

EXPANSION OF THE CHINESE HOP AND BREWING INDUSTRY

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ABSTRACT

Hop industry in China was characterized in 2005 with estimated 3,500 ha of hop area (7%), a production of 10,500 tons of hops, with an out put of 306.2 million hl of beer as the world biggest beer producer and with a beer consumption of 23 liters per capita. With China holding a membership in the WTO since 2001, it has been more deeply merged into the global economy. The contribution presents details of the Chinese hop production development and structure, its hop growing regions in Gansu and Xinjiang, a role in a global hop trade, as well as trends in a development within the national economical strategy. The paper is based on the bilateral research cooperation (BI-CN/03-04/014 and BI-CN/06-07/013) between the Slovenian Institute for Hop Research and Brewing and the China National Research Institute of Food and Fermentation Industries as well as on activities in the International Hop Growers' Convention.

Key words: hop production, brewing industry, PR China, IHGC

RAZVOJ HMELJARSTVA IN PIVOVARSKÉ INDUSTRİJE NA KİTAJSKEM

IZVLEČEK

Kitajska beleži v statistiki 2005 okoli 3.500 ha površin hmeljišč (7%), pridelek 10.500 t hmelja (11,3%), kot največja svetovna proizvajalka piva 306,2 mio. hl piva (19,2%) in skromno porabo piva 23 l na prebivalca. Z vključitvijo Kitajske v Svetovno trgovsko organizacijo (WTO) v decembru 2001 ta postane še tesneje povezana v mednarodne poslovne tokove. V prispevku so predstavljeni mejniki razvoja kitajskega hmeljarstva, pridelovalne značilnosti hmeljarskih območij provinc Gansu in Xinjiang, struktura pridelave hmelja, vpetost v globalno ponudbo in povpraševanje ter trendi panožnega razvoja v okviru nacionalne strategije gospodarstva Kitajske. Članek je rezultat bilateralnih projektov (BI-CN/03-04/014 in BI-CN/06-07/013) med Inštitutom za hmeljarstvo in pivovarstvo Slovenije in Nacionalnim inštitutom za prehrano in industrijo fermentiranih pijač iz Pekinga kot tudi sodelovanja v okviru Mednarodne hmeljarske zveze (IHGC).

Ključne besede: pridelava hmelja, pivovarstvo, LR Kitajska, IHGC

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1 METHODOLOGY – CHINESE HOP INDUSTRY REVIEW

Descriptive analysis of the Chinese hop industry shows that growing hops in China started in 1921 when a variety called Hadora was introduced from Germany. There were about 30 mu (2 ha) of area in Yimianpo of Heilongjiang Province. In 1943 an area of 100 mu (6.7 ha) of hops was planted in Changbai County of Jiling Province. After founding of P.R. China, Chinese started industrialized growing of hops within the following stages [3, 5]:

- **Pioneer trials with a wide range of test growing:** A 12 years wide range of experimental growth from 1954-1965 in different areas, crossing different latitude, longitude and in different sea levels, by which they learnt initially the basic features of hops, formulated standard and requirements for field management, and decided that Northwest China was a suitable place for growing hops, and from then on, designated **Tsingdao Flower** as the main hops variety for China.
- **A stage of popularization and promotion of hops technology and stable development:** In 14 years period from 1966-1980, the hop growing area in China had been expanded yearly to a total area of 16,500 mu (1,100 ha) total yield up to 1,400 tons, average yield per mu (*1 mu = 0.067 ha*) gradually reached 192 kg. In another 10 years time span from 1981-1990, hop industry in China has reached a full and rapid growing period and the location of hop growing was fixed. As determined by the hop features, hops are suitable to grow in high latitude, temperate zones, and cold/cool areas, China decided Xinjiang Autonomous Region, Gansu Province and Ningxia Autonomous Region of Northwest China as the main growing zones for hops in the country.
- **Development of mechanical and technical processing:** In a 10 years period from 1990-2000, there were years with overproduction in a global hop industry. The hops in China were mostly stored in warehouses of farms in a natural state. Thus, there was a serious loss of α -acids in hops and their products. By the time when new hops were harvested, some of the stocked hops have already been valueless. Each year such kind of loss aggregated several millions Yuan. Therefore, hop farms in China gradually put investment in hop storage equipment. Hops were mostly processed into pellets, vacuum packed and then stored in cold temperature, with technology either self- made or introduced from foreign countries, in which circumstances promoted the hops processing industry in China. In 2005, there were 19 hop processing firms in the country.

