

FINAL HOP REPORT - CROP 2015

Saaz, September 9, 2015



THE SITUATION DURING THE CROP YEAR AND THE QUALITY

A/ Development of the weather and the situation in production 2015

At the enclosure please find the monthly Hop Reports 2015, regularly published on the web sites of Bohemia Hop, a.s. Žatec - www.bohemiahop.cz. Tables No. 1 and No. 2 indicate summarized data concerning the whole vegetation period (April – August) in 2015, compared to the same period of 2014 and to the long-term average covering the period of 1961 to 1990.

Table No. 1 – Temperature (°C):

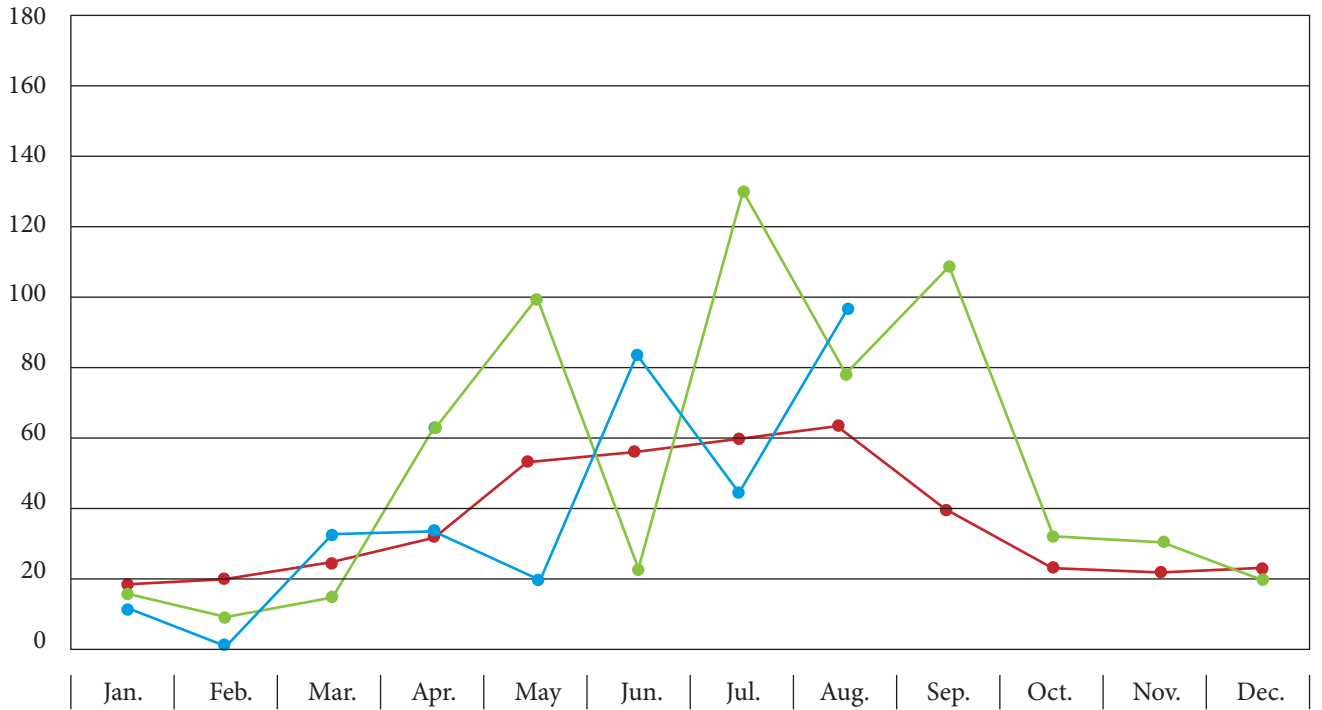
Month	average temperature		difference + -	30-years average	difference + -
	2015	2014			
April	8,70	10,90	- 2,20	8,50	+ 0,20
May	13,30	13,00	+ 0,30	13,40	- 0,10
June	16,40	16,60	- 0,20	16,70	- 0,30
July	20,50	20,00	- 0,50	18,00	+ 2,50
August	21,40	16,70	+ 4,70	17,40	+ 4,00
Total	80,30	77,20	+ 3,10	74,00	+ 6,30

