

## Structural Characteristics and Modernization of Alcoholic Beverages Production in Japan and China

|       |  |
|-------|--|
| メタデータ | 言語: eng<br>出版者:<br>公開日: 2009-04-28<br>キーワード (Ja):<br>キーワード (En):<br>作成者: 花井, 四郎<br>メールアドレス:<br>所属: |
| URL   | <a href="https://doi.org/10.15021/00002727">https://doi.org/10.15021/00002727</a>                  |

## Structural Characteristics and Modernization of Alcoholic Beverages Production in Japan and China

Shiro HANAI

1. Ethnic Alcoholic Beverages of Japan and China
2. The Role of Alcoholic Beverages in Modern Society
3. Production Volume in the Age of Mass Consumption
4. Comparison of the Production Methods of *Saké* and *Shaoxingjiu*
5. Market Price Structure and the Development of Low Priced *Huangjiu*
6. Comparison of the Methods of Production of *Shochu* and *Baijiu*
7. Characteristics of the Alcoholic Beverage Industry Structure
8. Industry Format after Expansion of Production Scale
9. Comparison of Productivity in a *Shochu* Factory and a *Baijiu* Factory
10. Conclusion

### 1. ETHNIC ALCOHOLIC BEVERAGES OF JAPAN AND CHINA

Japan and China belong to the same cultural group of East Asia where alcoholic beverages are made by brewing or distilling molded rice. In Japan, the brewed alcoholic beverage is called *refined saké* (*seishu*, hereinafter referred to as *saké*) and in China, *huangjiu*. The most famous *huangjiu* is *shaoxingjiu*. *Shaoxingjiu*, the Chinese alcoholic beverage most widely imported into Japan, is produced using traditional methods in Shaoxing in the province of Zhejiang. It is widely known as a high quality alcoholic beverage in China, so that the name of this region has become the commonly used name for this *huangjiu*. The distilled alcoholic beverages from the brewed mash using molded rice are called *shochu* in Japan and *baijiu* in China. In addition to these ethnic alcoholic beverages consumed from ancient days in the two countries, there is beer first made by Europeans who were domiciled in Beijing, Qingdao, Shanghai, and Yokohama in the late 19th century. Today, these alcoholic beverages are consumed as the drinks of the masses by the peoples of both countries.

Whereas the ethnic alcoholic beverages, *sake* and *shaoxingjiu*, or *shochu* and *baijiu*, all have the same method of basic production involving molded rice, they are entirely different in flavor and fragrance. With respect to *sake*, the light colored *Ginjo-Sake* with a fragrance similar to a delicious apple has a graceful flavor and is most popular. On the other hand, *Chennian-Shaoxingjiu* is aged in an earthenware pot and has the dark color typical of aged alcoholic beverages; its unique flavor is most treasured. In the case of *shochu*, the fruity ester flavor type due to the large amount of iso-amylalcohol acetate and ethyl caproate contained in *Ginjo-Sake* is preferred, while the *baijiu* that is most popular among the Chinese has a fragrance composed

of ethyl acetate, butyl acetate and ethyl caproate, etc., similar to fermented milk or cheese, and is the flavours are referred to as the “*nongxiang* type (rich flavor type)” or “*jiangxiang* type (soysauce flavor type).” The typical brands in these categories are “Wuliangye” and “Maotaijiu” respectively.

The reason the two ethnic groups have developed alcoholic beverages having an entirely different flavor, despite the fact that the fundamental process of using molded rice is the same, lies in the difference in their taste preferences. This difference has given rise to unique methods of production to arrive at the preferred flavor.

## 2. THE ROLE OF ALCOHOLIC BEVERAGES IN MODERN SOCIETY

The purpose of alcoholic beverages is to satisfy consumers. In low income societies, products that intoxicate economically with the best flavor are most in demand. Moreover, in addition to the inebriating effect that brings relaxation, alcoholic beverages play an important role in supporting national budgets or as part of social welfare in the establishment of modern states and thus contribute to the maintenance and development of society.

In Japan, not only does the government impose a tax on the *saké* industry which is not levied on other industries, but it has in the past established a National Research Institute of Brewing as a public agency and actively nurtured the industry through technical guidance in an effort to lower the cost and enhance the quality of alcoholic beverages in order to increase tax revenue. On the other hand, in post-revolution China, in order to maintain the socialist system, a policy was adopted under which corporations were nationalized and positioned as core to the national economy, thus playing an important role in social welfare. With the advent of the modern age and the shift of the social structure to mass consumption, the alcoholic beverage industries of the two countries that had in the past been manual shifted to mass production. The subsequent formation of corporations was within an industrial structure that reflected the national policy or characteristics of the social establishment.

In Japan, the era of high economic growth that began around 1955 brought with it a dramatic increase in the consumption of alcoholic beverages. However, although the professed intention with regard to the alcoholic beverage industry was free competition, under the pretext of preserving the alcoholic beverage tax structure, the licensing system did not permit new entries into the business, and thus production was increased under the protection of regulated prices. In China, the reform and liberalization measures that began around 1980 introduced market principles into the country's economy and brought about increased income and consumption. Production increased in response to this, but it has been strictly controlled by national policy. How the business structure of the alcoholic beverage industry changed as a result of these policies will be discussed by contrasting *saké* to *shaoxingjiu* and *shochu* to *baijiu*.