2 RESULTS - DEVELOPMENT OF HOP GROWING AREAS IN CHINA

China's Hexi Region especially Hexi Corridor Area of Gansu Province is featured for typical dry climate in North temperate zone, with long sunshine hours, big temperature difference, few precipitations, big evaporation, annual radiation quantity up to 145,64 kilocalorie/cm², annual average temperature 6.4-12 °C, annual sunshine of 3059-3509 hours, 150 non-frost days, annual precipitation 32-240 mm concentrated from July till September, annual evaporation

2511 mm. These favorable natural conditions have catered optimal growing condition for hops. The soil type of this region is mainly desert limy soil thick in strata, most of which above 2 meters. This area is marked for its rich underground water resources that facilitate agriculture irrigation Both Xinjiang and Gansu located in dry Northwestern area of China, and both are the major hops growing bases of the country, both are rich with many years of growing and processing experience, while Gansu has more advantage of lower cost in land transportation than its neighbor province Xinjiang, taking half distance to the coast for shipping, and half distance domestic breweries as well, Therefore, to set up a growing and processing center of China based on Hexi Corridor Area, which is geographically center of China, is more advantageous [5].

About 20 years of Chinese market economy intensified the competition among Chinese hops enterprises and farms. After years of competition, two main hop growing regions have been established in **Gansu Province** and **Xinjiang Autonomous Region**. A production in other areas was brought to an end.



Fig. 1: Hop areas are located in NW of China - around city of Urumqi (Xinjiang) and NW from Lanzhou city (Gansu)

Slika 1: Hmeljišča na SZ Kitajske – v okolici mesta Urumqi in SZ od mesta Lanzhou

2.1 Hop growing area in the Xingjiang province of China

The growth of hops in Xinjiang concentrates in Baringuole State, Arksu Region, Changji, Bringuole and Yili. Baringuole State is located in Southeast part of Xinjiang, with an area of 482.7 thousand square km, bordering Gansu Province, Qinhai Province, and Tibet Autonomous Region. Baringuole State belongs to continental moderate temperature, featured in dry, less rain, large evaporation and long sunshine hours.

Arksu Region located in south range of Tianshan Mt, north edge of Tarim Desert, E78°03' - 84°07', N39°30' - 42°41', covering 132.5 thousand square km, bordering Kyrgyzstan and Tajikistan on northwest. Arksu Region is typical continental temperate climate zone, its weather featured with dryness, less rainfall. As a one of the most radiation concentrated areas in China, Arksu is notable for long sunshine hours, with annual radiation up to 2750-3029 hours, total solar radiation amount up to 5340-6220 megajoule/m², large temperature difference between day and night, long in non-frost days as long as 183-227 days, annual average temperature 9.9-11.5 °C and annual rainfall 42.4-94.4 mm.

Changji State is located in north of Tianshan Mt. (E85°34'-91°32' and N43°06'-45°38'), bordering Mongolia at Northeast, harboring Urumqui (Wulumuqi) City, at length of 541 km from east to west, 285 km from south to north, covering a total area 93.9 thousand km². Changji State is diverse with desert climate at north desert areas, with sufficient sunshine, annual radiation up to 2700 hours, total solar radiation amount up to 133,6 megajoule/cm², annual average temperature 6.8°C, January average temperature -15.6 °C, July average temperature 24.5°C, annual precipitation 190 mm, non-frost day as 160-190 days.

Yili Region is located on slope of Yili River valley at north side of the Tianshan Mountain (E79°50'-84°56' and N42°14'-44°50'), covering a total area 56 km², surrounded by Tianshan Mt. on three sides flat on west side. The climate in Yili Region is mild and humid.

2.2 Hop growing area in the Gansu province of China

The important hop growing areas in the Gansu province include regions of Jiuquan, Suzhou, Jinta, Yumen, Anxi and Dunhuang [2].

Jiuquan District as the main one is situated at 98°E, and 39°N, located in Gansu Province, bordering Qinhai Province on south, next to Xinjiang Autonomous Region on the west, and its northern part bordering Mongolia. Jiuquan covers an area of 192,000 square km account for 42% to total area of Gansu, 700 km in length from east to west, 500 km in width from north to south. The total population in Jiuquan is approximately 1 million, consists mainly of Han nationality and other 25 ethnic groups, namely Hui, Mongolia, Kazak, and Yugur. There are 522 villages, and 76 towns administered respectively by two county level cities, Suzhou Region and Yumen District, four counties Jinta, Anxi, Subei and Aksai.

