

A review of the EU hop industry involvement within a beer brewing sector

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ABSTRACT

The aim of this paper is to give an overview of the EU hop industry structure, production characteristics and its economic position within the world beer industry. This article is based on authors' research results, activities within the International Hop Growers' Convention (IHGC) and a review of the literature available. The results demonstrate that the production structure in the hop industry sector varies greatly across EU countries. Furthermore, the structure is changing due to a market-driven structural adjustment aimed at being more competitive. The number of farms growing hops in the main hop-producing countries in the EU declined significantly during the 2000-2008 period. As a result, the average farm size increased in almost all EU member states. The rate of specialization of hops farms is generally increasing. Hop farmers are stepwise becoming entrepreneurs, trying to achieve a farm size that creates production more lucrative.

Key words: hop industry, beer markets, production structure, competitiveness

INTRODUCTION

A formal link between brewing and hop industry was already acknowledged by the Purity Law in 1516 and lasts for centuries. Brewing industry requires traditionally its raw materials of a high quality. Beer brewing is an intricate process encompassing mixing and further elaboration of four essential raw materials, including barley malt, brewing water, hops and yeast. Particularly hops determine to great extent typical beer qualities such as bitter taste, hoppy flavor and foam stability and storage potential of beer.

Beer continues to be a popular beverage, worth more than any other drink type (in sales value), despite a reduction in the consumption of alcohol across the EU population. A maturing market reveals a need to develop products to attract new consumers, and understanding their perception is paramount to success. Factors affecting beer quality include ingredients, processing parameters and packaging. Factors influencing consumer perception are much more complex and include interactions between the main flavor components (Clark et al. 2011).

To remain globally competitive, hop and brewing industry must respond to the ever-changing needs of consumers by providing appropriate new types of beer. 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 (Forster 2001).

Furthermore, to suit various brewing industry requirements, research programs in hop breeding, hop physiology and processing of hops into hop products, used to be intensified during the last few decades. However, in spite of many improvements such as development of new hop varieties, modern growing techniques, implementation of new plant protection measures, nowadays even some of the biggest and the most respectable hop research organizations are faced with the plain endurance and share the future of farmers.

GLOBAL LINK BETWEEN A HOP SUPPLY AND A BREWING INDUSTRY

Let us have an overview of main global beer market statistics. Figure 1 demonstrates a world beer production from 1999 to 2010. In 2010 for example (with a beer output of 1.8 billion hl), on the basis of a reported output of 28.8m hl and taking the adjusted figures for the previous year into account, beer output rose by 1.6% (Table 1). While a virtually unchanged volume of beer was produced on the American continent, the negative trend in Europe continued for the third year in succession. All the other continents registered rising output. Russia was replaced by Brazil in third place in the rankings of the top beer-producing nations. China remains unchallenged in first place, followed by the USA, Brazil, Russia and Germany. In Europe, output decreased by 11.9m hl. A decline of more than 1m hl was registered for five countries: Russia (-5.6m hl), Germany (-2.4m hl), Romania (-1.9m hl), Czech Republic (-1.5m hl) and the Netherlands

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(-1.4m hl). The only significant growth in Europe was achieved by Poland (+1.7m hl). On the American continent, Brazil almost made up for the decline in Venezuela and the USA (both -3.1m hl) and Mexico (-2.4m hl) with an increase in output amounting to 7m hl. In Asia, the beer market boom continues (+34.1m hl). The greatest increase of all was in China, which has also been a global leader in a brewing industry output since 2003. 24.7m hl of beer was brewed there, raising its share of output growth worldwide to 86%. But also Vietnam managed to achieve an impressive increase of 3.5m hl. Output growth of 7.2% (+7.2m hl) in Africa meant that this was the continent with the highest growth rate (Barth 2011; IHGC 2012).

Hops are essential for the brewing industry, as they supply considerably to the organoleptic qualities of beer.