## 3. PRODUCTION VOLUME IN THE AGE OF MASS CONSUMPTION

The period in which consumption increased in Japan was between 1955 and 1980, the years of post-war economic growth. Looking at the volume of *saké* produced (Table 1), against total production in 1945 of 173 thousand kiloliters, production in 1980 was about 8.5 times this,

**Table 1.** Annual Production of Alcoholic Beverages in Japan (Unit: 1,000 kiloliters)

| Year          | 1945 | 1950 | 1955 | 1960 | 1965  | 1970  | 1975  | 1980  |
|---------------|------|------|------|------|-------|-------|-------|-------|
| <i>Saké</i>   | 173  | 183  | 507  | 751  | 1,159 | 1,601 | 1,747 | 1,473 |
| <i>Shochu</i> | 29   | 173  | 272  | 260  | 212   | 216   | 202   | 254   |
| Beer          | 98   | 178  | 406  | 932  | 1,985 | 2,981 | 3,905 | 4,521 |

**Table 2.** Annual Production of Alcoholic Beverages in China (Unit: 10,000 tons)

| Year            | 1978  | 1980  | 1982  | 1984  | 1986  | 1988  | 1990  | 1991 | 1992  | 1993  | 1994  |
|-----------------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|
| <i>Baijiu</i>   | 143.7 | 215.3 | 253.3 | 317.4 | 350.6 | 467.4 | 514.9 | 524  | 547   | 594.4 | 590   |
| <i>Huangjiu</i> | 40.0  | 43.3  | 59.1  | 62.3  | 86.8  | 85.9  | 57.5  | —    | —     | 93    | 104   |
| Beer            | 40.4  | 68.8  | 117.3 | 224.0 | 412.9 | 662.8 | 692.1 | 838  | 1,021 | 1,192 | 1,400 |

Source: Data from 1978 to 1990 were extracted from *Joshu* (April, 1991), and data after 1991 from *China Statistical Yearbook*.

or 1,473 thousand kiloliters. Similarly, in the case of *shochu*, production in 1980 was about 6.4 times that in 1945 at 254 thousand kiloliters.

In China, with the ending of the Cultural Revolution that began in 1966 and the introduction of a socialist market economy under the reform and liberalization policies initiated in 1979, growth of the economy accelerated as did consumption spurred by increased levels of income. Looking at the volume of *baijiu* produced (Table 2), against a total of 1,437 thousand tons in 1978 before the reform and liberalization policy, production stood at 2,153 thousand tons in 1980 and 5,900 thousand tons in 1994, or about 4 times the level in 1978. In the case of *huangjiu*, whereas production in 1978 was 400 thousand tons, by 1994 this had grown about 2.5 times to 1,040 thousand tons. The reason this growth is smaller than that of *baijiu* relates to the fact that the regions of production are limited to the provinces of Jiangsu, Fujian, and in particular Zhejiang.

In response to this dramatic increase in consumption, the alcoholic beverage industry expanded its production facilities, and the structure of the industry came under the influence of the particular features of alcoholic beverage production technology and the fetters of national policy.

#### 4. COMPARISON OF THE PRODUCTION METHODS OF *SAKÉ* AND *SHAOXINGJIU*

The quality products of *saké* and *shaoxingjiu* are respectively *Ginjo-Saké* and *Chennian-Shaoxingjiu* that has been aged over many years in an earthenware pot. The manufacturing process of *Ginjo-Saké* in recent years is carefully controlled, using such rice brands appropriate for *saké* brewing as “Yamadanishiki” and “Gohyaku-mangoku,” some optimum strains of *Aspergillus oryzae* and *Saccharomyces cereviciae* for *Ginjo-Saké*, and programmed conditions of fermentation in which the saccharification and the fermentation in the *saké moromi* (mash) progress simultaneously, thereby yielding the optimal fruitiness of *Ginjo-Saké*.

Once the targeted quality of *Ginjo-Saké* has been achieved by the fermentation, the solid part of the *saké moromi* is filtered out and the *Ginjo-Saké* obtained pasteurized to inactivate the



**Photo 1.** *Ginjo-saké* bottles stored in a refrigerated showcase  
These are kept at a low temperature of not more than 10 degrees centigrade to prevent changes in quality.



**Photo 2.** Earthenware pots used to prepare *moromi* (mash) - for *shaotingjiu*  
To produce *moromi*, a cup-shaped earthenware pot holding about 500 liters is used. Manufacturers can meet increasing demand by using more pots.



**Photo 3.** Secondary fermentation of *moromi* - for *shaoxingjiu*  
The *moromi* is transferred to earthenware jars and left outdoors for two to three months.

enzymes that remain, thus preventing any further change by the enzymes. A micro membrane filter may be used to eradicate enzyme proteins in order to maintain the delicate flavor. *Ginjo-Saké* manufactured by this method is called *Nama-Saké* or non-pasteurized *saké*. After the finished product has been produced, it is kept in an air-tight stainless steel tank at 5 to 10 degrees centigrade to prevent changes in quality. Also at the retail stage this *saké* is stored in refrigerated showcases as in the case of beer to prevent deterioration of quality (Photo 1). Such products are normally designed to be consumed within a year. In this way, the fermentation process is strictly controlled, enzymes in the *saké* are inactivated, and chemical and physical changes are prevented in storage or during distribution through exercising strict quality control until the product reaches the consumer. This method of production shall here be called “Parallel Fermentation and Completed System” (Table 3).