Jiuquan is rich with natural resources, especially rich with land, water, and heat resources, annual sunshine period up to 3400 hours. Jiuquan is noted for rich water resources, renowned as *Oasis in Desert*. Jiuquan is famous since ancient time for irrigated agriculture, with 3 rivers run through this region, Hehe River, Shule River, and Harteng River with aggregated surface runoff 3.3 billion m³, capacity of underground water 2.95 billion m³, and there are 73 medium and large reservoirs scattered in the entire region. Jiuquan is marked for its biggest hops base in China, with main variety **Tsingdao Flower**.

3 RESULTS – SPECIFIC FARMING STRUCTURE

In 2005 China there were estimated 3,500 ha of hops. It was the third world largest hops growing area in the world (after Germany – 17,167 ha and USA – 11,817 ha), whereas Gansu Province and Xinjiang Autonomous Region, located in a high latitude, of China are renowned for a good quality, and high yield, with over 30 years growing experience [6].

As the Hexi Corridor Area on northwestern part of China locates in dry Gobi Desert area, it is favorable to plant and grow hops, and farmers in this area foresee the advantage of this produce and introduced hops. After years of development Hexi Corridor Area becomes the main hops growing and processing region in China. The hops is produced predominantly on low trellis up to 3 meters high (fig.1a,b). There are no reliable statistics on acreage and production volume in China. The estimations (till 2006 no official figures for China were available) presented in this article here have been gathered using various national, business and IHGC sources. By the year 2005, the hop growing area in China reached 3.500 ha with an annual yield of 9,773 tons (fig.2), from which Xinjiang accounted 44% and the Gansu area 56% of the national market volume [6].

A total of 46 so called collective and cooperative farms did grow hops in China in 2005. There were 27 farms in the Xinjiang region (of which 11 are privately owned farms) and 19 in the Gansu province. The average hop acreage per farm fell to 76 ha, compared with 83 ha in 2004 [1]. The hop varieties cultivated are named in the fig. 2.



Fig. 1a: Low trellis hop production systems in China
Slika 1a: Pridelava kitajskega hmelja na nizkih žičnicah



Fig. 1b: Low trellis hop production systems in China
Slika 1b: Pridelava kitajskega hmelja na nizkih žičnicah

Area	Variety	Development of acreage			Development of production			
		2004	+/-	2005	2004	2005	2004	2005
		Acreage ha			Ø-Yield	mt/ha	Production mt	
Xinjiang	Tsingdao Flower	1,200	-163	1,037	2.80	2.99	3,360.0	3,100.0
	Marco Polo	287	13	300	2.61	3.33	750.0	1,000.0
	SA-1	281	-1	280	2.06	2.86	580.0	800.0
	Kirin Flower	160	-27	133	2.50	3.01	400.0	400.0
	Others	128	-48	80	1.33	2.50	170.0	200.0
Total Xinjiang		2,056	-226	1,830	2.56	3.01	5,260.0	5,500.0
Gansu	Tsingdao Flower	1,378	-40	1,338	2.87	2.94	3,960.0	3,933.0
	Nugget	206	0	206	0.87	0.67	179.2	139.0
	Kirin Flower	72	0	72	2.70	1.71	194.1	123.0
	Others	40	0	40	1.63	1.94	65.1	77.5
Total Gansu		1,696	-40	1,656	2.59	2.58	4,398.4	4,272.5
Total Aroma		449	-49	400	1.82	2.69	815.1	1,077.5
Total Bitter		2,810	-230	2,580	2.82	2.93	7,914.1	7,556.0
Total High Alpha		493	13	506	1.88	2.25	929.2	1,139.0
CHINA TOTAL		3,752	-266	3,486	2.57	2.80	9,658.4	9,772.5

Fig. 2: Chinese hop supply data in 2005 and 2006 [1]
Slika 2: Ponudba hmelja na Kitajskem v letih 2005 in 2006 [1]

4 DISCUSSION - ANALYSIS OF BREWING INDUSTRY IN CHINA

In 2005 a global beer output of 1,598 billion hl rose year on year by 3 %, or 45.8 million hl. China contributed the largest share of 306.2 million hl of beer – together with USA (230.3 million hl) and Germany (105.5 million hl). Only Chinese increase was 15.2 million hl [1].