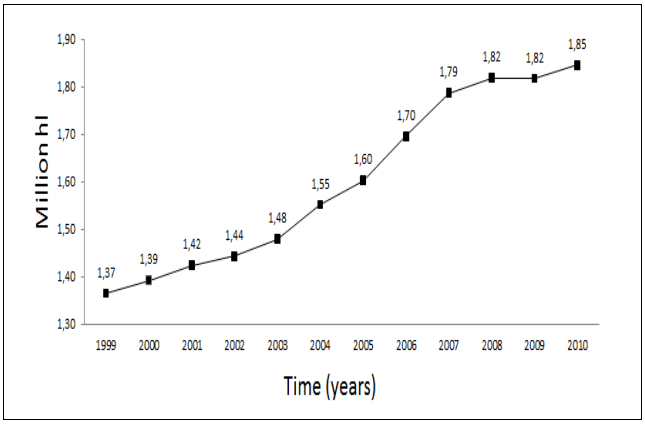

Figure 1: Global beer production 1999 – 2010 in m hl

Table 1: Beer output development 2009 – 2010

	2009 (1.000 hl)	2010 (1.000 hl)	2009 (+/- % rel.)	2010 (+/- % rel.)
European Union	381.945	375.264	-5,5%	-1,7%
Rest of Europe	171.671	166.475	-4,9%	-3,0%
Europe total	**553.616**	**541.739**	**-5,3%**	**-2,1%**
North America	335.656	329.927	-0,3%	-1,7%
Central America/ Caribbean	15.504	15.468	-2,4%	-0,2%
South America	193.744	198.840	1,6%	2,6%
America total	**544.904**	**544.235**	**0,3%**	**-0,1%**
Asia	**597.858**	**631.978**	**3,4%**	**5,7%**
Africa	**99.612**	**106.810**	**8,9%**	**7,2%**
Australia/Oceania	**21.576**	**21.631**	**0,0%**	**0,3%**
WORLD TOTAL	**1.817.566**	**1.846.393**	**-0,1%**	**1,6%**

Approximately 48,000 ha of hops were grown in 2012 worldwide at 20 countries in all five continents. This production supplied the majority of the domestic market, as well as exports to a range of overseas breweries and hop retailers. The main hop growing countries Germany and the USA have over two thirds of global hop acreage and produced in 2011 more than 80% of alpha-acid quantities worldwide. These two countries are followed according to hop acreage significance by Czech Republic, China, Poland, Slovenia, etc (IHGC 2012).

The hop industry is one of the highest capital- and work-intensive types of agricultural production. It is estimated that on EU competitive hop farms (more than 10 ha of hops) the initial capital investment required for hop fields with wirework is more than 15,000 €/ha. Additional investments for specialized mechanization such as spraying and picking machines as well as a hop kiln with all necessary equipment would require at least an additional 25,000 €/ha. The amount of machine and labor hours varies related to the level of mechanization. The amount ranges between 60 and 80 machine hours and 200 and 350 labor hours per hectare. Based on the production costs model, 39% of the variable costs in hop production involve hop picking and drying, 26% stringing and training of hop bines, 13% plant protection, 12% winter and spring activities in hop fields, etc. with 10 ha of hops and an average yield of 1,800 kg/ha (Pavlovič 1997).

Hop plants are grown on a wire and cable trellis usually suspended about 6 to 7 meters above the ground on a regular arrangement of wooden or concrete poles. Anchors, attached to trellis cables, surround the yard and hold the trellis upright under the weight of the developing crop. Plant spacing depends mostly on hop variety and growing area, with 2.4 to 3.2 m between rows and about 1.1 to 1.7 m between plants within rows (Friškovec et al. 2002). Once established, the hop rootstock will produce indefinitely although industry practice is to rotate plantings every 15-20 years. The timing of the rootstock replacement is influenced by declining yield caused by insects, disease and pests (Dolinar et al. 2002) and by merchants', i.e., brewers', demand for specific varieties (Barth 2011). The major production practices used annually to produce hops include pruning, stringing, training, irrigating, protecting plant against pests and diseases, harvesting, drying as well as processing and packing according to market demands (Pavlovič 1997; Srečec et al. 2004).

The European Union is the main player in the world hop market. Hops are produced by fourteen EU member states although together Germany and the Czech Republic account for more than 80% of the total EU production by volume.

Poland is the only other member state to account for more than 5% of total EU production. Traditional hops production areas can be found within each hop-producing member state, including Bavaria, Saxony, and Bitburg in Germany; Bohemia in the Czech Republic; the Lublin region in eastern Poland; Savinja Valley, Ptuj, and the Koroška region in Slovenia; the Kent and Hereford area in England; the León area in Spain; Alsace in France; the Horna Streda region in Slovakia; the Poperinge area in Belgium, the Velingrad area in Bulgaria, etc (Barth et al. 1994). Table 2 shows hop supply elements during the period between 2010 and 2011 on a global level, where acreage and production are clearly illustrated.