On the other hand, glutinous rice is normally used in producing *shaoxingjiu*, and when this rice has been soaked in water for about 2 weeks, lactic acid fermentation takes place producing a distinctive odor. This water that gives off a putrid odor is called “*jiangshui*” and is used in place of lactic acid. In the saccharification of the steamed glutinous rice, *koji* made from rice powder called “*jiuyao* (or variously *jiubing*)” is used in the *shubo* or yeast starter stage and brick-like wheat *koji* made from crushed wheat called “*meiqu*” is used in the *moromi* stage. These are produced in the natural environment of the fermentation room, the habitat for various natural moulds, yeasts, and bacteria. In producing *moromi*, a cup-shaped earthenware jar holding about 500 liters (Photo 2) is used in which compound fermentation takes place involving a variety of micro-organisms such as lactic acid bacteria in addition to yeast. After this initial fermentation, the *moromi* is transferred from the jar into an earthenware pot and left outdoors

**Table 3.** Comparison of *Ginjo-Sake* and *Chennian-Shaoxingjiu* in Control of Making Process, Quality and Sales

| Alcohol beverage   | Title of Quality Sake            | Manufacturing Process control                |                        |   |  |   |
|--------------------|----------------------------------|--|------------------------|---|--|---|
|                    |                                  | Raw Material                                 | Polishing rate of Rice | <i>Koji</i> (Name : Materials / Microbes)   | <i>Shubo</i> (Yeast cultivation)       | Condition and type of fermentatio   |
| <i>Sake</i>        | <i>Ginjo</i>                     | High quality rice for <i>sake</i> production | Less than 60%          | ① <i>Koji</i> : Polished rice<br><i>Aspergillus oryzae</i>  | Rapid cultivation method <sup>1)</sup> | Ferm temp. <sup>3)</sup> : Low temp.<br>Ferm Type. <sup>4)</sup> : Paralell ferm.   |
| <i>Shaoxingjiu</i> | <i>Chennian (Huadia, Guoyan)</i> | Standard glutinous rice                      | About 90%              | ① <i>Jiuyao</i> : Rice powder<br>Rhizopus, Bacteria, and Yeast etc.<br>② <i>Meiqu</i> : Crushed wheat<br><i>Aspergillus</i> , and Bacteria etc. | Linfun method <sup>2)</sup>            | Ferm. Temp.: Normal temp.<br>Ferm. Type : Paralell ferm. and Compound ferm. consisted of 1 <sup>st</sup> and 2 <sup>nd</sup> stage. |

1) Pure yeast (*Saccharomyces cerevisiae* sake) is cultivated largely in the mash added lactic acid.

2) Wild Yeast from *Jiuyao* and the atmosphere is cultivated largely in the mash following tradition.

3) Ferm temp.: fermentation temperature

4) Ferm. Type.: Fermentation type

| Alcohol beverage   | Quality and Sales Control                    |  |                    |                            |                                  |   |
|--------------------|--|--|--------------------|----------------------------|----------------------------------|---|
|                    | Pasteurization process                       | Aging condition and storage container  | Container for sale | Temperature for sale stage | Maximum storage period           | Fermentation type and quality completion system       |
| <i>Sake</i>        | Low temperature pasteurization <sup>1)</sup> | Storage : Tank<br>Condition : Low temperature                                | Bottle             | Low temperature            | One year                         | Parallel fermentation and completed system            |
| <i>Shaoxingjiu</i> | High temperature pasteurization              | Storage : Earthen pot<br>Condition : More than 3 years at normal temperature | Pot                | Ordinary temperature       | No limit (the longer the better) | Complicated chain fermentation and incompleted system |

1) The enzymes in new *saké* is inactivated by the low temperature pasteurization.

for 2 to 3 months in the secondary fermentation stage (Photo 3). During this period, bacterial fermentation and a browning reaction take place in addition to alcohol fermentation. After the secondary fermentation is complete, the *moromi* (mash) is filtered and the *xinjiu* (new *saké*) obtained is pasteurized at 90 degrees centigrade, transferred into a sterilized earthenware pot, sealed tightly, and placed in a storage house. During this storage period, the taste of *xinjiu* (new *saké*) becomes milder and sweeter due to iron and lime dissolved out of the earthenware pot, the ingredients are oxidized by air entering through the pores of the earthenware pot, and an aminocarbonyl reaction causes browning. Thus, these reactions promote the ageing of the *jiu*. The longer this ageing period is, the more mature and mellow is the taste, thus resulting in an

expensive alcoholic beverage of high quality. Generally, since the product is placed in retail stores in the storage pot itself and sold by volume to consumers who come with containers, slight changes in quality continue to occur before the earthenware pot is empty. With this type of *moromi*, compound fermentation occurs through the action of various micro-organisms, and the process of ageing progresses through physical and chemical reactions that take place in the earthenware pot. The ageing process does not stop until the alcoholic beverage is completely consumed. This type of production method shall be called “Complicated Chain Fermentation and Incompleted System” to contrast it to the method used in the production of *saké* (Table 3).

## 5. MARKET PRICE STRUCTURE AND THE DEVELOPMENT OF LOW PRICED HUANGJIU

The price of alcoholic beverages in China shifted after the advent of reform and liberalization in 1980 from the price dictated by the government to either a negotiated price agreed upon by producers and consumers or a market price in a free market economy. The retail price in the liberalized market was different depending on the brand (manufacturer), and often varied from region to region. Moreover, within a given brand, a large price differential has appeared based on the number of years of ageing. In the case of a *shaoxingjiu* brand called “Guyuelongshan” (Table 4), while products aged 2 years are priced at 6.4 yuan, those aged 3 years are priced at 13.8 yuan and 10 years at 168 yuan. If ordinary Chinese people are drinking such expensive *shaoxingjiu*, this would mean that there is an enormous income differential.

