

MARKET SUPPLY OF HOPS FOR THE GLOBAL BREWING INDUSTRY IN THE THIRD MILLENIUM

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Abstract

Hops are grown in relatively few countries throughout the world and they are a classic international trading commodity on the markets for agricultural produce. The main role on the market plays a global hop balance, i.e. a world demand level of merchants and breweries as well as a supply from hop growers. The article demonstrates some of the main characteristics of the global hop market. For the market supply both hop quantities as well as the brewing value of hops have great importance. Following the statistics from the hop market demonstrated for the first decade of the third millennium it is obvious that hop products represent very important goods in the global hop trade.

Key words: hop, hop industry, global market supply, brewing industry, trading, yield, cultivation

PONUDBA HMELJA SVETOVNI PIVOVARSKI INDUSTRIJI V TRETJEM TISOČLETJU

Izvleček

Hmelj raste v sorazmerno maloštevilnih državah po svetu, uvrščamo pa ga med tipično blago v prometu mednarodnega trgovanja s kmetijskimi pridelki. Pomemben kriterij trgovanja predstavlja bilanca hmelja, oz. povpraševanje trgovcev in pivovarn ter ponudba hmeljarjev. Članek predstavlja ključne značilnosti svetovnega trga s hmeljem. Za razmere tržne ponudbe sta pomembni tako količina hmelja, kot tudi njegova kakovost oz. pivovarska vrednost. Predstavljene so globalne statistike ponudbe hmelja za časovno obdobje prve

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dekade tretjega tisočletja. Iz prikazanega razberemo, da predstavljajo proizvodi iz hmelja pomembno blago mednarodne trgovine.

Ključne besede: hmelj, hmeljarstvo, globalna ponudba, pivovarska industrija, trgovanje, pridelek, predelava

1 INTRODUCTION

Due to hops' latitudinal sensitivity, production is restricted to those countries situated between the 35th and 55th parallel north and south of the equator (Barth et al., 1994). Hops are currently grown in about 30 countries world-wide, the majority of which are in the Northern Hemisphere. The international hop market is characterized by a few large players, and a large number of small players. Namely, the world production of hops is dominated by two countries, Germany and the United States of America. They represented jointly in the period analyzed i.e. in the first decade of the third millennium about two thirds of the world hop production. Moreover, as stated by the IHGC, Germany (34,234 tons of hops / 3,600 tons of alpha-acids) and USA (29,707 tons of hops / 4,026 tons of alpha-acids) produced in 2010 already over 75 % of the total alpha-acid quantity worldwide. Given their huge size in the world market they are supposed to be price makers, and any shortage or surplus in their production directly influences international hop prices.

A list of other significant and export oriented EU hop producing countries includes Czech Republic, Slovenia, Poland, UK, Slovakia and France. While some other small sized EU hop producing countries have predominantly their hop industry focused on domestic breweries (Spain, Austria, Belgium and Romania).

On the other hand, only a small proportion of market hops (about 3% of world production) are produced in the Southern Hemisphere (Republic South Africa, Australia, New Zealand) (IHGC, 2012).

2 CHARACTERISTICS OF A HOP TRADE

In the hop industry – similarly to the brewing sector and hop trade – we have been noticing the concentration of capital and of the decision-making process for decades. The economic situation within the hop sector is controlled by the production, market and research activities of the global brewing industry. The demand of breweries for more profitable hop varieties, modern processing methods, and storage of hops, as well as the business decisions of the internationally organized hop merchants affect the economy of the hop industry (Čeh et al., 2012).

Hops are a classic international trading commodity on the markets for agricultural produce. Trade between the individual importing and exporting countries is at present relatively free of tariffs and other barriers to trade, as only a few hop-producing countries protect their growers through customs duties.

The main role on the market plays a global hop balance, i.e. a world demand level of merchants and breweries as well as a supply from hop growers. The supply of hops (S_x) is determined mainly by the area under cultivation (S_1), growing conditions (S_2) and the cultivated varieties (S_3). On the other hand their demand (D_y) depends on the quantity of beer production (D_1), the usage rate for hops (D_2), trends in consumer preferences (D_3) and varying levels of technology employed by the breweries (D_4) (Pavlovič, 1997).

Hops can be sold on a contract base or on a spot market. Long term contracts for selling hops are treated as an important instrument to stabilize the market. Forward contracts are a useful means of hedging against price volatility. Unlike spot hops whose price is often unreliable, it is customary nowadays for fixed supply contracts - valid for several years - to be agreed between the hop growers and the hop trade. These contracts bind the two parties to supply or purchase an agreed quantity of hops on a particular variety at a fixed price. In this way price fluctuation on the hop market as well as the production risk are reduced. However, many growers still avoid producing hops on a contract basis. Some of them – predominantly from the East European countries - prefer to play with speculative market situations – producing hops for a spot market (Čeh et al., 2012).