Hop growers must respond to the ever-changing needs of the brewing community by providing appropriate varieties at a certain quality demanded by the market as well remain competitive in the global hop industry (Pavlovič et al. 2011).

Table 2: Global hop supply 2010 and 2011

Country	Hop Acreage 2010 (Hectares, Ha)				Hop Production 2010 (in MT = 1.000 kg)			Alpha acid Prod.	Hop Acreage 2011 (Hectares, Ha) estimations				Hop Production 2011 (in MT = 1.000 kg) estimations			Alpha acid Prod.
	Aroma	Alpha	Total	New	Aroma	Alpha	Total	MT	Aroma	Alpha	Total	New	Aroma	Alpha	Total	MT
Australia	32	416	448	0	51	1.048	1.099	144	46	378	424	0	59	1.037	1.096	139
Austria	185	32	217	16	300	68	368	30	193	36	229	9	305	71	376	30
Belgium	51	135	186	0	84	289	373	36	60	120	180	9	72	216	288	25
China	580	5.216	5.796	0	1.600	14.500	16.100	860	580	5.216	5.796	0	1.600	14.500	16.100	860
Czech Republic	4.943	74	5.017	193	7.631	141	7.772	314	4.454	64	4.518	200	5.400	100	5.500	190
France	398	45	443	137	691	99	790	34	361	63	424	68	653	90	743	34
Germany	9.649	8.460	18.109	277	16.333	17.901	34.234	3.600	9.500	8.100	17.600	200	16.000	17.000	33.000	3.500
New Zealand	230	150	380	0	440	350	790	95	230	150	380	0	440	350	790	95
Poland	408	1.360	1.768	0	500	1.400	1.900	150	408	1.360	1.768	0	500	1.400	1.900	150
Romania	64	172	236	9	62	145	207	16	61	173	234	7	50	160	210	17
Russia	346	74	420	43	26	40	66	4	84	54	138	20	92	70	162	9
Serbia	34	33	67	12	58	76	134	11	34	33	67	12	58	76	134	11
Slovakia	229	0	229	0	229	0	229	7	222	0	222	0	222	0	222	8
Slovenia	1.299	56	1.355	36	2.376	85	2.461	140	1.282	72	1.354	00	2.100	100	2.200	140
South Africa	0	492	492	0	0	913	913	128	0	492	492	0	0	913	913	128
Spain	0	477	477	0	0	1.037	1.037	128	0	507	507	0	0	900	900	128
Ukraine	660	276	936	52	510	240	750	42	439	206	645	10	470	230	700	47
UK-England	817	252	1.069	20	1.150	450	1.600	100	817	252	1.069	0	1.150	450	1.600	100
USA	4.375	8.270	12.645	0	5.513	24.194	29.707	3.500	4.193	7.954	12.147	0	5.451	23.067	28.518	3.150
IHGC	**24.300**	**25.990**	**50.290**	**795**	**37.554**	**62.976**	**100.530**	**9.339**	**22.964**	**25.230**	**48.194**	**557**	**34.622**	**60.730**	**95.352**	**8.761**

(Source: IHGC 2012)

EU AS THE MAIN PLAYER IN THE WORLD HOP MARKET

In the period 2001-2008, the hop-growing surface area in EU countries varied from 32,569 ha (21,554 ha of aroma hops and 11,015 ha of bitter hops) in 2001 to 29,705 ha (19,756 ha of aroma hops and 9,949 ha of bitter hops) in 2008. In 2008, the total EU hop production was about 57,000 t, more than 50% of the world hops production. The largest producer within the EU is Germany (39,676 t), followed by the Czech Republic (6,753 t), Poland (3,446 t), Slovenia (2,359 t), France (1,469 t), the UK (1,410 t), etc. Hops acreage is decreasing steadily in the EU, with a 16% reduction since 2001. Bitter varieties are grown in about one-third of the area. This percentage has been constant throughout the last eight years.

Number of hop farms (holdings) in EU

During 2000-2008, the number of holdings growing hops declined significantly in the main hop-producing countries (Table 3). The reduction ranges from 10.9% in Poland to 37.7% in Spain. In Germany, the decrease was 22.9%, with a loss of 446 farms. While the number of holdings has decreased, the average acreage per holding has increased in all the listed countries from +2.5% in the Czech Republic to +31.6% in Germany. These data series show a large variability in average acreage across member states. The largest holdings are in the Czech Republic (40.7 ha per holding in 2008), and the smallest are in Spain and Poland (around 2 ha per holding).