Table No. 2 – Precipitations (mm):

Month	Total precip. per month		difference + -	30-years average	difference + -
	2015	2014			
April	34,00	61,60	- 27,60	32,00	+ 2,00
May	18,80	101,00	- 82,20	54,00	- 35,20
June	85,40	26,30	+ 59,10	56,00	+ 29,40
July	47,20	127,60	- 80,40	59,00	- 11,80
August	96,00	78,80	+ 17,20	62,00	+ 34,00
Total	281,40	395,30	- 113,90	263,00	+ 18,40

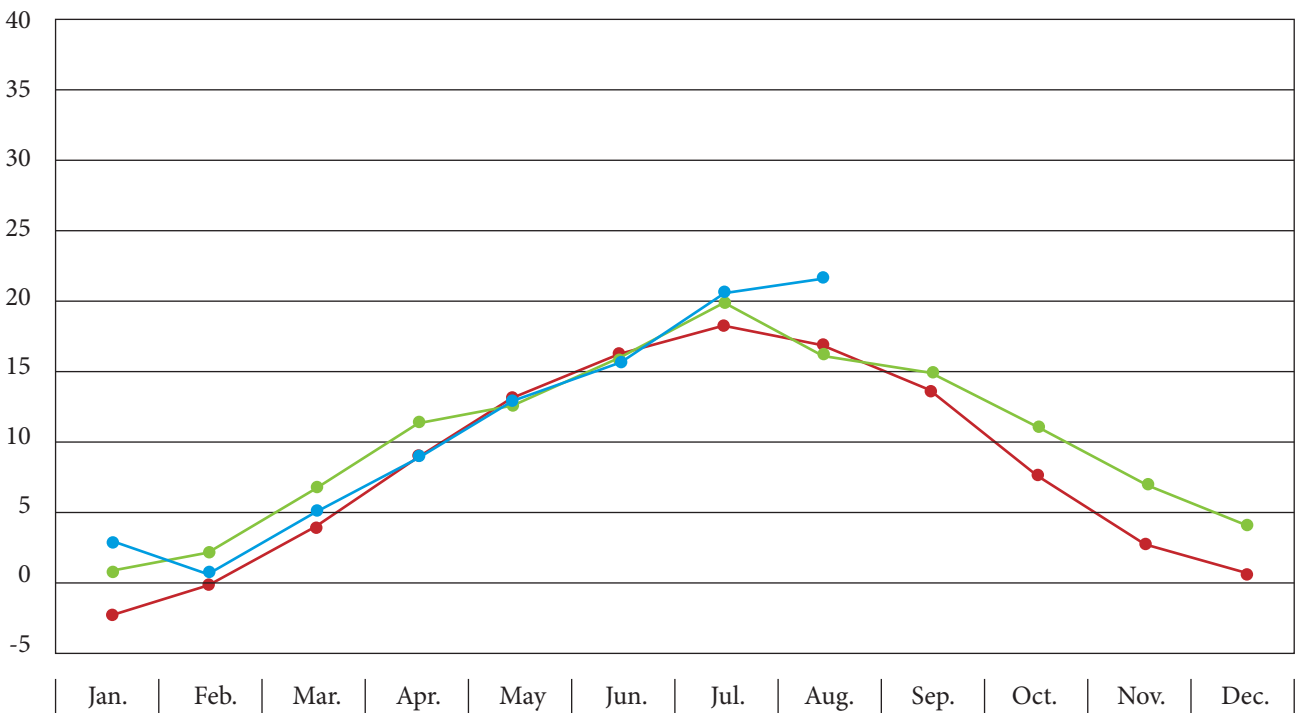
The data indicated above are accompanied by graphs illustrating the average temperatures and the total of the precipitations per month, covering period of January, 2015 to August, 2015 (Graphs No. 1 and 2).