In Japan, the current free pricing structure has come about via a standard pricing structure from the original and official pricing in the days of a regulated economy. However, even today, the retail price employed by opinion leader manufacturers still acts as a kind of guideline. Thus in contrast to China, the prices range from 1,728 to 2,910 yen according to manufacturer with more expensive varieties priced at 4,850 yen (Table 4) so that there is no really significant gap in the prices. The least expensive *shaoxingjiu* aged 2 years is offered in bottles ranging from 600 to 640 milliliters for between 5.8 and 8.6 yuan. Translated into the standard 1.8 liter bottle used for *saké*, this amounts to between 18 and 26 yuan and with the yen to yuan exchange rate assumed to be 13 yen to yuan, this is between 234 and 338 yen. Comparing household expenditure on alcoholic beverages, which is a non-essential product for a wage earner, the average monthly salary of a wage earner in China is between 200 and 400 yuan or in terms of Japanese yen between 2,600 and 5,200 yen. In other words, the price of a 1.8 liter bottle of *shaoxingjiu* is approximately 10% of monthly salary. In comparison, the price of a bottle of *saké* is less than 1% of the average salary of a white-collar worker in Japan. This clearly shows that the burden on a Chinese wage earner is large and that the price is prohibitive.

With the economy progressing further towards a market orientation, prices increasingly on the rise, and the gap in personal income widening, a quick production *huangjiu* called “*xingongyifa- huangjiu* (or *huangjiu* by new manufacturing method)” for low income classes has appeared on the market. Non-glutinous rice instead of glutinous rice as the raw material is steamed, saccharified, and fermented using wheat bran *koji* (*fuqu*) in a large steel tank. The fermentation period is short at 1 to 2 weeks. The wheat bran *koji* (*fugu*) used is less expensive compared to that used in the traditional wheat *koji* (*meiqu*). Spores of *Aspergillus oryzae* are



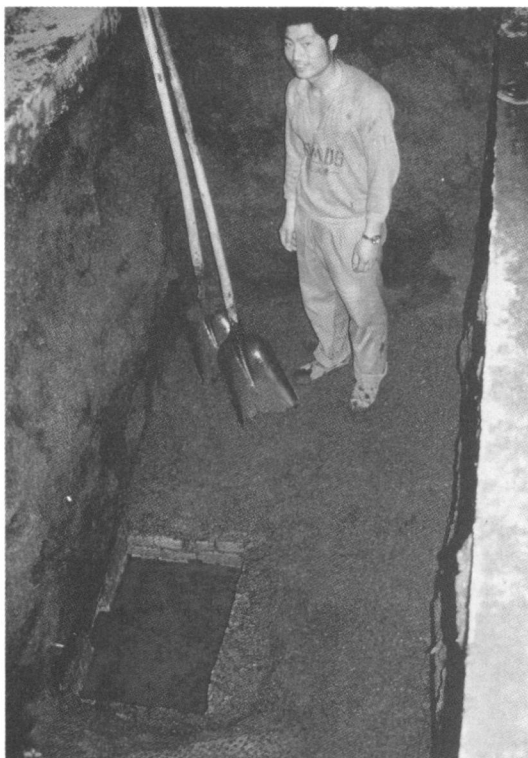
**Table 4.** Retail Prices of *Shaoxingjiu* and *Saké*

| Shaoxingjiu, China |                |            |              |              |          | Sake, Japan  |                |                         |       |       |
|--------------------|----------------|------------|--------------|--------------|----------|--------------|----------------|-------------------------|-------|-------|
| Brand              | Specific title | Age (year) | Content (mℓ) | Retail price |          | Brand        | Specific title | Retail price (yen/1.8ℓ) |       |       |
|                    |                |            |              | Shanghai     | Shaoxing |              |                | Tokyo                   | Osaka | Kyoto |
| Guyuelongshan      | Guoyan         | 10         | 640          |              | 168.00   | Gekkeikan    | Josen          |                         | 1,835 | 1,729 |
| 〃                  |                | 5          | 500          | 19.8         | 20.80    | 〃            | Tokusen        |                         | 2,155 | 2,039 |
| 〃                  |                | 3          | 640          |              | 13.80    | 〃            | Chotokusen     |                         | 2,910 |       |
| 〃                  |                | 2          | 640          |              | 6.40     | 〃            | Daiginjo       |                         | 4,850 |       |
| Nüerhong           |                | 3          | 640          | 8.60         |          | Ozeki        |                |                         | 1,825 | 1,729 |
| 〃                  |                | 8          | 640          |              | 38.00    | Hakutsuru    | Josen          |                         |       | 1,729 |
| 〃                  | Huadiao        | 3          | 1,000        |              | 84.00    | Kikumasamune |                |                         | 1,825 |       |
| Shenyonghe         |                | 2          | 600          | 8.40         |          | Syoutikubai  | Josen          |                         | 1,825 | 1,728 |
| Huijishan          | Huadiao        | 3          | 1,000        |              | 78.00    | 〃            | Chotokusen     |                         | 2,910 |       |
| 〃                  |                | 5          | 600          |              | 19.30    | Tosatsuru    | Honjo          | 2,030                   |       |       |
| 〃                  |                | 3          | 640          |              | 7.00     | Kamotsuru    | Tokusen        |                         | 2,900 |       |
| 〃                  |                | 2          | 640          |              | 5.90     | Masumi       | Junmai         | 2,230                   |       |       |
| 〃                  | Guoyan         | 10         | 640          |              | 188.00   | Otokoyama    | 〃              | 2,230                   |       |       |

