D.); Ozeki (1996, 432).

<sup>34</sup> See Ninomiya (2014, 471-72); Nihon (N.D.); Toku A (N.D.); Mori Muramai (N.D., 124); Ninomiya (Meiji, 311); Hyogo (1961, 98-104); Mori (1983, 126) Daiginjo (2014, 3).

<sup>35</sup> For lists of the muramai villages, see generally Ozeki (1996, 433); Hyogo (1961, 89). For the pricing hierarchy in 1938 of the villages relative to Kamikume, see Mori (1983, 125).

<sup>36</sup> See Ninomiya (2014, 472-73); Nishinomiya (1989, 197); Hyogo (1961, 99-109); Mori (1983, 126).

<sup>37</sup> See Ninomiya (2014, 471-72); Toku A (N.D.); Nishinomiya (1989, 197); Ozeki (1996, 432); Hyogo (1961, 98-105).

negotiate their own supply contracts. By then, however, the Nada firms no longer produced high-quality sake. Rather, they competed by price for the low-end sectors.

Nevertheless, many of the Nada producers did again negotiate muramai contracts. By the 1970s, they needed yamada nishiki for their best offerings, and the hamlets that had provided sake rice before the war now grew some of the best of the yamada nishiki. As of 1981, the 10 largest Nada brewers obtained their yamada nishiki through muramai contracts with 326 hamlets (Mori 1983, 126).

These new muramai contracts were not simple continuations of the old. Hyogo in 1980 was not the Hyogo of 1930. Within Yokawa village, 38 groups of farmers now sell to brewers. They include classic hamlets that produced the best sake rice before the war (Saito 2015, 9). But other villages that had maintained muramai contracts pre-war no longer do, while hamlets without pre-war muramai now do negotiate them (Koike 1995, 166; Nihonshu no korekara).

#### D. Direct Contracts:

1. Introduction. -- Should brewers want to make sake that reflects the weather and soil of their area, they will need to approach the farmers themselves. If President Takahashi of the Matsuo brewery wants to make a sake that reflects the Arasebara paddies on the foothill of Mt. Madarao, he will need to approach the Arasebara farmers himself.

Increasingly, premium regional sake brewers are doing exactly that. Over the course of the past decades, brewers had been procuring about 70 percent of their sake rice through the agricultural cooperatives. In 2010, they bought 73.8 percent of their sake rice through the coop. By 2015, they bought only 58.3 percent. In 2011, Akita prefecture brewers directly contracted for 167 ha of sake rice. By 2014, they had 292 ha under contract.<sup>38</sup>

That farmers might find a terroir contract advantageous seems straightforward: they gain a promised buyer for their entire produce, and for that produce obtain a generous price. After all, if a brewer offered less than what the coop would likely pay, a farmer can simply refuse. For the farmer, the direct contract seems a clear win.<sup>39</sup>

The puzzle is why brewers would want to pay more than what they would pay the coop (as in fact they do). After all, the coop examines the rice, and grades it by quality. It then lets brewers specify the variety and grade they want. If they want certifiably high-quality rice, they can buy it from the coop. And this is exactly what many premium brewers do. Several years ago, I asked one why he just bought his rice from the coop. Would he not do better to contract for exactly what he wanted? He laughed. "I'm a pro," he replied. "I can do just fine with coop rice."

For the premium-sake specialists who buy their sake rice directly, the benefit must lie somewhere else. Apparently, the benefit must lie in a dimension of quality that they can observe informally but for which they cannot contract verifiably. For these brewers do not want only high quality or only local variation: instead, they want both.

Consider first the nature and structure of the contracts they use, and then how and when they intervene in the farming itself.

2. The nature of the contracts. -- (a) Brewers pay a generous price. Regional breweries pay their farmers more than what they would pay the coop -- sometimes substantially more. In his

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<sup>38</sup> Nihon (N.D.); Saito (2015, 3); Hirogaru (2018); Keiyaku (2018); Suzuki & Takada (2017); Hayashi (2017, 56).

<sup>39</sup> Hirogaku (2018); Keiyaku (2018).

recent study of Akita brewers, Futoshi Hayashi (2017, 62) examines the way they set the price. Often, he finds, they simply add a premium to the coop's price. They do not use formulas that turn on the results of quality inspections, or on the methods that the farmers use to cultivate. They simply take what the farmer could obtain from the coop, and pay him substantially more.

"We want a price where the farmers will want to raise sake rice even if table rice is selling for 20,000 yen [per 60 kg]," said one brewer. To do this, he would need to pay two or three times the usual price for table rice (Hayashi 2017, 62). In paying these premiums, the breweries follow the muramai tradition. In 1933, Hyogo sake rice sold for an average 23.30 yen per koku (180 l); the Kamikume muramai rice sold for 27.30. In 1935, the Hyogo sake rice sold for 32.63, while Kamikume muramai went for 35.60. In 1937, the Hyogo average was 36.64 while Kamikume sold for 40.00. And in 1938, the Hyogo sake rice sold for 37.73, while Kamikume muramai sold for 43.10 -- a 14.2 percent premium.<sup>40</sup>

(b) Brewers use renewable (and therefore terminable) contracts. A simple high price presents a risk of moral hazard, of course. A farmer can renege on the deal in myriad observable but not legally verifiable ways. The breweries mitigate this risk straightforwardly: they offer only one-year contracts. They renew the contracts if a farmer cooperates, and look elsewhere if he or she does not. Should a farmer adopt opportunistic strategies, he or she will find himself or herself next year without a high-priced contract.

