Final Hop Report - Harvest 2013

Saaz, Semptember 7, 2013

THE SITUATION DURING THE CROP YEAR AND THE QUALITY

A/ Development of the Weather and the Situation in Production 2013

At the enclosure of this report you can find the monthly Hop Reports 2013, regularly published on the web sites of Bohemia Hop a.s. – www.bohemiahop.cz. Table No.1 and No.2 indicate summarized data concerning the whole vegetation period (April – August) in 2013, compared to the same period of 2012 and the long-term period covering last 30 years.

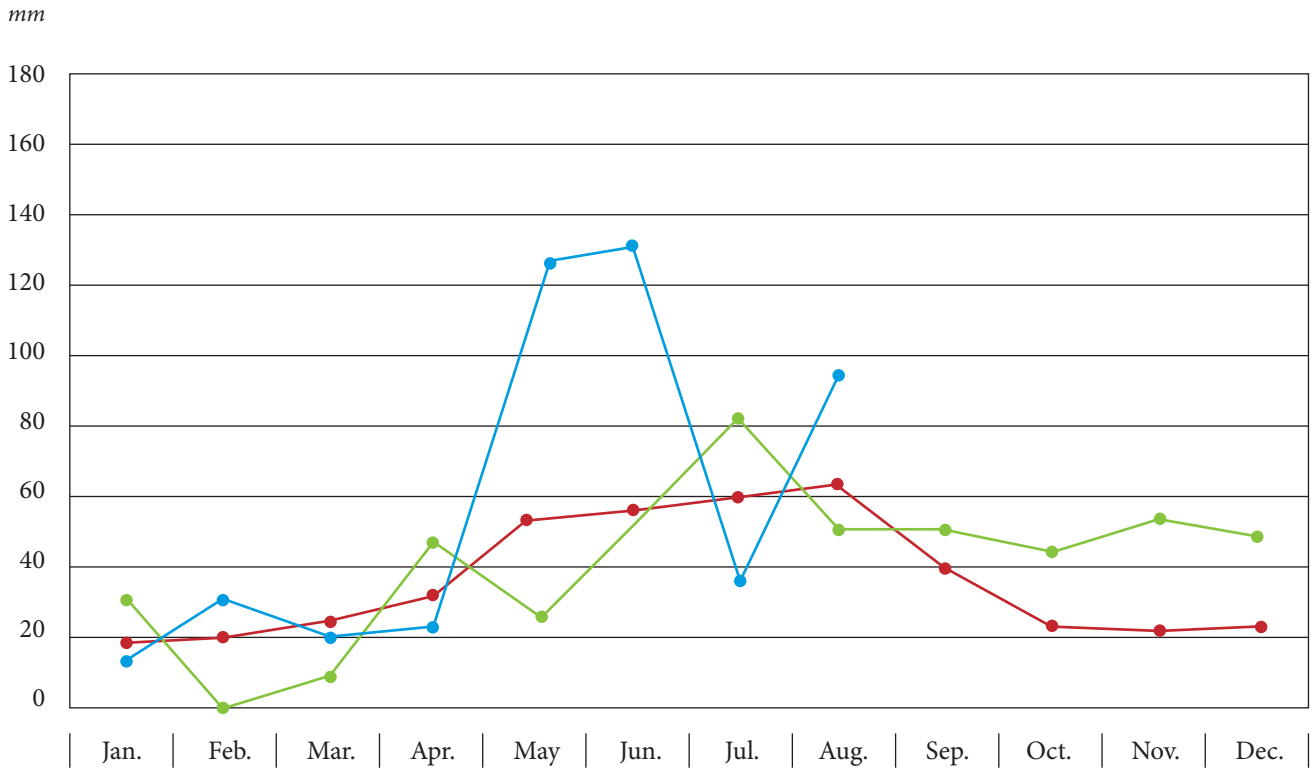
Table No. 1 – Temperature (°C):