scattered on the steamed wheat bran as *koji* seed and mixed and placed in a cultivating room for 2 to 3 days. Compared to the time required in this process for wheat *koji* which is 25 to 30 days, the process is quick; and since inexpensive raw materials are used, the cost of the *koji* is low. Moreover, the short time required for the brewing process and mass production using large tanks makes it possible to produce *huangjiu* that is far less expensive than *shaoxingjiu* made using traditional methods. Among quick production *huangjiu* priced at about 2 yuan, there are those that are not aged in earthenware pots but have alcohol added and colored with caramel. In Japan, what was called “synthetic *saké*” produced by adding seasoning to alcohol was once produced. This was the result of a struggle to overcome the scarcity of food. However, today in China, *huangjiu* that was developed for people in lower income strata who cannot afford the normal prices charged is being distributed as a product that intoxicates cheaply.

## 6. COMPARISON OF THE METHODS OF PRODUCTION OF *SHOCHU* AND *BAIJIU*

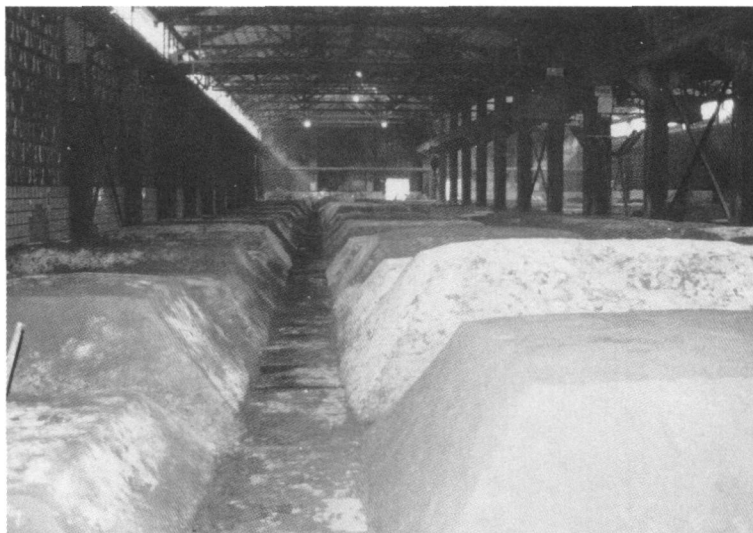
In the Chinese alcoholic beverage market, *baijiu* leads by an overwhelming margin in consumption translated into pure alcohol content and in the number of manufacturers. Total production in fiscal 1993 was 5,940 thousand tons from 4,600 manufacturers. It would not be an exaggeration to say that the alcoholic beverage the Chinese most prefer is *baijiu*. *Baijiu* can be categorized into four types by the difference in flavor. Of these, the *nongxiang* type (rich ester flavor type) and the *jiangxiang* type (soysauce flavor type), represented by “Wuliangye” and “Maotaijiu” respectively, are the most popular; more than 80% of all grain *baijiu* belongs to these two flavor types. The main regions in which these two types are produced are located on the northern part of the upper basin of the Changjian River. The method of production involves placing solid *moromi* made of steamed *kaoliang* mixed with wheat *koji* called “*daqu*” and chaff as filling in a pit in the ground called “*jiaochi*” (Photos 4 and 5) and allowing the



**Photo 4.** *Jiaochi* (pit) for solid *moromi* fermentation – of *baijiu*.

Solid *moromi* is placed in a pit in the ground called “*jiaochi*” (3.5 meters in width, 2 meters in length and 2 meters in depth). After 30 to 35 days fermentation, the *moromi* is dug out and distilled.

mixture to ferment. It is a method that has come down through many centuries. Wild alcohol yeast, *Hansenula genera*, and aerobic and anaerobic bacteria all coexist in the solid *moromi*. Various alcoholic and aromatic substances are yielded through the chain reaction of the various micro-organisms on the *kaoliang* that cause decomposition and fermentation. In particular, such anaerobic bacteria as lactic acid bacteria and butyric acid bacteria yield large amounts of ethyl lactate and ethyl butyrate with a flavor similar to cheese. The solid *moromi* is dug out after 30 to 35 days fermentation, mixed with new *kaoliang* and new steamed chaff, and distilled. After distillation, the residual mash is mixed with wheat *koji* (*daqu*) and transferred again into *jiaochi* to continue secondary fermentation. This operation is generally repeated several times a year. The distilled new *baijiu* is poured into earthenware pots and stored for several years (Photo 6). During this storage, through oxidation of some substances that are harsh and malodorous in new *baijiu*, *baijiu* obtains a typical mellowness as an aged alcoholic beverage. The longer the ageing period, the better the quality of the alcoholic beverage. As in the case of *shaoxingjiu*, this type of production and control method will be called “Complicated Chain Fermentation and Non-completed System” (Table 5).



**Photo 5.** Solid *moromi* in *jiaochi* (pit).

Fermented solid *moromi* swells like a mound out of the *jiaochi*.  
Manufacturers can meet increasing demand by using more pits.

Orientation towards a market economy has pushed up the price of grain based *baijiu* made using traditional methods, and famous national brands of *baijiu* are even more expensive than *shaoxingjiu* and beyond the reach of the ordinary public (Table 6). For this reason, a method of producing cheap *baijiu* was developed by blending the alcohol obtained by the continuous distillation of liquid mash made from sweet potatoes with the seasoning flavor of famous *baijiu* brands which is artificially added. This product, called “*xingongyifa-baijiu* (or *baijiu* by new manufacturing method)” or “*Daluhuo-Baijiu*,” is priced at about 2 yuan in bottled form. The increased income gap has resulted in the polarization of *shaoxingjiu* and *baijiu* consumption into one group of drinkers oriented to enjoyment of flavor and another group of drinkers oriented to achieving intoxication, but the recent trend is towards consumption of alcoholic beverages with low alcohol content. *Xingongyifa-Baijiu* that allows changing the alcohol content at will now commands two thirds the share of all *baijiu* production.