(c) Brewers select for the person. Over and over, the brewers insist that they "need to be able to see the farmer's face."<sup>41</sup> Character and ability matter crucially. Were they obtaining their rice from the cooperative, brewers could specify the graded quality they want. From a farmer under contract, they have no such guarantee. They will take the rice the farmer delivers, and the quality of their sake for the year will turn in part on that rice.

Whether through opportunism or simple incompetence, a farmer can easily sabotage a brewer's product. To be sure, a brewer could specify a verifiable quality metric. If a farmer failed to meet it, he or she could sue for breach. But if any brewer ever did, no record of it remains on the Westlaw database. For the most part, Japanese farmers are low-income retirees with a tiny paddy of little economic value and a dilapidated two- or three-cylinder truck. Seventy-two percent of the farmers own less than a hectare of paddy (Hatsuki 2015, 128), and the trucks are 50 horsepower machines that sell for as little as \$7,000 new. If a farmer has few assets to attach, the brewer gains little from any claim for breach. If the farmer has little left on his or her line of credit, any legal recovery would arrive long after he or she auctioned his or her plant in bankruptcy anyway. At root, as Lisa Bernstein (2015, 562) put it in the otherwise quite different context of mid-western heavy machinery manufacturers, the contracts simply "are not designed to create incentives for performance."

Instead, the brewers negotiate the contract to build a collaborative relationship. Toward that end, they pick their suppliers carefully. They pick by talent. They pick by character. And in the brutal candor of small towns the world over, they pick by family: know a farmer's last name,

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<sup>40</sup> Ninomiya (2014, 474); see also Mori (1983, 124). In the analysis that follows, I integrate the sake example with the modern literature on relational contracts. Note that there are strong similarities (and clear differences) with the contracts between new firms and venture capital investors.

<sup>41</sup> E.g., Keiyaku (2018); Hirogaru (2018).

explained the muramai chair for Yokawa village, and you know the quality of his rice (Nihonshu 2017).

(d) Brewers select for the land. And almost as often, the brewers insist that "to buy the rice, you need to see the land."<sup>42</sup> Brewers do not offer contracts on just any paddy; they select for the quality of the land. To raise sake rice properly, "you need to see the rice paddy," explained the muramai chair for Yokawa village (Nihon shu 2017). "You need to talk to the yamada nishiki." By soil, by location, by drainage, some farms produce better rice than others. Orley Ashenfelter (2007) noted the same phenomenon in the Bordeaux, of course: "information on chateau and vintage alone explain over 90% of the variation in [wine] prices." Even within Yokawa village -- the very origin of the muramai contract -- some paddies yield better rice than others (Nihonshu 2017). The Miyajima brewery (Miyajima shuzo website) in Nagano stresses the importance of water: the fields upstream must not use heavy pesticide; the homes upstream cannot discharge their sewage. It stresses the importance of sunlight, and it stresses the importance of the wind patterns.

(e) Brewers monitor observable inputs. -- Verifiable inputs can correlate with rice quality, and many brewers mandate the levels of the inputs that do. Brewers often specify cultivation methods. Masaya Iga examined closely the contracts that one regional premium brewer maintained. Should a farmer insist on using pesticides and chemical fertilizers at ordinary levels, the brewer offered no contract at all. Should he or she agree to use them at only low levels, the brewer might offer one price. Should he or she agree to use none, the brewer paid a 50 percent premium (Table 3, Panel A; Iga 2008, 157).

[Insert Table 3 about here.]

Other brewers focus on yield. Wine quality tends to correlate inversely with vineyard productivity, and so it is with sake.<sup>43</sup> As a result, both wineries and sake breweries contract to buy the entire yield of a field. They then discourage farmers from ramping the productivity by adopting pricing formulae that track yields only up to a given volume, and pay nothing for any excess.<sup>44</sup>

(f) Sometimes (but only sometimes), brewers contract over observable outputs. Brewers can observe rice quality, and can verify that quality -- in part. They can measure the percentage of broken kernels. They can measure the level of protein in a kernel. And they can adjust the price they pay by these verifiable measures (Hayashi 2017, 56).

And some do -- but not all. The problem with setting price by verifiable quality is precisely that it works, and may work too well: it may skew an agent's effort toward the verifiable measures, but away from other possibly more important aspects of quality. Quality is a subtle thing, and only some measures are verifiable. As Holmstrom & Milgrom (1991) point out, a principal who pays his agent only by verifiable indices of quality may cause the agent to bias his efforts away from aspects of quality not incorporated into the pricing formula. If the cost of that bias is sufficiently high, the principal may rationally choose to offer instead a contract with only muted incentives.