So, to reduce the risk faced by both growers and breweries against fluctuating world prices, the bulk of hops produced world-wide are sold under forward contracts on a fixed price basis for 3-5 years, rarely more, ahead. This means that up to 80% of a farmer's crop could be sold at a price determined, before it is harvested. Thus, between 80 and 90% of all hops globally are sold by way of forward contracts. Any residual quantities, the volume of which depends on the size of the harvest, are sold on the spot market where prices fluctuate considerably according to supply and demand.

In the past, hop supply had predominantly a seasonal nature. However, from the 1980s onwards the hop industry itself increasingly suggested that hop products could also be marketed outside of the usual 6-months period. So in the 1990s extensive refrigerated storage capacities were constructed to deliver quality hops at all times and to market the refrigerated storage of hops as a service. From then on hop products were on hand more or less in fitting quantities, at all times and to the required quality specifications, even without showing considerable signs of ageing.

Hops are a successful product in the global hop trade. However, during the last 60 years the number of hop merchants worldwide has been significantly reduced. In the third millennium, the international hop market is dominated by a small number of large international merchants. They are nearly all German based, with agents in the United States and other parts of the world. Most of the merchants are vertically integrated and own hop gardens to aid their control of the market. The two biggest hop trading houses that are active globally in producing, processing and trading hops (*Joh. Barth & Sohn* and *Hopsteiner*) control over two thirds of the global trade with hops as well as hop products and thus also most of the EU supply. As an example, with a volume of over 156 million EUR, the German hop industry supplied in 2007 breweries in 130 countries (Pavlovič, 2012b).

3 BREWING VALUE OF HOPS

Since a brewing industry depends on hops to provide distinctive and proprietary characteristics to beer, a stable supply of high-quality hops is a high priority. Hops take a very small part in the structure of costs in brewing industry (less than 1%). However, to avoid unexpected supply risks main breweries and hop merchants do also have globally their own hop farms worldwide.

In the last decade brewers' demands change, especially following mergers where the policy on which hops are used might be altered. When this happens negotiations are necessary to stop producers from producing unwanted hops, which the brewers would be obliged to buy. Agreements are usually reached to pay a proportion of the price to the growers as compensation (Hopsteiner, 2010).

It is obvious that the topic of beer is of great attention not only to the brewing community but also to the beer consumer, as shown by the various references on this subject. If hop growers want to be competitive in the quality circle, they have to take into consideration standard quality requirements which are set by European Legislation. Hop growers also have to comply with the new requirements, which were induced by global economic, technological, social and socio-economic changes in the last decade, and which are strongly present in hop growing and brewing (Pavlovič, 2012a).

The brewing value of hops is assessed according to the content of bitter substances (alpha-acids), aromatic substances (essential oils), tannin (polyphenols, anthocyanogenes, tannoids), the oxidation state of hops, i.e. the degree of oxidative deterioration of hops during handling and storage, utilization of bitter substances, the quality of bitterness and aroma. Still newer and newer quality requirements are

being set in hop production, linked to consumers' health protection, pesticide residues, nitrates and the presence of heavy metals.

Hops affect flavor stability of beer in various ways, most of them positive; in particular by suppressing typical ageing flavors. Certain mechanisms of action can be supported by the tailored addition of hops. For one thing, it appears to be beneficial to increase the quantity of humulones and polyphenols by means of several doses in the brew house – as this generates a larger quantity of free radical scavengers and radical inhibitors. This results in an intensified hop aroma which aids in the sensory perception of the beer as it ages. The fact that brewery use of hops would increase in the process is, of course, a positive side effect – particularly for the hop industry (De Keukeleire, 1999).

Science and technology development has gradually caused big changes in a hop and brewing industry. Most changes have taken place in: (i) beer production (automatic dosage, additives and hop portion, the time of malt brewing, frequent use of hop products), (ii) hop processing (pellets 90 and 45, hop extracts, isomeric hop products), (iii) hop breeding (changes in the variety structure), (iv) analytical methods, (v) ecological aspects and (vi) health-protective effects on consumers (Pavlovič, 2012b).

For beer brand marks certain hop variety or their mixture are used. The conservative character of beer brewing does not allow many changes in their process. However, with a concentration process in a brewing sector, where merging of breweries appear more and more often, the brew masters' decisions are being replaced by financial experts, who decide also for buying the raw materials (hops). Their prior strategy is not always quality of hops (aroma varieties), but the price of hops or kg of alpha-acids (higher yielding super-alpha varieties). If buying of hops base on a kg of alpha-acid price, than aroma varieties with lower yields are less competitive. The expansion in beer products has created the need for more distinctive hop varieties. The global hop variety list with all - on a market available hop varieties – is yearly updated by the International Hop Growers' Convention (www.ihgc.org). In this way misunderstandings or a bad business practice could be avoided.