On the other hand, in Japan *shochu* is divided into two classes and produced individually using standardized production technology, just as in the case of *saké*. One kind is called “*Honkaku Shochu* (made by the old traditional method and by pot still distillation)” and the other “*Korui-Shochu* (made by the modern method and by continuous distillation).” Particularly in the case of *Honkaku-Shochu*, the raw materials handed down from ancient times are used. And *Aspergillus awamori* and *shochu* yeast handed down from ancient times as microorganisms for *koji* and the alcohol fermentation are also used and have been selectively bred through repeated use over a long time. The temperature of *moromi* is strictly controlled to allow a balance between saccharification and fermentation and aromatic substances similar to those found in *Ginjo-Sake* are produced. The features of the product so manufactured, though possibly having differences depending on the raw materials used, are not exceedingly different from one



**Photo 6.** Earthenware pots for *baijiu* storage.  
Distilled *baijiu* is aged over several years in an earthenware pots to reach maturity. Manufacturers can meet increasing demand by using more pots.

**Table 5.** Comparison of *Shochu* and *Baijiu* in production process and quality control

| Manufacturing Process     |   |   |                             |   |   |
|---------------------------|---|---|-----------------------------|---|---|
| Alcoholic beverage        | Main raw materials                        | Koji (material/ micro-organism)   | Containers for fermentation | <i>Shubo</i> (yeast cultivation)  | Condition and type of fermentation  |
| <i>Honkaku Shochu</i>     | Rice · Barley · Sweet potato · Buck wheat | <i>Koji</i> : Rice<br><i>Aspergillus awamori</i>  | Vat, Tank                   | Pure <i>Shochu</i> yeast is cultivated in mash at lower pH <sup>1)</sup>  | Temperature : Low<br>Type : Parallel fermentation                         |
| Traditional <i>Baijiu</i> | Kaoliang · Rice                           | <i>Dagu</i> : Wheat<br>Rhizopus,<br>Aspergillus, and<br>Bacteria etc.<br><i>Xiaoqu</i> :<br>Rice powder<br>Rhizopus,<br>Bacteria, and Yeast<br>etc. | <i>jiaochi</i> (Pit), Jar   | Wild yeast,<br>Hansenula,<br>Aerobic bacteria<br>and Anaerobic<br>bacteria from the<br><i>qu</i> and atmosphere<br>increase<br>simultaneously in<br>solid mash. | High temperature,<br>primary<br>and secondary<br>compound<br>fermentation |

1) Citric acid yielded by *Aspergillus awamori* makes lower pH of mash.

| Refining and storage management |                   |   |                           |   |
|---------------------------------|-------------------|---|---------------------------|---|
| Alcoholic beverage              | Storage container | Refining method   | Aging period              | Fermentation type and quality completion system   |
| <i>Shochu</i>                   | Tank              | Filtration after cooling,<br>Treatment by activated carbon or<br>ion exchange resin | About 1 year              | Parallel fermentation and<br>complete system      |
| <i>Baijiu</i>                   | Pot               | Filtration after oxidative aging  | More than 2 to<br>3 years | Complicated fermentation and<br>incomplete system |

**Table 6.** Retailed Prices Classified by Cities: *Baijiu* and *Shochu*

| Retailed price of <i>Baijiu</i> (yuan/500ml) |                |                      |         |          |         |         | Retail price of 25percentage <i>Shochu</i> (yen/1.8ℓ) |                 |              |        |       |
|--|----------------|----------------------|---------|----------|---------|---------|---|-----------------|--------------|--------|-------|
| Brand  | Fragrance type | Alcoholic percentage | Cities  |          |         |         |   | Brand           | Raw material | Cities |       |
|  |                |                      | Beijing | Shanghai | Nanjing | Guiyang | Xian  |                 |              | Osaka  | Kyoto |
| Maotaijiu                                    |                | 53                   | 240     | 230      | 205     | –       | 230   | Ichiko          | Barley       | 1,320  | 1,280 |
| Wuliangye                                    |                | 52                   | 215     | 196      | 200     | 193     | 210   | Nikaigo         | ∕            | 1,366  | 1,361 |
| Jiannanchun                                  |                | 52                   | 90      | 96       | 100     | 95      | 105   | Yokaichi        | ∕            |        | 1,223 |
| Luzhoulaojiao                                |                | 52                   | 45      | 41.5     | 40      | 42      | 39  | Unkai           | ∕            |        | 1,330 |
| Langjiu                                      |                | 53                   | 45      | 41.5     | 41      | 39      | 40  | Satsumasiranami | Sweet potato |        | 1,320 |
| Gjinggong                                    |                | 53                   | 34      | 31.5     | 31.5    | 33      | 31  | Takachiho       | Buck wheat   |        | 1,450 |
| Quanxingdaqu                                 |                | 52                   | 32      | –        | 30      | 32      | 28  | Unkai           | ∕            |        | 1,515 |
| Fenjiu                                       |                | 53                   | 17      | 16       | 19      | 22      | 18  |                 |              |        |       |
| Xifengjiu                                    |                | 55                   | 15      | 15       | 16      | 16.2    | 14.8  |                 |              |        |       |
| Xunjiu                                       |                | 54                   | 16.5    | –        | 19      | 18      | –   |                 |              |        |       |
| Yanghedaqu                                   |                | 55                   | –       | 35       | 35      | 35      | –   |                 |              |        |       |
| Jianzhuang                                   |                | 52                   | 8.5     | 6.3      | 7       | 6       | –   |                 |              |        |       |
| Kouzijiu                                     |                | 53                   | 16      | 14.5     | 14      | –       | –   |                 |              |        |       |

Source: Data of 1996. 7.7. from *Kakashuhou*

manufacturer to the other.