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<sup>42</sup> E.g., Ozeki (1996, 432); Mori (1983, 124).

<sup>43</sup> And for that reason, both wineries and sake breweries that focus on high-quality offerings try to avoid buying grapes or rice by the ton. Ashenfelter & Storchmann (2016, 30); Hayashi (2017, 60); Firstenfeld (2008); Washington (2015, 3).

<sup>44</sup> Iga (2008, 157); Washington (2015, 10)(grapes); Hayashi (2017, 62)(rice).

Wineries face the same problem. Grape quality turns in part on observable characteristics, but "more subtle characteristics are harder to measure," notes one observer (Goodhue 2002). "With higher-quality grapes," he continues, "production requirements are more likely to be included in the contract but price incentives are less likely to be included (conversely, price incentives are more likely to be used in lower-priced areas)."

And so it is that many premium sake brewers omit quality measures from their pricing formula. Instead, they meet regularly with the farmers and discuss how better to raise that quality. If a farmer produces defective rice, they bring samples with them and talk to him or her about what to do (Hayashi 2017, 60). But when so many of the distinguishing measures of rice quality are observable but not verifiable, many of them rationally decide not to key their contracts to those verifiable measures of quality.

3. Direct intervention. -- (a) Introduction. Let me restate the point: rather than structure contracts on verifiable measures of output quality, the premium regional breweries intervene regularly in the farming itself. Had they merely wanted rice that met verifiable quality measures, they could have bought it more cheaply through the cooperative. These are the brewers who deliberately choose to avoid the cooperative and pay higher prices. Fundamentally, they do so because they want farmers to focus not just on verifiable measures but on other, more subtle elements of quality as well.

These brewers want farmers to use as little fertilizer and pesticides as possible (Hayashi 2017, 60). But they want much more. They want the farmers to watch the crop -- "to talk to the yamada nishiki," as one put it -- and to change as needed the steps they take and when they take them. Toward these ends and more, the brewers monitor the progress of the crop. They may meet with the farmers, consult about schedules, suggest new techniques. To facilitate this collaboration, they do what they can to build trust. And to encourage the farmers to welcome their intervention, they pay the high prices that they do.

Nothing here is peculiar to agriculture. The brewers and farmers negotiate their contracts to structure what they envision as a working, collaborative relationship. Lisa Bernstein (2015, 563) made the point about Midwestern manufacturers: they negotiate contracts "to create a framework for growing relational social capital and leveraging network governance." They negotiate them to generate "the conditions that will better enable transactors to identify and bond value-creating exchanges in the future." As Bosovic & Hadfield (2015, 8) put it in the context of technology firms: the parties negotiate their contracts to "coordinate beliefs" about what they intend to do, to create the "essential scaffolding [ital. in orig.] to support the beliefs and strategies that make informal means of enforcement such as reputation and the threat of termination effective."

Turn then to the component aspects of this strategy.

(b) The brewers monitor intensively. To gauge when and how to intervene, the brewers need information about a crop's progress. Toward that end, they monitor the paddy. For truly local operations, they can do this informally. The brewer lives in the area. He or she knows the weather. He or she can watch the rice grow in the paddy. Brewers more remote can engineer more elaborate arrangements. Dassai installs sensors in its farmers' fields to record rain fall and temperature (Nihon 2018). Other brewers follow the progress of the crops with drones (Sekai 2019).

The brewers monitor because they need the information in order to make decisions about the crop. Like Bernstein's (2015, 572) Midwestern manufacturers, they "go to great lengths to regulate the production processes used in suppliers' plants." And to regulate that production effectively, they monitor.

(c) The brewers intervene directly. As necessary, these brewers then intervene. The necessity varies: some farmers need it more, some brewers have more to offer. But in order to intervene, the brewers meet with their contracting farmers. Some hold conferences among all of their farmers. Some meet each farmer at the beginning of the season and then again at harvest. They may help the farmers plant the rice and then harvest it (Iga 2008, 158). Others meet with them on an ad hoc basis throughout the growing cycle. Masaya Iga (id.) describes a brewer who meets with his farmers as often as nine times a year.

Should a crop fall short on some dimension, the brewers work with the farmer to devise a way to skirt the problem the next year (Hayashi 2017, 60). They review their farmers' plans (id.). At root, they meet with their farmers to discuss and collaborate. Again, as Bernstein (2015, 576) wrote of Midwestern manufacturers, the brewers "interact with their suppliers throughout the production, delivery, and quality assessment process to try and catch problems sooner rather than later ...." They intervene in order to work with their suppliers to improve the quality of the rice they will obtain.

(d) To facilitate the intervention, the brewers build social capital. To enable this monitoring and intervention, the brewers work to build the "relational social capital" that fosters trust. "If you can see a farmer's face," explained several brewers, "it's easier to specify the quality you want."<sup>45</sup> "If you can see his face, both of you will feel as though you're making sake together," said another (Saitama 2017). Learn to know each other personally and a brewer can communicate more effectively the type, quality, and quantity of rice that he or she needs (Matsuo 2017, 44).