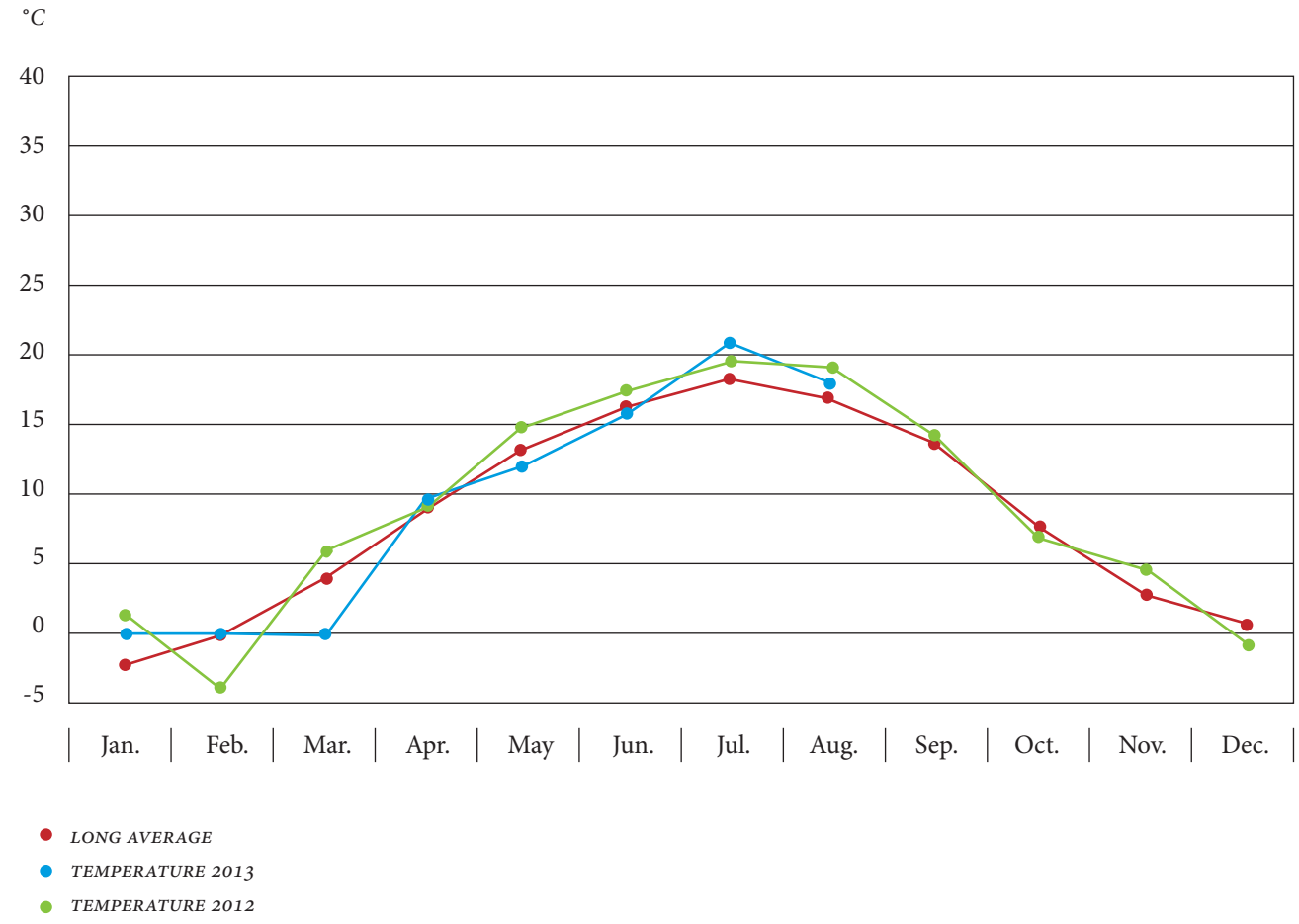
Month	average temperature		difference	30-years average	difference
	2013	2012	+ -		+ -
April	8,90	8,70	+ 0,20	8,50	+ 0,40
May	12,60	14,80	- 2,20	13,40	- 0,80
June	16,50	17,20	- 0,70	16,70	- 0,20
July	20,30	18,80	+ 1,50	18,00	+ 2,30
August	17,90	19,00	- 1,10	17,40	+ 0,50
Total	**76,20**	**77,60**	**- 2,30**	**74,00**	**+ 2,20**

Table No. 2 – Precipitations (mm):

Month	Total precip. per month		difference	30-years average	difference
	2013	2012	+ -		+ -
April	21,60	45,80	- 24,20	32,00	- 7,40
May	124,80	25,60	+ 99,20	54,00	+ 70,80
June	128,60	51,40	+ 77,20	56,00	+ 72,60
July	37,60	80,80	- 43,20	59,00	- 21,40
August	94,80	48,20	+ 46,60	62,00	+ 32,80
Total	**407,40**	**251,80**	**+155,60**	**263,00**	**+ 174,40**

The data indicated above are accompanied by Graphs illustrating the average temperatures and the total of precipitations per month covering period of January - August 2013.