In the 2004/2005 period, beer output grew in China by 5.2 % to just over 306 million hl (fig. 3). According to some estimates, growth rates could continue to be 5-6 % per year in the foreseeable future. It is considered possible that within ten years – till 2015 - China will have a brewing industry with an output of about 500 million hl. The average hopping rate in the Chinese brewing industry is between 2.5 and 3.0 g alpha/hl. This unusually low hopping rate is a consequence of the generally low utilization of bitter substances in Chinese beers. In the North, bitterness levels are somewhat higher than in the South. The availability of hops as a raw material will be insufficient to meet the demand of the Chinese brewing industry in year 2006.

In 2003 the Chinese brewing industry took a position of a leader in a global beer production. According to estimation of the IHGC delegates from China the output increase of beer in China shall reach 32 million hl per year in a year 2010. Having a calculation, with 3.0 g of α -acid to be used per hl of beer produced (less than global average estimation), together with an average alpha content of 6% (**Tsingdao Flower**) - 2.5 to 3 times more hops – as produced on a national level - is needed to cover the needs of the Chinese brewing industry. Apart from traditional types of beer there have been attempts to start producing also other types like low alcohol milk beers [7].

The global players in a brewing industry continue to increase their ability to influence the world market by means of brewery purchases, equity investments and take-overs. The top ten brewing companies alone account for some 926 million hl, or 58 % of world beer production (fig.4). Among the top 40 brewery groups worldwide, the Chinese breweries produced 121.5 million hl (7.7% of global production). They took in 2005 the following positions (fig. 4): (9.) Tsingtao, (10.) Yan Jing, (18.) Gold Star, (21.) Chuong Qing, (29.) Xue Jin, (38.) San de Li and (40.) Shenzhen Jinwei [1].

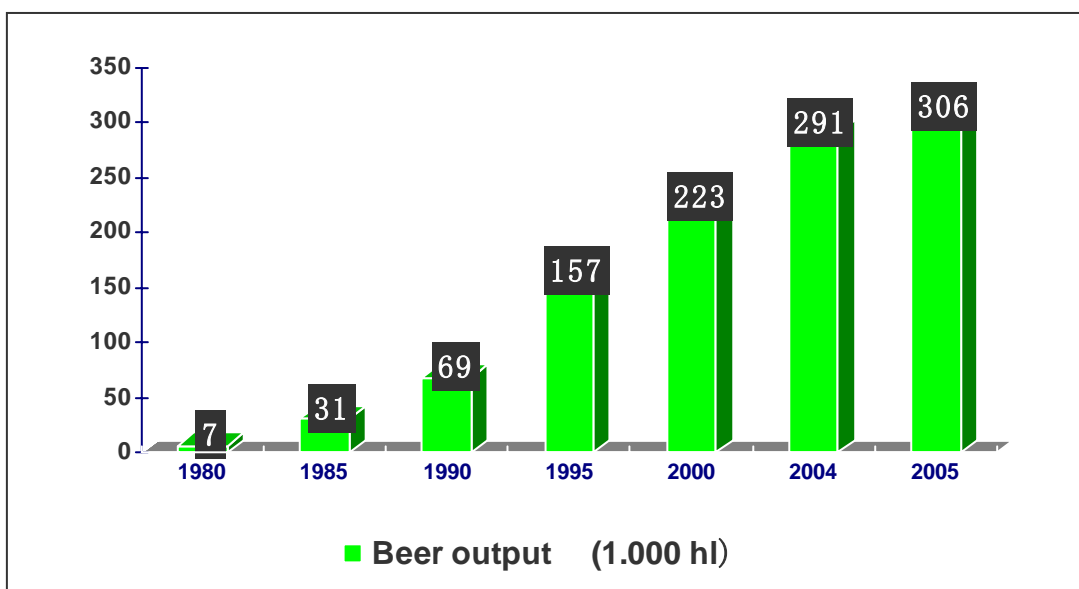


Fig. 3: Beer output in PR China 1980-2005 [4]

Slika 3: Proizvodnja piva v LR Kitajski 1980-2005 [4]