Introducing the HACCP system (Hazard Analysis of Critical Control Points) into a hop industry enables very efficient quality control as far as the consumers' health protection is concerned. Beer is foodstuff and it has to comply with the valid regulations. Breweries have introduced the HACCP system into beer production and they require the same of raw material producers, that is the producers of barley and hop growers (Pavlovič, 2012b).

The HACCP is a preventive system of quality control which does not only ensure the quality of the final product but also the quality of raw material. It makes sure that the yield complies with the specification. So, only by taking all these factors in the “quality circle” into consideration, will a hop grower be able to achieve the brewing value of hops, their market value, a reasonable price and a long-term existence of his hop farm.

The **certification of hops** is another traditional procedure and has intention to declare the hop geographical origin and its quality. This is a fundament of the stable quality supply of beer raw materials. In EU the process is carried out by neutral state institution on a country level (Forster, 2001).

Table 1: Hop varieties divided into commercial groups (Source: Joh. Barth & Sohn, The Barth report, Hops 2010/2011)

Preglednica 1: Delitev sort hmelja po komercialnih skupinah (Vir: Joh. Barth & Sohn, The Barth report, Hops 2010/2011)

GROUP I: Fine aroma hops	such as Hallertau Mittelfrueh, Hersbruck Spaet, Klon 18, Lubliner, Saazer, SA-1, Spalt, Savinjski Golding, Styrian Golding (Celeia), Strisselspalt, Tettngang.
GROUP II: Aroma hops	such as Aurora, Bobek, Cascade, Cluster, First Gold, Fuggles, Golding, Hallertau Tradition, Mount Hood, NZ Hallertau, Opal, Perle, Saphir, Smaragd, Spalt Select, Sterling, Willamette.
GROUP III: Bitter hops/ High Alpha hops	such as Admiral, Chelan, Chinook, Columbus/Tomahawk/Zeus (CTZ), Galena, Hallertau Magnum, Hallertau Merkur, Hallertau Taurus, Herkules, Kirin Flower, Marco Polo, Marynka, Millennium, Northern Brewer, Nugget, NZ Pacific Gem, Phoenix, Pride of Ringwood, Super Pride, Target, Tsingtao Flower, Victoria, Warrior.

Hops and hop products, as far as they are produced within the European Union, are marketed according to the criteria of variety, growing region and crop year. The certification regulations of the EU assure that hop products can be traced back to the raw hops used and that they are classified correctly according to the aforementioned criteria.

The development of hop products minimized the use of raw hops in breweries mainly due to the considerably improved storability of e.g. pellets and extract. Although this stability is proved in many publications, the crop year is still of great importance when purchasing hop products.

4 MARKET STATISTICS FOR HOPS

As the production of hops is confined to relatively few countries, a considerable amount of hops are traded internationally. Many varieties of hops are traded, with different regions having specific preferences for particular varieties, depending on consumer tastes and existing production. For example, the US growers are traditionally specialized in producing super-alpha hop varieties and therefore the USA imports large quantities of aroma hops. On the contrary, German growers were conventionally focused in aroma hops and thus merchants and breweries in Germany import necessary quantities of bitter or super-alpha hops.

However, for the sake of the existing global competition, growers in both countries act in farm management as entrepreneurs. They are forced to adjust dynamically their farming variety spectrum to changing demands of the global brewing industry.

On the following tables and figures, statistics from the hop market supply are demonstrated for the first decade of the third millennium. From these figures it is evident the importance of the EU hop supply for the brewing industry. In addition, also the dynamics of hop acreage changes is obvious as well.

Table 2: Evolution of worldwide hop production area (ha) 2001–2008 (Source: Munisteri et al., 2010)

Preglednica 2: Gibanje površin hmeljišč (ha) 2001–2008 (Vir: Munisteri in sod., 2010)

	2001	2002	2003	2004	2005	2006	2007	2008
Europe (EU-27)	36259	34942	33019	33370	31020	29881	30167	31300
Europe (others)	3004	3346	2404	2308	1886	1884	1373	1452
America	14536	11776	11314	11232	11817	11912	12509	15889
Asia	4918	6109	5642	4400	3486	3544	5796	9369
Africa	512	510	503	503	506	438	438	444
Oceania	1176	1288	865	957	852	717	791	831
World	60405	57971	53747	52770	49581	48376	51074	59285



Figure 1: Global hop areas 1999 – 2010 in ha (Source: Joh. Barth & Sohn, The Barth report, Hops 2010/2011)

Slika 1: Svetovne površine hmeljišč 1999 – 2010 (Vir: Joh. Barth & Sohn, The Barth report, Hops 2010/2011)