Ethyl esters of higher fatty acids exist in the new *shochu* immediately after distillation, and they are allowed to coagulate through cooling and are then removed. After this, the new *shochu* goes through a refining process using activated carbon or ion exchange resin to remove undesirable substances such as aldehydes and intensify the refreshing fragrance of esters. This completes the final product. The product thus manufactured under the standardized process control will experience no degradation as it makes its way to the consumer. Thus, as in the case of *saké*, this method of production will be called “Parallel Fermentation and Completed System” (Table 5).

## 7. CHARACTERISTICS OF THE ALCOHOLIC BEVERAGE INDUSTRY STRUCTURE

The production methods and product concepts of *saké* and *shaotingjiu*, *shochu* and *baijiu*, all ethnic alcoholic beverages of Japan and China, have been studied thus far on a comparative basis. With the exception of alcoholic beverages produced under the new manufacturing method developed as intoxicants for the lower income class in China, *shaotingjiu*, “Moataijiu” and “Wuliangye” are regional products manufactured using unique methods handed down over many generations.

The methods of production do not involve manufacturing an alcoholic beverage product of pre-designed quality but rather use as raw materials grains harvested in a particular region, production facilities indigenous to that region, and unique and traditional technology employed within the natural environment. The micro-organisms that cause fermentation are yeasts, moulds, and bacteria found in the soil and the raw materials. These micro-organisms coexist in

**Table 7.** Characteristics of Alcoholic Beverage Industry Construction: Japan and China

| Country | Fermentation and quality completion system       | Method to expand production quantity     |                          |                     |                                      |
|---------|--|--|--------------------------|---------------------|--------------------------------------|
|         |  | Containers for fermentation              | Automatic control system | Number of employees | Operation type of modernization      |
| Japan   | Parallel fermentation and completed system       | Enlargement of tank capacity             | Available                | Decreasing          | Full-scale mass production           |
| China   | Complicated fermentation and incompleting system | Increase of vat and <i>jiaochi</i> (pit) | Not available            | Increasing          | Succession of traditional technology |

the *moromi* and cause chain fermentation. The resulting product is placed in an earthenware pot and aged over long periods. The alcoholic beverage thus obtained is the traditional regional product. Since in this process there is no intentional control technology for the purpose of creating a product with designed quality, complex operations for maintaining control such as analysis and measurements are not required.

We have called this type of production pattern “Complicated Chain Fermentation and Incompleted System.” Since there are no parameters for controlling the fermentation process in this system, increased production cannot be accomplished by increasing efficiency through enlarging the scale of facilities or introducing automatic control equipment. Thus, since the creation of a modern industry through introduction of equipment technology is not possible, the alcoholic beverage industry in China may be termed an industry based on traditional techniques (Table 7).

In contrast to this, alcoholic beverage production in Japan begins with product planning that determines the quality of the alcoholic beverage to be produced, followed by selection of raw materials appropriate to producing an alcoholic beverage of such a quality and the use of genetically engineered micro-organisms to control the fermentation process. The resulting product undergoes a refining process in order to stabilize quality and is further controlled to preserve quality in the distribution stages which the product follows before reaching the consumer. This production process, which we have termed “Parallel Fermentation and Completed System,” allows enlarging the scale of equipment and introducing process control towards increased production. The products so produced are standardized with very little difference among manufacturers. In this sense, the alcoholic beverage industry of Japan is a typical standardized mass production type (see Table 7) and may be termed a modern mechanized industry.

## 8. INDUSTRY FORMAT AFTER EXPANSION OF PRODUCTION SCALE

The alcoholic beverage industry of China, faced with a rapid increase in consumption as a result of policies of reform and liberalization, responded by expanding production facilities. However, due to the limitation imposed by the fact that the industry is regional and utilizes traditional techniques, it has been impossible to progress beyond a manual-based factory industry. For that reason, increased production was achieved through horizontal extension of traditional production facilities. Moreover, those companies that successfully increased the

scale of production were limited to manufacturers of products well known for their quality. This was because the creation of a market economy enabled sales through a national network and allowed setting a high sales price commensurate with the acclaim enjoyed by the product. However, since the companies producing traditional products are public corporations and a large part of the profits are channeled into social welfare, an activity that should rightly be conducted by the government, and into compensating for companies operating at loss, a substantial portion of profits are used in activities that do not contribute to enhancing productivity such as investment in housing, entertainment, and education facilities or welfare operations such as medical care and annuities for retired workers.

In contrast to this, in Japan old facilities for producing alcoholic beverages were expanded under a scrap and build policy and manufacturing operations were made more efficient through the introduction of automatic controls and mechanical equipment. Moreover, this trend was further accelerated by the government's attempt to preserve the alcoholic beverage tax through controls on pricing and the policy of limiting excessive competition through the licensing system. When a manufacturer expands its business, it purchases its manufacturing license from another company in order to expand production facilities. Enhanced productivity that comes as a result of increased scale leads to reduction of cost and increased profits that are then used to acquire another company. As a result, Japan's alcoholic beverage industry that was, until recently, in a development phase as a manual-based factory industry transformed very rapidly into a modern industry equipped with automatically controlled equipment.