The Miyajima (N.D.) brewery in Nagano works its rice grown in an "environmentally sustainable" fashion. To work with its farmers to do this, it assures the public, it needs to be able to trust them. "This is not about finding farmers who will follow the terms of the contract," it explains. "We need to be able to talk with a farmer. We need to be able to trust each other. This is true everywhere in the world."

For this consultative approach to work, the brewers need farmers who can in turn trust them. President Takahashi of the Matsuo brewery has lived in Shinano village all his life. His father ran the brewery before him, and his grandfather before that. He lives within a dense network of "structural social capital" in which information about how he treats one farmer will travel quickly to all of his other suppliers.

But this structural social capital is not just an attribute of birth. It is also a characteristic that firms can -- and do -- deliberately build. Bernstein (2015, 608) notes how Midwestern manufacturers construct networks among their suppliers through which each supplier can rapidly learn how the way the manufacturer has treated other suppliers. Miwa & Ramseyer (2000) detail the way Japanese car assemblers organize tight associations of their suppliers. And so too here: brewers sometimes organize their contracting farmers into "study groups" where the farmers can meet each other and discuss the course of their work (Hayashi 2017, 56). The networks "increase

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<sup>45</sup> Keiyaku (2018); see also Hirogaru (2018); Miyajima (N.D.).

the reputational harm and nonlegal sanctions for misbehavior," observes Bernstein (2015, 604), and expand "the type of misbehavior that can be policed through multilateral nonlegal sanctions."

(e) To create incentives for cooperation, the brewers pay efficiency-wage-level prices. For these brewers, the key to buying the rice that meets their desired level of quality is price. The brewer wants rice that meets not just the verifiable indices of quality that the cooperative can provide, but indices that are observable but nonverifiable (and therefore not contractible) as well. For that, the brewer wants to be able to work closely the farmers. Toward that end, he (or she) wants to monitor the crop, and intervene whenever he believes it helpful. Crucially, when he does so, he wants the farmer to welcome his intervention.

The contractual measure by which the brewers address this problem is simple: a one-year contract to buy all of the yield of a field at a high price, subject to renewal at the discretion of the two parties. Consider it the contractual analogue to the economic concept of "efficiency wages." Sometimes, an employer can raise profitability by raising wages. Sometimes, those higher wages will raise productivity by an amount that more than offsets the higher wage costs. The classic example is Henry Ford. He had conceived a new manufacturing technique: the assembly line. To make the technique work, he needed workers who would stay on the job. He needed workers who would accumulate experience, and then draw on that experience to make the hundreds of changes necessary to make the assembly line work. As long as he paid the going rate in Detroit -- \$2.50 per day -- workers quit as they pleased. So Ford doubled the pay to \$5.00, and workers now stayed on the job. They studied the assembly line, made it work -- and Ford earned higher profits paying \$5/day than he earned paying \$2.50.

Ford paid "efficiency wages." As Daniel Raff and Lawrence Summers put it, "over some range a firm can increase its profits by raising the wage it pays its workers to some level above the market-clearing one." Profits increase because -- in some circumstances -- the higher wages succeed "in eliciting effort, reducing turnover, attracting better workers, and in improving morale."<sup>46</sup>

The same phenomenon can arise in contractual relations between two independent parties. The farmer could grow sake rice for the coop, and receive a given price. Should he or she grow rice for the local brewery, he or she will receive a substantially higher price. In effect, that higher contractual price gives the farmer an incentive to work closely with the brewer to grow a crop that more closely matches the (observable but not verifiable) attributes that the brewer so badly wants.

#### E. Leasing, Ownership, and Vertical Integration:

##### 1. Why do some breweries contract across the market?

(a) Introduction. For their best wines, many wineries do not use grapes they buy on the market. Instead, they use grapes they grow themselves. Sometimes, they grow them on land they hold under long-term leases. Usually, they grow them on land they own.

The question is obviously one of make or buy -- the extent of vertical integration. A winery or sake brewer can integrate vertically in agriculture, or it can contract across the market to buy its agricultural supplies. High-end wineries in France tend to integrate vertically, while mass-market wineries buy their grapes on the market.<sup>47</sup> In the sake industry, even high-end breweries generally buy their rice on the market.

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<sup>46</sup> Raff & Summers(1986, 1); see also Shapiro & Stiglitz (1984).

<sup>47</sup> The contrast is less sharp in Napa, where Andrew Beckstoffer grows large quantities of high-end grapes.

The question is why.

(b) The law. Until 2003, the explanation for the different patterns of integration between wine and sake was simple, and legal. Japanese law banned rice farming by corporations. In the late 1940s, the post-war occupation-dominated government had redistributed paddy land. It effectively took (the payment was trivial) land from its owners, and gave (the price was trivial) it to those who had earlier leased the land. The government lowered agricultural productivity in the process, but the occupation forced through the program in the name of "democratizing" rural society (Ramseyer 2015). Lest market participants transfer the land back to the earlier equilibrium, the occupation mandated a wide range of transfer restrictions. For the most part, it stopped people from taking land out of rice production. And relevant here, it banned corporations from owning or renting paddies (Ramseyer 2015).