The weather during the first trimester was completely out of character from the point of view of temperature. The average temperature in each of these three months was the same that is 0°C. The minimum temperatures were not as low as last years. Moreover, these low temperatures lasted no more than one or three days and appeared on the days with snow cover. The precipitations of the first trimester 2013 were slightly above the long term average. The higher total of precipitation was caused above all by high precipitation in February. This month the precipitation reached 65 % more than the long term average. The hop cultivation and the beginning of spring works were negatively affected by this character of the weather – low temperatures in later March and at the beginning of April together with frequent snow showers.

The similar character of the weather was under way during the first decade of April. It got warmer just in the remaining twenty days of the month. As far as precipitation is concerned, April was below long term average. Particular rainfalls were poor. In a period of 15 rainy days just 2 mm of precipitation fell down. Regarding climatic data, this year´s May can be considered below-average concerning temperatures and record above-average in precipitation level with 124,8 mm of rainfall (231,1% of long-term average). Due to relatively low day temperatures, the difference between day and night temperatures was not as pronounced as in previous year. The night temperatures never fell below freezing point during this May.

Not even June 2013 can be considered as a favourable month for hops development concerning climatic condition. Steady rains, with precipitation of 151,6 mm in a period of 26th May - 10th June 2013, caused Czech rivers to overflow, including rivers in Saaz and Auscha hop growing regions. Vltava and Labe (Elbe) rivers harmed hop gardens in Auscha region as well as Ohře (Eger) in Saaz region. Regarding gathered data from Czech growers, we can count with about 389 ha of hop gardens that were flooded (204 ha in Auscha region and 189 ha in Saaz region). The total loss has been reckoned to 80-90 million Kč. We are collecting data about the health state of harmed hop plants. The first estimations were that about 50% of harmed plants were not able to be considered to be harvested because of fatal damage.

The situation in July 2013 was completely different then situation in June and May. July was characterized by abnormally high temperatures and lack of precipitations. The July average temperature was 2,3 °C above long term average and 1,5 °C above average temperature in July 2012. The period of 22nd – 28th July 2013, when the average day temperature did not drop below 30 °C, had an influence on that situation. July 2013 can be considered as a critical month concerning precipitations. The significant rainfalls were recorded only at the end of July (28th – 30th July). 25 of dry days were not also favourable for this situation. August 2013 was characterized by abnormal precipitation (153 % of long term average) and by normal temperatures concerning the long term average. The significant rainfalls (58,6 mm) covering 62 % of total month precipitations were recorded in the first decade of August.

B/ Quality: Alpha Contents in Original, Aroma, the Appearance of the Cones, the Pests

The unfavourable weather conditions at the beginning of April affected the beginning and the course of spring works. The character of the weather caused a one week delay. This situation was seen as the cutting of hop roots. Despite these problems the hop growers made the cutting works as well as stretching and fastening of hop-leading wires within deadline.

The beginning of the training of hops was expected to be launched in early May. The beginning of the spread of alfalfa snout beetle (*Otiorhynchus ligustici L.*) as well as of hemp flea beetle (*Psylliodes attenauta Koch.*) was recoreded. Owing to the registration of the insecticide Actara 25 WG, there were no problems to reduce these insects. There was nearly no necessity to treat the hops against the primary infection of downy mildew of hops (Pseudoperonospora humuli Myi at Takah.) owing to the low growth of hop vines. Aliette 80 WG was applied and in some localities used together with the fertilizer Farm-Fos 44.

The weather conditions were not helpful to the development of hops. Low temperatures caused unbalanced and weak growth of hops. This phenomenon was demonstrated primarily in case of hop gardens which were cut behind schedule and also in case of gardens located in higher altitudes. The hop gardens where the pruning was done in time were basically in normal condition. Above mentioned situation was the reason for problems in hop training. Individual gardens could not be trained at once, in majority of cases, and they had to be passed through and trained up to three times. The end of training operation was negatively influenced by rain, as some of the gardens were accessible with difficulty due to high degree of wetness. Windy weather caused diversion of the vegetation tops (heads) of hop bines; it was therefore necessary to train them again. The hop plants did not reach usual average height corresponding to the end of May. The development of hops was seven to ten days delayed compared to normal.