How the industrial formats have changed in China and Japan, faced as they are with the age of mass consumption and responding to this with expanded scales of production, will be viewed through the typical examples of a *shochu* factory and a *baijiu* factory.

## 9. COMPARISON OF PRODUCTIVITY IN A *SHOCHU* FACTORY AND A *BAIJIU* FACTORY

The comparison will be based on a Maotai factory representative of *baijiu* factories and a *shochu* factory belonging to the Kagura Shuzo Kaisha in Takachiho, Kyushu, with similar scales of operation and regional environments. Maotai Village in the Yungui-Guizhou highland, where the Maotai factory is situated, is located 250 kilometers from the provincial capital Guiyang City. It has a population of about 15,000 and is a town that relies solely on the Maotai factory. Kagura Shuzo Kaisha is situated in Takachiho Town, Miyazaki Prefecture, a highland town of about 17,000 people located about 140 kilometers from Miyazaki City.

Both factories manufacture regional products, but the volume of "Maotaijiu" produced converted into *shochu* terms is about 4,500 kiloliters, just over one third of the production of "Kagura Shochu." A significant difference is that whereas the number employed by Kagura Shuzo is 78 people (with an additional 63 in sales), an abnormally numerous 2,155 people are employed at the Maotai factory [QIN 1993]. In addition to the fact that the production method of "Maotaijiu" is based on traditional techniques, this is due to the fact that the factory possesses and operates employee apartments, hospitals, schools, hotels, theaters, and other infrastructure related facilities. For this reason, the land space of the factory is enormous and takes up the whole town (Photo 7). Since "Maotaijiu" is a regional product entrenched in Maotai Village,

**Table 8.** Comparison of Scale and Production of Shochu and Baichu Factories

|                            | Kagura Shuzo Kaisha                       | Maotai Jiuchang  |
|----------------------------|---|--|
| Location                   | Takachiho Town, Miyazaki Prefecture       | Maotai Village, Guizhou Province                             |
| Distance from a major city | Approx. 140 km from Miyazaki              | Approx. 250 km from Guiyang                                  |
| Major products             | Barley <i>shochu</i> , <i>soba-shochu</i> | Kaoliang <i>baijiu</i>                                       |
| Annual production          | 12,500 <i>kℓ</i>                          | 2,060 t (corresponding to 4,500 <i>kℓ</i> of <i>shochu</i> ) |
| Area of factory site       | Approx. 14,000 m <sup>2</sup>             | Approx. 530,000 m <sup>2</sup>                               |
| Number of employees        | 78 (and 63 engaged in sales)              | 2,155  |
| Population of area         | Approx. 17,000                            | Approx. 15,000   |

increased production cannot be achieved since locating plants elsewhere is not possible and liberalization has caused the advent of a seller's market, thus pushing the price of the product up. This has helped the shouldering of the many financial burdens such as welfare for employees, but with consumer preferences turning to beer and other light fragrance beverages with low alcohol content, the industry can be said to be one that is struggling with how to respond to changes in society, particularly as the product it produces is a traditional one.

On the other hand, the Japanese alcoholic beverage industry is one in which competition among companies in expanding operations led to rationalization through enhanced productivity and conversion into a modern industry with automatic control equipment. Kagura Shuzo Kaisha's factory is located in a mountainous region (Photo 8) and is typical of companies that have achieved rationalization despite being of medium scale. Meanwhile, the more a company has expanded its scale of production and completed a mass production system, the more standardized and the more devoid of character are its products. As a result, separately from rationalization of the production format, corporate effort is now being focused on developing differentiated products.

## 10. CONCLUSION

Comparing *shaotingjiu* and *baijiu* to *saké* and *shochu*, we have examined how the alcoholic beverage industries of the two countries that had been in a development stage as manual-based factory industries until recent years have responded to the shift in society towards mass consumption.

Because the product characteristics of Chinese alcoholic beverages are of the "Complicated Chain Fermentation and Non-completed System" variety, in expanding production volume to respond to increased consumption in the age of reform and liberalization, companies were limited to preserving traditional techniques and implementing horizontal expansion of existing facilities without rationalization through mechanization. This was possible only for companies with products that were well known and could attract a high retail price in the free market that ensued. However, as part of the profits obtained is channeled to social welfare under socialist policy, the Chinese alcoholic beverage industry is to this day divorced from productivity enhancement.

On the other hand, with *saké* and *shochu*, as the production process is of the "Parallel





**Photo 7.** Overall view of Maotai factory - China.

Factory buildings, storage houses and a museum can be observed behind the high-rise factory hotel by the river. A theater and other infrastructural facilities are located halfway up the hill, and employee apartments are located at the top. The enormous factory complex dominates the whole town.



**Photo 8.** *Shochu* factory of Kagura Shuzo Kaisha - Japan.

The factory stands alone in the middle of Takachiho Heights.

Fermentation and Completed System” variety, introduction of automatically controlled equipment was possible in expanding production scales, and the alcoholic beverage industry in Japan has been converted into an advanced technology industry.

## **BIBLIOGRAPHY**

QIN Hanzhang (秦含章)

1993 『新編酒經』北京：人民日報出版社. (*Xinbian Jiujing*, Beijing: Renminribao Chubanshe. [In Chinese])