During the first decade of the new century, the government changed the law. By the 1990s, farmers were abandoning their fields. Because agriculture now paid low returns to labor compared to other employment, young men and women were choosing not to farm at all. Those who owned paddy fields found that no one wanted to farm their land. Faced with increasing numbers of abandoned fields, the government finally loosened the restrictions on paddy transfers. It began to allow limited leasing of rice paddies by corporations in 2003, and further liberalized leasing in 2009. Subject to greater restrictions, it began to allow corporate ownership as well.<sup>48</sup>

(c) Relational specificity. -- Sake brewers do have less reason to integrate than wineries. "Vines are perennials with a productive lifetime of more than 25 years," note Ashenfelter & Storchmann (2016, 26). As a result, they constitute substantial long-term investments. Because their value hinges in part on the relationship between the vineyard and the winery, they present the risk of hold-ups so famously explored by Williamson (1975, 1985), Klein, Crawford & Alchian (1978), Masten (1984) and others.<sup>49</sup>

A rice farmer makes no such multi-year investment toward producing sake rice. He (or she) makes some, of course. Perhaps most notably, he invests in the knowledge and expertise he will need to grow the idiosyncratic varieties that the brewery wants and in the way that the brewery wants. But he will make few physical investments: a paddy to produce sake rice is little different from one to produce table rice. Should a brewery decide -- however opportunistically -- not to renew his contract, a farmer can safely return to table rice.

(d) And the theory of the firm. In his theory of the firm, Oliver Hart (Grossman & Hart, 1986; Hart & Moore 1990) suggests that assets should be owned by the institution whose involvement raises the value of the asset to its highest use. As Halonen-Akatwijuka (2019) summarized the argument

If ... assets are so complementary that they are productive only when used together, they should have a single owner. ... Furthermore, if there are such strong complementarities between an asset and a party that the asset is productive only with that party, then this

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<sup>48</sup> Shibuya (2016, 73; 2020, 89); Takayama & Nakatani (2017, 77-79). See government summaries of the statutory changes at: <https://www.maff.go.jp/j/keiei/koukai/pdf/hy.pdf>; [https://www.maff.go.jp/j/keiei/koukai/nouchi\\_seido/pdf/nouchi\\_taihi.pdf](https://www.maff.go.jp/j/keiei/koukai/nouchi_seido/pdf/nouchi_taihi.pdf); <https://www.nogyo-tetsuduki.com/corporation-yoken/>

<sup>49</sup> Noted most recently in the Japanese context by Shishido (2019).



indispensable party should own the asset. Ownership of the asset would not give power to anybody else and the incentive effect would be wasted.

If the land is most valuable when used for the production of sake, it should be owned by the firm that best produces the sake.

This would suggest that since 2003 the premium breweries should be integrating vertically into farming on a massive scale. Some indeed are, but the shift is leisurely and modest. In turn, that relaxed pace reinforces the point made by many observers in other contexts: in a wide variety of situations, vertical integration and contracts are close substitutes. In a wide variety of situations, firms can replicate the incentives produced by vertical integration through contract -- and vice versa.

## 2. Why do other breweries integrate?

(a) Aging farmers. And yet -- leisurely as their pace may be -- some breweries do integrate vertically into farming. Why? The breweries themselves suggest several reasons.

Often, the brewers explain that they started growing sake rice because the local farmers had grown so old. Their contracting partners were about to retire, and their partners' children were not staying on the farm. Their suppliers were about to disappear, and they needed to prepare.<sup>50</sup>

Young people are indeed leaving farming villages. Regional breweries that rely on farmers skilled enough to raise temperamental sake rice do indeed face the risk their suppliers will die without a replacement. Take the Sekiya brewery in Aichi prefecture (Shibuya 2020, 95-98; Sekai 2019). After visiting European wineries, the firm's president decided to focus its production on local rice. Yet in his community, a 60-year-old farmer was on the young side. "With another 10 years," explained the president, "I doubted there would be anyone around to farm for us." Nothing seemed feasible except to grow the rice himself. He asked the retiring farmers to teach him how to farm, and by 2018 had 24 ha under cultivation.

The Watanabe brewery in Nechi valley reached much the same conclusion (Shibuya 2020, 93-94; firm website). It wanted local sake rice, but the nearby farmers were growing old and had no successors in sight. The Watanabe family already owned a very small piece of land. The brewery rented another 15 ha and now grows its own rice. Its employees brew in the winter and farm in the summer.

(b) Seasonal work for employees. Like Watanabe, some breweries also rent the farms to provide off-season employment for their own workers (Shibuya 2016, 76). Brewers traditionally made sake in the winter when the cold temperatures helped prevent spoilage, and hired their help on a seasonal basis. As long as the local community was agricultural, they could hire men and women in the winter and expect them to return to their farms in the spring. With the agricultural industry in economic freefall and local farms no longer using young labor, that coordination became increasingly difficult. When breweries like the Watanabe terroir brewery raise the rice themselves, they assign their employees to make the sake in the winter, and work the paddies in the summer (Shibuya 2020, 93-94; Watanabe N.D.).