mm



- LONG AVERAGE
- PRECIPITATION 2015
- PRECIPITATION 2014

°C



- LONG AVERAGE
- TEMPERATURE 2015
- TEMPERATURE 2014

The character of the weather during the first trimester of 2015 could be compared to the first trimester of previous year. The average monthly temperatures of the first three months of both years reached coincidentally positive values. Especially the temperatures in January exceeded considerably the level the long-term average as well as the temperature of January 2014. As far as the precipitations is concerned, the first trimester of this year was very poor. Catastrophic situation came in February, when the rainfalls reached only 2, 4 mm. Alike to the previous year, the whole winter was without snow. This fact intensified the decrease of the ground water level and caused very low water surface of rivers not only in spring season. April 2015 can be characterized as warm and dry. The temperatures were on the level of long-term average. Low level of precipitation was very distinctive negative aspect – it reached approximately only 50% of the level of previous year. Better rainfalls came only by the end of the month (on 27th and 28th of April, 2015). The rains were accompanied by perceptible temperature drop. Also the temperatures in May were on normal level and there were no expressive extremes in this sense. On the other side, this May was very poor as far as the precipitation is concerned. Compared to previous year the rainfalls were 80mm lower.

June was cooler in comparison to long-term average. The rainfalls were above-average and also higher than in June 2014. The rains between 7th and 9th June brought also local hail-storms. In Saaz region there were about 40 hectares of hop gardens damaged, especially in localities of Klůček and Postoloprty. The weather conditions in July were very adverse to the development of hops. Precipitations reached 47 mm (but only in Saaz meteorological station). In other localities, especially in Rakovník region, they were much lower. Majority of the rains fell only during the first decade of month and it practically did not rain until the end of July. The temperatures in July were 2, 5°C above the long-term average. Very negative aspect represented high number of hot days. Altogether, in 8 days the temperatures exceeded 32°C and the average daily temperatures in 17 days exceeded the level of 20°C. Critical weather conditions continued also in August until the beginning of the harvest of hops. Precipitations, which came during this month, already did not influence positively the state of hops. The period without the rains took – depending on the locality – between 37 and 46 days. Moreover, the temperatures reached the levels which were never recorded in many meteorological stations since their establishment. For instance, the day temperatures reached more than 30°C every day between 3rd August and 14th August, 2015. In comparison with long-term average the medium temperatures in August were 4°C higher. Such a big difference was never recorded in the history of weather monitoring.

B/ Quality: alpha contents in original, aroma, the appearance of the cones, the pests

The weather in April was very favourable for beginning and performing of spring works in hop gardens. Warm and dry weather enabled to carry out all the works in tranquillity, in time and in the best quality. Until the end of April therefore the farmers implemented the pruning of the hops, stretching and fastening of hop-leading wires and in some areas of Sládek variety they proceeded to the hop training. The monitoring of the occurrence of spring pests proved the presence of alfalfa snout weevil (*Otiorrhynchus sulcatus* F.) and flea beetle (*Psylliodes attenuata* K.). The gardens, where it was necessary to carry out the treatment by the chemical preparations, were treated mostly by the preparation Actara 25 WG, eventually against flea beetle also by the preparation Karate Zeon 5 SC. Also the elimination of primary infection of downy mildew of hops (*Pseudoperonospora humuli* Miy and Takah.) is one of the prerequisites for healthy growth and development of the plants. Then there were used the preparations Aliette 80 WG and in gardens with alternative way of protection of hops against downy mildew of hops, which is based in application of PK fertilizer Farm-Fos 44, also the preparation Curzate K was applied.

The development of hops in May was relatively within normal. The training of hops (variety Saaz semi-early red-vine hops) started by the end of the first decade of the month and it finished within determined periods. Also in this year there appeared some problems with auxiliary

labour force due to non-fulfilment of the contracted number of seasonal labourers. Until the end of May the farmers carried out the additional fertilizing and the hilling of the hops. The state of hops by the end of May was assessed as very good. As far as the protection of hops is concerned, the attention was given first of all to the treatment against downy mildew of hops. The intensity of fly-over of hop aphid (*Phorodon humuli* Schrank) was very weak and the occurrence of red spider mite (*Tetranychus urticae* Koch) was not ascertained in this period.