A certain positive sign was the state of hop gardens which were damaged by frost in the previous year and consequently also by the fungal diseases. In majority of cases, the condition of hops in places which lay fallow and where the planting was completed in autumn was better than in 2012. Regarding the health treatment of hops, the priority was given to the prevention of downy mildew of hops (*Pseudoperonospora humuli Myi* et Takah.). The reasons for this measure were the extremely high precipitations and high relative humidity, when, especially during short temporary warming, the downy mildew of hops became recognizable by high occurrence of ear-shape sprouts. Besides the usual protection of hops by the product Aliette 80 WG, it was recommended to carry out the treatment by the curative fungicide Curzate K at all sites where the ear-shape sprouts appeared, even before the first treatment against secondary infection.

The treatment against insect pests (aphis - *Phorodon humuli* Schrank and red spider mite - *Tetranychus urticae* Koch) was not necessary due to climatic conditions. Evaluating a hop growth, unbalanced and weak growth of plants, mainly where the pruning had not been done in time, still persisted due to low temperatures on the beginning of June. Intensive lengthened growth of hop plants was recorded in period of 19th to 25th June 2013. The development of hops was eight to ten days delayed compared to normal. Blooming of hops was not practically recorded. Character of the weather in June encouraged propagating downy mildew of hops (*Pseudoperanospora humuli* Myi et Takah.) due to abnormal precipitation and high relative humidity. Moreover, wet ground and puddles complicated a chemical protection of hop gardens. The priority was given to the prevention of downy mildew. It was recommended to carry out the treatment by the Ortiva, Ridomil Gold plus 42,5 WP, Aliette Bordeaux or Curzate K.

The monitoring of the development of red spider mite (*Tetranichus urticea* Koch) occurrence was also recommended. The health state of hop plants was good. Evaluating a hop growth in July, the development of hops is eight to ten days delayed compared to normal. The intensive lengthened growth of hops was almost under way up to the middle of July. That time, the first blooming of hops was recorded. The hop plants from hop gardens that were not harmed by flood and wet weather in May and June almost grew over trellises. The botanical habitus was very good and the first blooming could be considered as good. The appearance of flowers was unusually rich. Nevertheless, probably tropical temperatures on the break of July and August affected negatively the development of hops. Character of the weather in July did not encourage propagating downy mildew of hops (*Pseudoperanospora humuli* Myi et Takah.) due to very hot and dry days. Thus, it was not necessary to carry out the fourth treatment against the secondary infection on the hop gardens where irrigation

systems were not used. An occurrence of hop aphids was very weak and it was enough to carry out the treatment at the end of June. On the other hand, the climatic conditions were very favourable for the development of the red spider mite. The occurrence of this beetle was recorded on majority of hop gardens. The treatment in July was carried out by preparations Ortus 5SC, Vertimec 1,8EC and Kanemite 15 S.

Climatic conditions were in August considered as favourable for hop development. Only strong winds in the middle of the month caused damage of some hop gardens. 17 ha of hop trellises fell down. The first estimations of the yield had been very positive due to enough rainfalls and lower temperature. After well-done blooming and enough rainfalls in the beginning of August, hop cones started appearing. Nevertheless, the development of hops was terminated at the end of the first August decade. Hop cones lost their development and creation of alpha acids. At the end of month, even decreasing of alpha acid contents was recorded. Current estimations are average concerning yield and slightly below long term average concerning the alpha acids content. The harvest started later in comparison with previous years due to delayed hop development. Most growers started their harvest during the period of 23rd - 25th August 2013. Climatic conditions for harvesting hops were unfavourable due to rainfalls recorded on 19th and 25th August 2013 that made field works more difficult. The hop cones have not developed sufficiently. The cones are small and were not closed which resulted in making harvest and equipment adjustment more difficult. The estimation of average yield of the SAAZ variety counts with the 1,1 ton per hectare. Most growers finished harvesting SAAZ variety hops up to 8th September 2013. Very positive is that harvested hops are in very good health state and have very nice colours.