(c) Contractual problems. Some breweries report that they started farming themselves because they could not convince independent farmers to cooperate. In the discussion above, I explain the logic by which breweries use contractual structures to induce farmers to grow the high-

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<sup>50</sup> Niigata (2019); Nihonshu (2017); Shibuya (2020, 74, 94-96).

quality sake rice they need. If only life were so simple, these other breweries seem to imply. Some of them simply could not induce their supplying farmers to grow the high-quality rice they needed. Despairing of a contractual option, they integrated vertically into agriculture themselves.

The small Marumoto brewery in Okayama prefecture focuses on organic sake (Shibuya 2019, 92; Marumoto N.D.). It has 14 employees, and focuses on organic sake. The owner begged local farmers to supply him with low-fertilizer rice, but could not convince them to do so. Despairing of obtaining the rice any other way, he went into farming himself. His family had owned 35a. He leased more, and by 2019 his firm was farming 18 ha. Again, his employees brewed sake in the winter, and farmed the firm's paddies in the summer.

(d) The informational advantage. And some -- perhaps most -- of the brewers who integrate into farming do so to improve their ability to coach the farmers who still supply them with the rest of their rice under contract. By using the contractual mechanisms described earlier, the brewers have negotiated the right to intervene in the farming. To intervene effectively, however, they need to understand farming itself. By tending even a modest sized field, they acquire some of that essential technique.

Ichinokura is a large brewer in Miyagi prefecture. It farms some plots in order to test new varieties and farming methods. It still contracts extensively with local farmers, but grows rice itself to learn how better to advise those suppliers. "By cultivating sake rice and using abandoned fields," it explains, "we learn cultivation techniques, and become better able to convey that information to local farmers" (Shibuya 2020, 100; Ichinokura N.D.).

"The quality of sake rice and the quality of sake are inextricably intertwined," explained one group of partially vertically integrated brewers. "But there is not yet enough information flowing between farmers and brewers." The group turned to growing to acquire that information. They started growing some of their rice themselves in order first to acquire and then to "be able to convey the experience and skill" to others raising the temperamental sake rice (Sekai 2019; No N.D.)

You learn as you farm, the Marumoto brewery in Okayama explained. The firm grows 18 ha itself, and plans to expand. When you farm, you learn that "you can grow koji mai on this field. This other paddy would do better with kakemai." The brewery continued: "Each paddy has its own individuality." As a result, "we study the soil in each paddy." And "we study what rice works best in which field, match the field to our goals, and then proceed with the cultivation." Grow rice, and you come to appreciate more closely the connection between raising rice and brewing sake. "Rather than sake rice made by a farmer who doesn't brew sake," the firm explained, "we wanted a sake rice grown under the eye of a brewer" (Marumoto N.D.; Denno 2018; Shibuya 2020, 93-94)

The Izumibashi brewery in Kanagawa prefecture both grows rice and buys rice. It uses five different kinds of rice, and allocates the varieties among its supplying farmers according to farmer expertise and paddy suitability. It monitors rice growth with drones. And it ties that growth to paddy output and soil characteristics through computers. The firm grows some rice itself; it studies growth and outcomes scientifically; and it advises its contracting farmers. "Ultimately, we learn who, using which paddy with what kind of soil, grew a rice that upon brewing" produced what kind of sake.

(e) Contrasts. Unsatisfactory as the statement may seem, contracts and vertical integration in the sake rice market apparently accomplish very similar ends. Several theories of the firm may

suggest that the premium local brewers would integrate into farming -- and some such brewers have. Many have not, however, for the apparent reason that simple one-year efficiency-wage contracts accomplish have much the same effect.

#### V. Conclusions

For over a century now, Japanese consumers have been losing their taste for sake. But until the last few decades, sake brewers gave them little to taste. Stringent controls begun during the war drove a few producers in Kobe to dominate the mass market through economies of sake. They flooded the country with mediocre but cheap drinks, and the regional brewers steadily went out of business.

Within this environment, desperate regional brewers began to explore whether they could create a market for unambiguously delicate and subtle high-end sake. A few of them succeeded spectacularly. Several more regional brewers then began to explore whether they could create a market for delicate sake that showcased environmental variation. By most measures, several of them seem to be succeeding as well.

In creating this new terroir sake, the regional brewers face a complex contracting problem. A few of them skirt the contracting process by vertically integrating into rice farming. The others must convince independent local farmers to grow the high-risk and high-cost varieties of rice optimized for premium sake. They solve the attendant information and incentive problems through deceptively simple arrangements. For the most part, they offer extremely high-paying year-to-year contracts. They pay what are effectively "efficiency wage" prices -- prices high enough to induce the farmers to collaborate in their efforts to raise rice quality. The brewers meet with the farmers regularly to build social capital and trust. They monitor the crops closely. And they intervene as necessary to insure high quality.