In the period 2004-2007, according to the data available for all member states, more than 480 farms abandoned hop production. Comparable data for the period 2001-2007 were not at hand. However, if we keep the number of farms abandoning hops growing in the new member states (which make a conservative estimate) constant, we estimate that more than 1,350 farms in Europe stopped producing hops in the period 2001-2007.

Growers mostly exit the hop sector as their farms and hop gardens are not able to guarantee a sufficient income. This phenomenon is affecting old farmers, whose farms are not

Table 3: Number of hop farms and average acreage per farm in major hop-producing countries (2002-2008)

	Indicators	2002	2003	2004	2005	2006	2007	2008	2000/08 (Change %)
Germany	Nr. of farms	1943	1710	1698	1611	1554	1510	1497	-22,9
	ha/farm	9,5	9,7	10,3	10,7	11,1	11,7	12,5	+31,6
Czech Rep.	Nr. of farms	185	165	162	145	145	139	131	-29,2
	ha/farm	40,0	36,0	36,0	39,0	37,0	39,0	41,0	+2,5
Poland	Nr. of farms	1191	1129	1121	1144	1113	1066	1061	-10,9
	ha/farm	1,9	1,9	2,0	2,0	2,0	2,0	2,1	+10,5
Slovenia	Nr. of farms	189	186	176	176	150	140	140	-25,9
	ha/farm	9,6	8,9	8,8	8,8	10,1	11,0	11,0	+14,6
UK-England	Nr. of farms	85	76	60	60	60	60	58	-31,8
	ha/farm	21,4	19,0	22,6	17,9	17,4	17,7	18,5	-13,6
France	Nr. of farms	111	100	96	96	96	90	89	-19,8
	ha/farm	7,4	8,2	8,2	8,4	8,3	8,8	9,3	+25,7
Spain	Nr. of farms	398	400	395	353	325	248	248	-37,7
	ha/farm	1,7	1,7	1,7	1,9	1,9	2,0	2,0	+17,7
Belgium	Nr. of farms	52	49	47	45	44	42	29	-44,2
	ha/farm	4,8	4,7	4,4	4,6	4,5	4,4	5,8	+20,7
Portugal	Nr. of farms	14	12	12	12	7	4	4	-71,4
	ha/farm	2,6	3,1	3,1	3,3	2,6	5,3	5,0	+89,2
Austria	Nr. of farms	72	73	70	70	67	65	63	-12,5
	ha/farm	3,1	3,0	3,0	3,0	3,0	3,1	3,3	+9,6
USA	Nr. of farms	60	60	52	52	56	62	74	
	ha/farm	196,3	188,6	216,0	227,3	212,7	201,7	267,0	

(Source: Munisteri et al. 2009)

continued by younger generations, and farmers who have small farms. Land abandonment is thought to occur rarely, but no relevant figure exists for hops. Farmers who stop growing hops normally sell their hop gardens to other hop growers, who continue to grow hops (Munisteri et al. 2009, Pavlovič 2010).

Average size of hop farms

The average hop acreage per farm increased in almost all the member states because several farmers stopped growing hops. The farmers mostly stopped because of ageing rather than for economic reasons, according to the interviewees. However, the economic component might be stronger than what the interviewees suggested. Related to measures of the EU Common Agricultural Policy (CAP) in the hop sector 2004-2008, some growers of the countries adopting full decoupling may wait to leave the hops sector until they face the next heavy investment (for instance, when renewing hop gardens) and exit at this point, keeping the decoupled support. No figures are available at the national level on the causes of the cessation of hops production, so the estimates are based on personal assumptions made by the interviewees. The hops gardens were mainly sold to other farmers who stayed in business.

Hop farmers are stepwise becoming entrepreneurs; thus, most try to attain a farm size that makes production more profitable. The main concern of farmers is to be able to spread the high fixed costs generated by hop growing over a sufficient number of hectares, so that the farmers can make profits per hectare. When this is not possible, hop growers are slowly stopping hop production, according to the interviewees. Spain, for instance, is an emblematic case in this sense.