Figure 2: Global hop production 1999–2010 in metric tonnes (Source: Joh. Barth & Sohn, The Barth report, Hops 2010/2011)

Slika 2: Svetovna pridelava hmelja 1999–2010 v tonah (Vir: Joh. Barth & Sohn, The Barth report, Hops 2010/2011)

Furthermore, if we had analyzed a longer time period, this negative trend would have appeared still more obvious. In 1992 for example, there were over 92,000 ha

of hop fields in production worldwide. Such a trend in acreage cutback could be explained by large spreading of higher yielding super-alpha hop varieties from the USA (Columbus/Tomahawk/Zeus, Summit) and Germany (Hallertauer Taurus, Herkules) with over 15% of alpha-acids, as well as by a changing trend of brewing technology using new (isomerized) hop products and reduced hopping ratio in the brewing process. The hopping ratio changed in 10 years from 5.5 in 2001 to 4.1 g of alpha-acids/hl beer in 2010. On the other hand, a quantity of hops produced globally is influenced by hop acreage, hop variety spectrum, production technique and last but not least by weather circumstances.

Table 3: Development of acreage and yields of hops worldwide 2001–2008 (Source: Munisteri et al., 2010)

Preglednica 3: Prikaz globalnih površin hmeljišč in pridelka hmelja 2001–2008 (Vir: Munisteri in sod., 2010)

		2001	2002	2003	2004	2005	2006	2007	2008
Acreage (aroma varieties)	Ha	28,069	27,000	25,595	25,903	25,879	25,862	25,583	27,105
Acreage (bitter varieties)	Ha	27,460	25,725	25,064	24,197	22,565	20,212	23,940	26,759
Total acreage	Ha	57,967	55,348	52,203	51,408	48,995	46,095	49,523	53,865
% bitter varieties	%	47.4	46.5	48.0	47.1	46.1	43.8	48.3	49.7
Acreage (new)	Ha	2,438	2,623	1,544	1,362	586	844	1,551	5,420
Yield (aroma varieties)	Kg/ha	1,361	1,448	1,233	1,486	1,636	1,338	1,559	1,706
Yield (bitter varieties)	Kg/ha	2,203	2,911	2,116	2,238	2,265	1,846	2,171	2,426
Yield (all varieties)	Kg/ha	1,703	2,059	1,812	1,802	1,907	1,766	1,815	2,063
Yield of alpha-acids	Kg/ha	149	155	135	164	167	151	165	194
% alpha-acids	%	8.8	7.5	7.4	9.1	8.7	8.5	9.1	9.4
Production (aroma varieties)	Tons	38,212	39,090	31,566	38,504	42,336	34,594	39,893	46,228
Production (bitter varieties)	Tons	60,494	74,892	53,024	54,160	51,106	37,306	51,974	64,912
Total production	Tons	98,705	113,983	94,590	92,655	93,445	81,401	89,866	111,140
Production of alpha-acids	Tons	8,639	8,596	7,023	8,452	8,158	6,956	8,161	10,468

The requirement of hops for brewing beer internationally is very specific in both quantity and quality, while the supply of hops is unpredictable. Therefore there is an extremely inelastic demand for hops with variable supply, which results in shortages and surpluses of specific hops in any given year. World hop production is

cyclic. In the period analyzed an extreme shortage of hops globally appeared in 2007. However, already after the harvest in 2008 - several years of world hop surpluses and depressed spot market prices followed.

5 CONCLUSION

Wherever beer is produced around the world, regardless of the type or brand, it is hops which preserve beer, make it bitter and provide its unique hop aroma. Unlike malted barley, which can be supplemented by rice, wheat or maize, hops have no substitute as a raw material for brewing.

The world brewing industry, similar to the global hop sector and hop trade, is facing a trend toward a concentration in capital investment and decision making. The demand for hops world-wide is dependent on beer consumption. In Europe, America and Africa beer consumption is rather stable. In East Asian countries - it is increasing. Furthermore, in 2003 China took the first place in a global beer production that in 2001 globally totaled 1.42 mill hl while in 2010 it reached already a quantity of 1.85 mill hl (Joh. Barth & Sohn, 2011). Supply of hops is assured by the diversity of production centers, which specialize in certain markets. Bitter hops and high alpha hops continue to be the most widely produced varieties worldwide. The production of aroma hops is stepwise decreasing. In 2001 aroma hops represented 39% of the global harvest, and decreased to 37% in 2010. However, an increasing growth of craft breweries in the USA and worldwide - that use predominantly aroma hops - might change this tendency in the future (Pavlovič, 2012b).

Plentiful, quality and healthy hops give pride to the hop grower, are welcomed by the hop merchant and brewer and provide pleasure to the consumer - a beer drinker.

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