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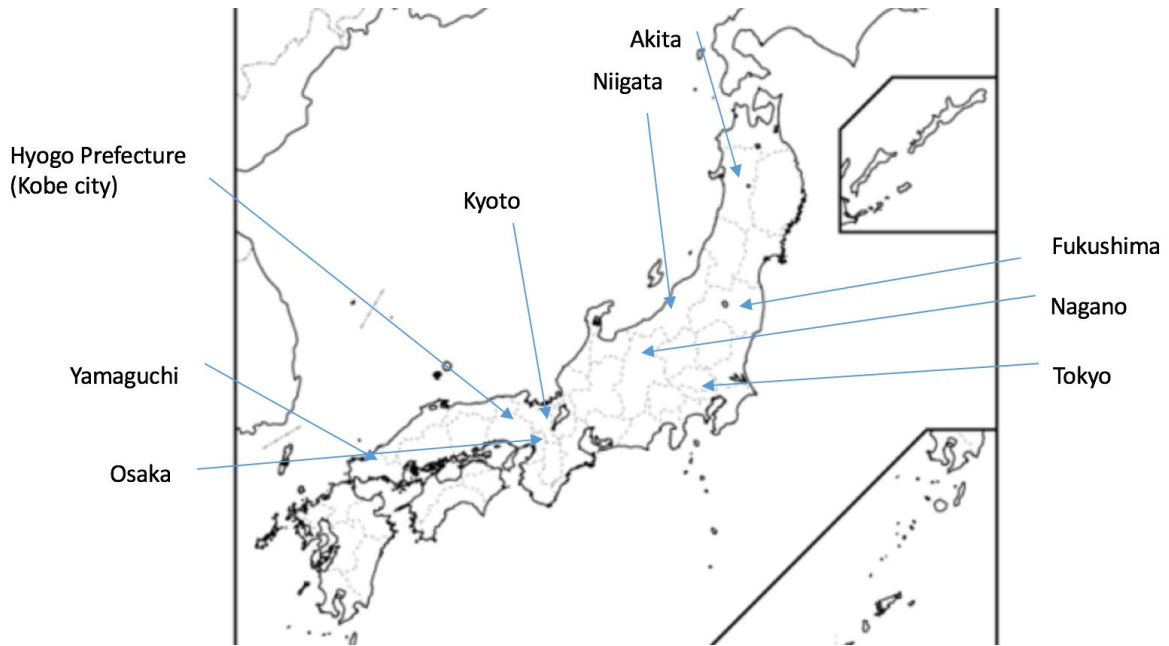
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Figure 1: Japan



**Table 1: Largest Breweries, 2018**A. By Total Production

	Location	Production (kl)
Hakutsuru	Nada	52,363
Takara	Fushimi/Nada	51,801
Gekkeikan	Fushimi/Nada	42,744
Koyama honke	Saitama	25,874
Ozeki	Nada	20,025
Kizakura	Fushimi	15,391
Kikumasamune	Nada	14,559
Nihon sakari	Nada	14,306
Oenon	Nada/other	12,896
Hakushika	Nada	8,563

B. By Premium Production

Dassai	Yamaguchi	6,270
Kubota	Niigata	1,483
Hakuryu	Niigata	1,048
Bon	Fukui	874
Koyama honke	Saitama	839
Hakushika	Nada	601
Masumi	Nagano	583
Gekkeikan	Fushimi/Nada	501
Shiratsuru	Nada	480
Oenon	Nada/other	466

Note: Premium -- Junmai ginjo

Source: Yoshio Ono, Shuzogyo keieisha no henkaku kodo [Transformation of Brewery Managers], Shiga daigaku keizaigakubu kenkyu nenpo, 26: 13-38 (2019); Shuin naki fushin ni ochiitta seishu shijo [The Sake Market that Is Thrown into Instability without Reason], Shurui shokuhin tokei geppo, Feb. 2019.

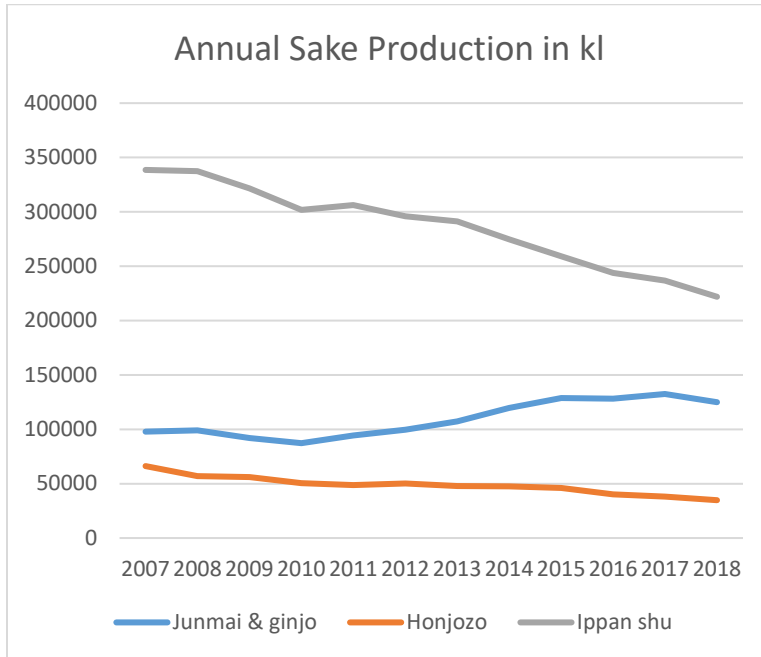
**Table 2: Consumption of Alcoholic Beverages**