Table No. 3 – Contents of alpha in original material according to Varieties and Regions (in %) after analysis in laboratories of Chmelarstvi, cooperative Zatec

Region	**Saaz-ST**	**Saaz virus free**	**Saaz**	**Sládek**	**Premiant**
Saaz					
Auscha					
Tirschitz					
Czech Rep.					

Czech Republic – currently SAAZ – around 3 %, will be updated during our meeting

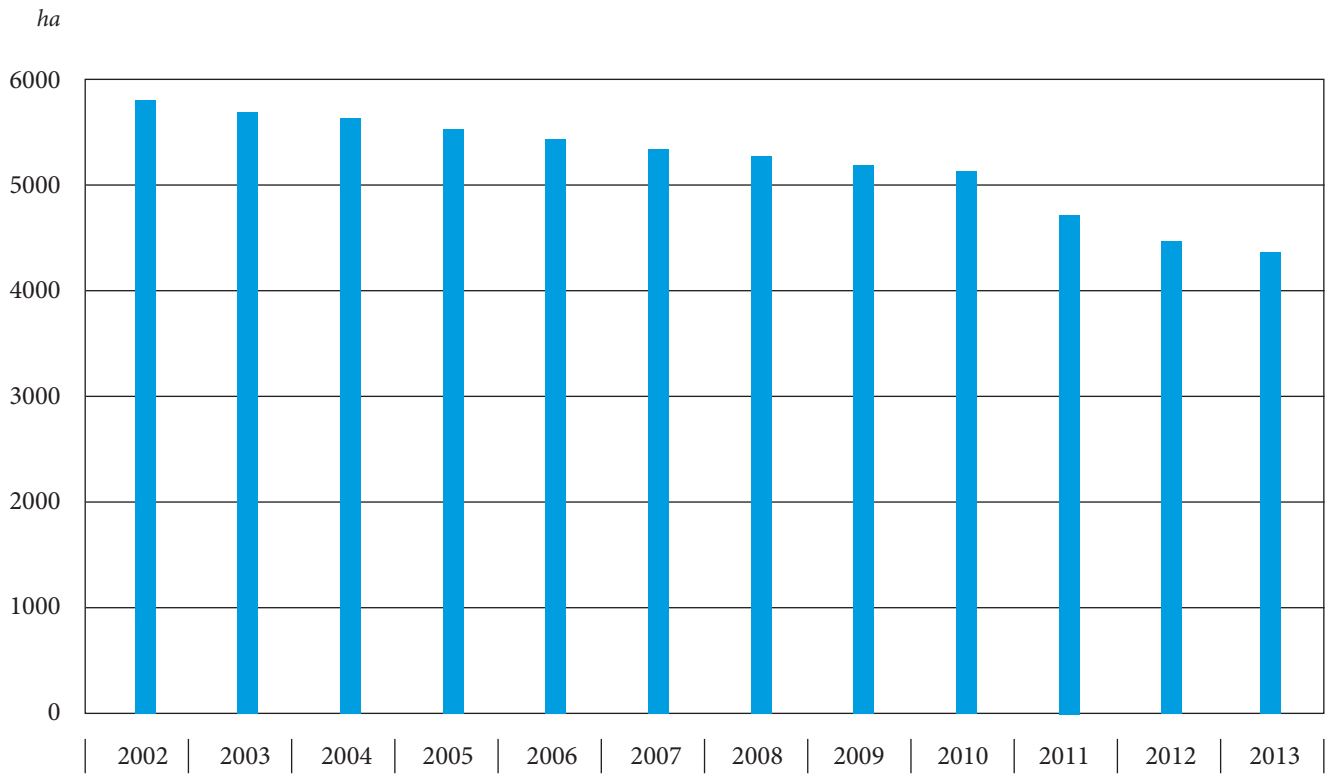
Estimation of Acreage and Yields According to Regions:
The harvested acreage in 2013 is shown in following table. The data indicated were kindly conceded by UKZUZ Žatec.