Rank	Brewery	Country	Production volume 2005 in million hl	Percentage of world beer production
1*	InBev	Belgium	202.1	12.6%
2	SABMiller	United Kingdom	176.0	11.0%
3	Anheuser-Busch	USA	173.5	10.9%
4	Heineken	Netherlands	118.6	7.4%
5	Carlsberg	Denmark	48.3	3.0%
5	Molson-Coors	USA/Canada	48.3	3.0%
7	Modelo	Mexico	45.5	2.9%
8	Baltik Beverage Holding (BBH)	Russia	41.5	2.6%
9	Tsingtao	China	40.9	2.6%
10	Yan Jing	China	31.2	2.0%
11	Scottish & Newcastle	United Kingdom	29.1	1.8%
12	Femsa (Cuauhtemoc)	Mexico	27.0	1.7%
13	Asahi	Japan	24.6	1.5%
14	Kirin	Japan	22.6	1.4%
15	Efes	Turkey	18.0	1.1%
16	San Miguel	Philippines	17.0	1.1%
17	Polar	Venezuela	16.5	1.0%
18	Gold Star	China	15.8	1.0%
19	Schincariol	Brazil	15.5	1.0%
20	Radeberger	Germany	15.0	0.9%
21	Chong Qing	China	14.4	0.9%
22	BGI/Castel	France	13.9	0.9%
23	Diageo (Guinness)	Ireland	13.0	0.8%
24	Mahou – San Miguel	Spain	11.2	0.7%
25	Hite	South Korea	9.7	0.6%
26	Foster's	Australia	9.2	0.6%
27	Beer Thai (Chang)	Thailand	9.1	0.6%
28	Sapporo	Japan	9.0	0.6%
29	Xue Jin	China	8.4	0.5%
30	Bitburger	Germany	8.2	0.5%
31	Lion Nathan	New Zealand	8.0	0.5%
32	Kaiser	Brazil	7.4	0.5%
33	Oettinger	Germany	7.0	0.4%
34	Singha	Thailand	6.8	0.4%
35	Suntory	Japan	6.6	0.4%
36	Damm	Spain	6.5	0.4%
37	CCU Cerv. Unidas	Chile	6.4	0.4%
38	San de Li	China	5.6	0.4%
39	Krombacher	Germany	5.3	0.3%
40	Shenzhen Jinwei	China	5.2	0.3%
Total			1,297.9	81.2%
World beer production 2005			1,598.1	100.0%

* The InBev group is composed of InBev Belgium (186.2m hectolitres) und Quilmes Argentina (15.9m hectolitres).

Fig. 4: Top 40 brewery groups in the world in 2005 [1]

Slika 4: 40 največjih pivovarn v letu 2005 [1]

5 TRENDS - FUTURE PROSPECTS OF CHINESE HOP INDUSTRY

With China holding the membership of WTO, it has been more deeply merged into the global economic unity. Hence, to grasp opportunity, and to draft a creative development strategy, is a great significance to the growing tendency of a Chinese hop industry. An **increase of beer consumption** means on the other side also an increase of a demand of hops. That is why with a governmental financial support they plan to enlarge their hop areas.

Introduction of **new hop varieties** shall focus on specified series, and diversifications, highly regard on application of technology to ensure the harmonious combination of technical factors and growing factors in order to streamline productivity and enlarge the market shares and maximize a profit as well. Creative concept is also highly recommended both in management creativity and technology creativity enabling hops products to have firm market positions. It is meaningful to draft sound introduction plans and set up full range herbarium for hops varieties. Before launching the introduction program, they plan to conduct surveys on the current Chinese and world hops varieties in order to sort out the correct varieties that in demand, and finally, set up Chinese hop herbarium. It is fundamental to keep regular varieties matching and timely replacing old hops, therefore, it is reasonable to adjust the existing ratio of bitter hops and aromatic hops from 90%:10% into 70%:30%. In order to maintain a high market percentage and to satisfy the production demand of premium quality beer, they will introduce aromatic hops and hops with high commercial values and speed up the process of propagation. Concerning a maturity, there are 3 kinds of hop varieties to be selected before introduction. The early mature, the mid-term mature and the late mature ones. Different varieties will be considered and matched for growing, for efficient utility of manpower and farming equipment.

In order to enable Chinese hop products to be competitive on a world market, Chinese hop industry stakeholders should further develop their **quality management** activities with intention to adapt to global ongoing changes and thus to face market reality. To reach all these goals and to execute their strategy in a hop industry they tend to keep their active role also within the International Hop Growers' Convention [4].

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