	Total volume (1000 kl)	Sake %	Beer %	Shochu %	Wine %
1882	573	96.5		1.6	
1892	695	96.6	0.2	1.4	
1902	660	92.2	2.5	3.2	
1912	860	88.4	4.1	5.4	
1922	1,344	80.1	10.3	6.7	
1932	1,002	73.7	14.0	9.4	
1942	669	44.0	31.4	8.1	
1952	1,073	30.9	34.1	22.8	
1962	2,791	23.7	54.4	8.7	
1970	4,901	31.2*	59.4	4.1	0.1
1980	6,660	22.6	65.8	3.4	0.7
1990	9,035	15.2	71.5	5.8	1.3
2000	9,520	10.3	71.0	7.7	2.8
2010	8,515	6.9	43.6	10.8	3.1

\* The total volume of sake consumed peaked in 1973.

Sources: Fujio Oana, Shuzogyo no suii [Trends in the Brewing Industry], Jokyo, 65: 307-311 (1970); Kokuzeicho no "sake no shiori" ... [The "Guide to Sake" from the National Tax Office ..., Nov. 9, 2014, Hatena blog, available at: <http://longlow.hatenablog.com/entry/20141109/p1>.

Figure 2



Source: Kokuzeicho, Shuzo nendo ni okeru seishu no seizo jokyo to ni tsuite [Regarding the Production Circumstances, Etc., of the Brewing of Sake], various years.

**Table 3: Two Regional Brewers and Supplying Farmers**

A. Brewer A:									
	Exp	Age	Kg	ha	Price(A)	Pestic	Fert.	Cont.	Notes
A1	40	60	2,640	.60	20,000	Low	None	4	Contact through coop where A1 had sold quality eggs
A2	10	50	2,031	.60	25,000	Low	Low	2	A2 took initiative, wanted to support local sake production
A3	8	40	2,310	.60	25,000	Low	None	9	Knew A already; wanted to work together
A4	4		2,250	.60	20,000	Low	Low	2	A4 took initiative; wanted to build community
A5	20	50	2,400	.60	30,000	None	None	2	Introduced through natural foods seller; wanted to produce organic sake
A6	4	60	1,290	.35	19,930	Low	None	2	A took initiative; wanted to support local community and economy
A7	4	40	362	.30	25,000	None	none	0	Introduced through local politician
A8	2	50	2,160	.60	25,000	Low	Low	0	A8 took initiative; wanted to support local community and build human relations with brewer
A9		60	1,800	.50	17,650	Low	Low	2	
A10	5	30	810	.30	30,000	None	None		Wanted to farm organically; brewer sympathized with farming philosophy
B. Brewer B:									
	Exp	Age	Kg	ha	Price(B)	Pestic	Fert.	Cont.	Notes
B1	10	70	1,225	30	20,000	Low	Low	2-4	B took initiative; wanted to support local community and economy
B2	10	70	1,505	39	20,000	Low	Low	2-4	B took initiative; wanted to support local community and economy
B3			4,458	87	20,000	Low	Low	2-4	
B4	5	50	1,020	40	60,000	No	No	2-4	Natural food connection; human relations important
B5	4	40	3,240	68	20,000	Low	Low	2-4	B took initiative; human relations important
B6	10	70	1,395	58	60,000	No	No	2-4	Introduced by B4; human relations important

Brewer A is Yamana Shuzo, a brewer in Tamba city, Hyogo, specializing in premium sake. In 2006, Yamana consumed 42.4 tons of rice per year. Of these, it purchased 18.8 by direct contract. It promises to buy all rice produced on designated fields.

Brewer B is Taketsuru, a brewer in Takehara city, Hiroshima. Taketsuru advertises only versions of junmai sake. In 2006, it consumed 59.9 tons of

rice, of which it acquired 12.8 tons by direct contract. Like Yamana, it promises to buy all rice produced on designated fields.

Notes:

Exp: Years of experience in sake rice production

Age: Age of male household head, deciles.

Kg: Kg of sake rice supplied

a: hectare of land devoted to sake rice

Price (A): yen per 60 kg.

Price (B): Market price plus adjustments plus number in table, per .1 hectare

Pest.: Pesticides use -- none, or low

Fert.: Chemical fertilizer use -- none, or low

Contact: Number of regular contacts with brewery per year.

Source: Masaya Iga, *Seishu kyokyu taikai ni okeru shuzogyosha to sakamai seisansha no teikei kankei* [The Relationship Between the Sake Breyers and the Sake-Optimized Rice Producers under the Sake Supply Structure], *Chiri gaku hyoron*, 81: 150-78 (2008).