Table No. 4 – The Acreage of Hop Gardens in the Czech Republic (ha):

Region	**up to 20.8.2013**	**up to 20.8.2012**
Saaz	3 358	3 400
of it Saaz var	2997	3 018
Auscha	457	466
of it Saaz var	392	399
Terschitz	504	500
of it Saaz var	397	389
Czech Republic	**4319**	**4 366**
of it Saaz var	**3786**	**3 806**

Further decrease of the acreage of hop gardens did not stop even in 2012-13. Altogether the reduction of acreage represented 47 ha, out of this 20 ha of Saaz Variety (ÚKZUZ 20th August 2013). Most hop gardens of this acreage were affected by the severe frost in February 2012 and have been planned to be replanted. In order to demonstrate the development of the hop gardens in the Czech Republic within previous 10 years we enclose the graph below.

Graph No. 3: The Development of the Acreage of Hop Gardens in the Czech Republic



The estimations of the hop production in the Czech Republic corresponded to the development of vegetation. The exact results of the Crop 2013 will be available in the beginning of December, after summarization of individual "Producers declaration about the number and the weight of marked packing with hops according to the cadastral territories and varieties of hops", made out by ÚKZUZ Žatec.

Table No. 5 – Estimation of the Crop According to Regions (Total):

Region	Harvested area (ha)	Production (t)	Yield in t per ha
Saaz	3 358	3 750	1,12
of it Saaz var	2 997	3 150	1,05
Auscha	457	620	1,36
of it Saaz var.	392	510	1,30
Terschitz	504	700	1,46
of it Saaz var.	397	510	1,40
Czech Rep.	**4 319**	**5 070**	**1,18**
of it Saaz var.	**3 786**	**4 170**	**1,11**

Expected Replacement of the Varieties and Hypothetic Production of Individual Varieties:

Table No. 6 – Comparison as per the Variety Composition in 2012 – 2013:

Variety	2013 (ha)	2012 (ha)	Diff. (ha) 13/12	2011 (ha)	Diff. (ha) 13/11	Diff.(ha) 11/10
Saaz var.	3 786	3 806	- 20	4 040	- 254	- 517
Agnus	44	53	- 9	52	- 8	- 9
Bor	4	5	- 1	4	0	0
Fuggle	0	0	0	5	- 5	0
Premiant	201	229	- 28	256	- 55	- 21
Sládek	240	242	- 2	249	- 9	- 28
Others	44	31	+ 13	296	+ 18	- 3
Czech Rep.	**4 319**	**4 366**	**- 47**	**4 632**	**- 313**	**- 578**

According to figures gathered by the Hop Research Institute Ltd., growers have ordered a record number of plant roots for planting out in autumn 2013 (300-350 ha). However due high number of destroyed or damaged hop yards by floods and rains that will need to be replaced the acreage increase for 2014 is expected to me only quite small.
Rising demands for original Czech hops will probably have positive influence on replanting hop plants and future acreage development even in the period of 2014-2016. It is also difficult to estimate the extent of cultivation of new varieties because of the market situation in the past few years. So far the breweries also did not show very extensive interest in many of the newly registered varieties. Nevertheless, demands for Kazbek and Saaz Late varieties have been increasing. However, certainly the Saaz variety hops will remain the most popular.
If we want to evaluate the development of the yields of the Czech hops, we must take in consideration increasing interests of Czech growers to replant old vegetation. Thus, we estimate an increasing development of the yields. Of course, we are aware of the fact, that work with biological material, which is subject to the influence of climatic conditions and certainly it will be influenced by that year by year.

Graph No. 4: Composition of Individual Varieties on Harvested Area in 2012 and 2011

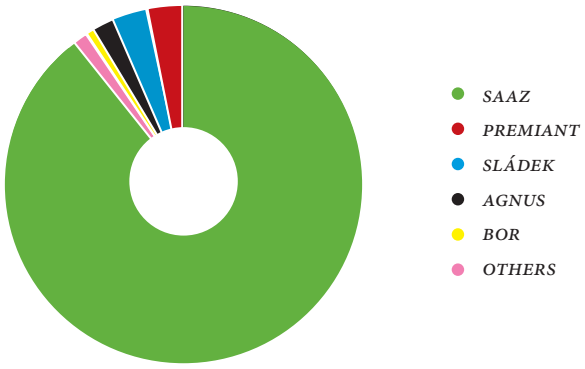


Table No. 7 – The Acreage of Hop Gardens in the Czech Republic (ha):

Variety	area 2013	%	area 2011	%
Saaz var.	3786	87,66	3 806	87,17
Agnus	44	1,01	53	1,21
Bor	4	0,12	5	0,11
Premiant	201	4,65	229	5,25
Sládek	240	5,55	242	5,54
Others	44	1,01	31	0,72
Czech Rep.	**4 319**	**100,00**	**4 366**	**100,00**