Most Spanish and Polish hop holdings are extremely small (< 2 ha) so farmers do not find it convenient to invest in machinery and in new technology. In the long term, farmers will either abandon hop growing or will expand their business to become specialized. The size threshold that makes a farm profitable varies across countries. In Germany, a holding having 10 ha of hops starts being economically viable (once one takes subsidies into account). A similar size enabling the hop farm competitiveness is envisaged for Slovenia.

European hop farms (holdings) are becoming larger. The farm structure varies greatly across the EU countries. The main reason lies in the competitiveness at the international level. No effect of the CAP reform after 2004 on a farming structure was discovered. The difference in the average size of European farms depends on historical and agronomic reasons. In the Czech Republic, the current farms are the heritage of the enormous socialist collective farms; thus, Czech farms are much bigger than the European average. On the other hand, hop farms in Poland and Slovenia used to be much smaller and predominantly in the hands of independent private farmers during the socialist period. In Slovenia, the hop farms on average were significantly enlarged from 3.5 ha to 10 ha per farm after significant structural changes in year 1999 as the company "Hmezad kmetijstvo" had collapsed. Consequently, about 1000 ha of hop fields were purchased by 70 local hop farmers (Pavlovič 2010).

The average hop acreage per farm in Europe is increasing but is still much lower than in the USA. This may affect the competitiveness of European hops in the medium term. Therefore, the production structure of U.S. farms is more competitive than European farms. For an idea of the comparative advantage enjoyed by the United States in terms of production structure, the 12,510 ha devoted to hops in 2007 in the US (WA, OR, ID) were spread over 62 farms. This

works out to 202 ha per farm, 18 times the average German farm and more than five times the average Czech farm (Munisteri et al. 2009, Pavlovič 2012).

Rate of specialization of hops farms

The rate of specialization of EU hop farms is generally increasing. The interview results showed that hop farms tend to become more specialized in Germany and Czech Republic. In Germany, the specialization rate (defined as the amount of revenues determined from hops of the overall farm revenues) for hop-producing farms increased from 42% in 2003 to 59% in 2006. A similar trend can be observed in the Czech Republic, with the specialization rate increasing from 16% in 2004 (the first year for which data were available) to 25% in 2006. As these data come from the FADN (Farm Accountancy Data Network) database, they are limited to these two countries.

Other EU countries had no hop sector FADN data available. However, a number of interviewees in other member states have confirmed this trend. Interviewees also linked the increased level of specialization to the high revenues that hops provide if cultivated on an adequate scale (Munisteri et al. 2009).

CONCLUSIONS

Hop and brewing industry must respond to the ever-changing needs of consumers by providing appropriate new types of beer. 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 (Forster 2001, MacKinnon 2008, Anon 2010, Hopsteiner 2010, Barth 2011). The EU hop industry sector, similar to the global hop trade and the world brewing industry, is facing a trend toward a concentration in capital investment and decision making. An important issue related to competitiveness is the production structure in the hop industry sector (number of holdings, average farm size, and rate of specialization), which was discussed here.

The EU production structure is changing, which is mostly due to market-driven structural adjustment aimed at being more competitive. Growers are exiting the hop sector as their farms and hop gardens are not able to guarantee a sufficient income. No evidence regarding the influence of the CAP reform after 2004 on the production structure was discovered.

The average hop farm size is increasing in all EU member states. The growth in the average size is mainly due to the reduction in the number of growers, while the reduction in hop area is less pronounced. Small hop-producing countries with weak or no sector-linked national research and development support have seen a sharper decrease in growing area and in the number of farmers. In some countries, such as Spain, Belgium, Bulgaria, Portugal, and the UK, the reduction in the number of growers has endangered the very existence of the hops sector. The few farms left are becoming more specialized in hops in terms of equipment and other investments. However, the farms are still much smaller than in the U.S., and this could affect the competitiveness of European hops in the medium term.

With the exception of Germany, hop acreage in Europe is diminishing, following the global trend. This is mainly due to the launch of new bitter hop varieties by the USA and Germany that provide a higher yield per hectare so that less acreage is needed for the same amount of alpha acids, required by the global brewing industry. However, the acreage reduction was insufficient to prevent an oversupply of hops in years 2009, 2010 and 2011. Again, farmers' on-time business decisions linked to making forward contracts for their crop production play a crucial role in the farmers' hop supply competitiveness as clearly apparent throughout the period under the scrutiny here.

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