TRENDS ON THE HOP MARKET

A/ The purchase movement from big buying countries

Due to the fact that crop 2012 in the Czech Republic was the lowest since several decades Bohemia Hop a.s got from farmers nearly 40% less hops than contracted with farmers. Quite important volumes had to be postponed for deliveries from 2013, 2014 and 2015 crops. It seems that many breweries waiting for lower prices did not conclude contracts in time and have troubles to secure enough hops in assortment needed. On the other side such situation helped to clean existing inventories from older crops.
Crop 2013 seems to be slightly better as to harvested volume of hops but worse as to alpha acid content compared to two previous years. Despite these fact harvested volume is under expectation and under our needs especially Saaz variety in Saaz region. No spot market will be opened. Also estimated volumes from existing acreage are sold out from 2014 and 2015 crops.

JAPAN: contracts are on lower level than we were used in the past and breweries hesitate to order future crops. It causes that farmers waver over investments into the future.

USA: big industry is not interested in high quality raw materials but craft breweries are running very well and are buying Czech hops also from future crops

CHINA: is now second biggest customer for all Czech varieties, future contracts are very promising

SOUTHERN ASIA: increasing demand

OTHER COUNTRIES: stable demand

B/ The purchase movement of domestic breweries

sales of Czech beer went a little bit down on domestic market but export of lager and premium beers goes considerably up so needs of high quality Czech hops went also up. At domestic market movement from on trade towards off trade was recorded.

C/ The estimated forvard contract ratio

2014 crop – 100%
2015 crop – 100% - new acreage needed
2016 crop – 90%

QUALITY MANAGEMENT

All activities were centralized to the principal place of Chmelarstvi and Bohemia Hop in the Mostecka street. Due to the centralization, the operation of one processing line for pellets T 90 was terminated, despite the fact that the equipment is still able to assure the highest standards of processing quality. The processing line in the Mostecka street enables processing hops to forms P90 as well as P45. This main location has been also equipped with camera security system.

On the ground of audits, we have been provided by ISO 9001:2008, HACCP, ISO 14001:2004, State Phytosanitary Administration certificate, FDA certificate.

Chmelarstvi built a new cold storage with a new system of stocking and manipulation that enables Chmelarstvi to store all hops contracted by Bohemia Hop as well as some other suppliers in cold storage. About 1 600 pallets can be stored there.

Further to this a complete replacement of the pelletizing unit took place in September 2012 in order to elevate quality assurance standards.

The company takes part in a number of circle tests for research of possible differences amongst laboratories of foremost customers to ensure the quality of work of our laboratory. For this purpose, the laboratory was equipped in September 2012 with the The AntarisTM II Fourier transform near-infrared (FT NIR) analyzer from Thermo Electron Corporation that enables to set a new standard for process and quality control.

A/ Regulation of preparations issued last year

All trends of the treatment of hops as well as treatment of another agriculture plant are subjects to EU regulations

B/ Newly approved preparations

Hop Treatment Methodology 2013 includes several newly approved preparations compared to the methodology issued in 2012:

Trade name	Active substance	Activity
Bellis Mildew	boscalid, pyraclostrobin	Downy Mildew, Powdery
Plenum	pymetrozine	Hop aphid
Kanemite 15 S;	acequinocyl	Red spider mite

Discarded preparations of the methodology compared to 2011:

Trade name	Active substance	Activity
Chess 50 WG	Pymetrozine	Hop Aphid
Omite 30 W	propargite	Red spider mite

C/ Monitoring system of preparations

The Hop Research Institute Ltd. has not received any instructions for changing current systems of monitoring so it keeps the original trend.
Bohemia started already last year its own monitoring in cooperation with EUROFINS SOFIA GmbH Berlin, international accredited laboratory.

D/ Hop Treatment in 2013

The hop treatment was carried out according to the Hop Treatment Methodology 2013 and The List of Preparations Approved for Hop Treatments in Crop 2013 issued for Chmelarstvi, cooperative Zatec and Bohemia Hop a.s.
If there is any special customer request for treatment system in oncoming year It will be necessary to inform us best before the end of February due to Supplier´s contract.

Saaz, September 7, 2013
Jaroslav Hájek