Generally favourable weather conditions in June kept the state of hop gardens on good level. Majority of hop gardens reached the height of the trellis. From this aspect the situation in this year was much better than in previous year, when only 40% of the hop vines reached the height of the trellis up to the same date. Thanks to sufficient precipitations the differences in the height of hop plants equalized; especially it concerned the newly planted hops. The elongation growth continued in this period and so in many hop gardens the plants exceeded the height of trellis by one meter or more. The blossoming of hops was not practically recorded in this period. The drought and higher temperatures in the beginning of June were not propitious for spreading of downy mildew of hops. The conditions for dissemination of this disease nevertheless improved later during the month. The actions against it were done preventively; the preparations used were Ortiva, Aliette Bordeaux and Ridomil Gold Plus 42, 5 WP. In localities, where downy mildew of hops was confirmed, the farmers applied the preparation Curzate K. The occurrence of hop aphid was very variable. In case that the critical number of 50 wingless nymphs for one leaf was exceeded, the farmers used the preparations Tepeki, Confidor 200 OD and eventually Plenum for the protection of hops. As far as the red spider mite was concerned, no significant occurrence was recorded and therefore there were not any reasons for vigorous intervention.

High temperatures in the first week of July stopped the elongation growth and by the end of the first decade of the month the hops came into blossom. The blossoming started very well, also thanks to quality habit of the plants. However, further development of the hops was negatively affected by extremely adverse climatic conditions. The drought and heat exceeding the level of tropical temperatures stopped definitely the development of hops. The cones ceased to grow and majority of hop gardens, especially the youngest, stayed on the stage of start of flowering. Undeveloped cones then were getting dry and falling down. The overall state of hops got rapidly worse by the end of July and the farmers' hopes for good crop year were dashed. From the aspect of the health state of hops the infection stress of downy mildew of hops continued. The preparations Ortiva or Bellis and eventually Curzate K were applied. Towards the end of the month the farmers used also the preparations based on copper. The most frequently it went for Kuprikol 250 SC and Cuproxat SC. Also new preparations - Defender or Cuprozin Progres - were recommended due to lower content of copper. In July the farmers applied also preparation Movento 150 OD against hop aphid. This preparation shows also very good acaricide effect. Hop aphid was then eliminated in this period. On the other side the weather contributed to fast propagation of red spider mite. By the end of month it therefore came to the application of other preparations against this pest - Ortus 5 SC, Vertimec 1, 8 EC and Acramite 480 SC.

Climatic conditions in August completed the adverse trends in development of hops which started already in July. The development of plants, above all the growing of cones and the creation of alpha-bitter substances, did not restore. The cones then remained very small and in upper parts of plants the development stopped in the stage of start of flowering. Although majority of the farmers postponed the beginning of the harvest, in comparison to the normal, the situation did not improve and the results of the crop will be deeply below long-term average. Bad results of the harvest will concern all the production regions of hops. The harvest started within the period between 22nd and 27th August 2015. The first results of the crop, in terms of quantity and quality – content of alpha-bitter substances, are very bad and this year crop will be one of the worth in long history. The farmers nevertheless managed to keep the health state of hops on very good level until the harvest.

Following table demonstrates the results of the alpha acid contents according to individual regions and varieties, as analysed in the laboratory of Chmelařství, cooperative Žatec.

Table No. 3 – Contents of alpha in original material according to varieties and regions (in %) after analysis in laboratories of Chmelařství, cooperative Žatec

Region	Saaz-ST	Saaz virus free	Saaz	Sládek	Premiant
Saaz	2,18	2,30	2,24	5,20	7,60
Auscha	2,03	2,28	2,15	-	6,09
Terschitz	2,09	2,21	2,19	-	5,44
Czech Rep.			2,20		6,90

Obs.: The results of the analyses of the Sládek variety from Auscha and Terschitz regions are still not available and the number of analyses of Premiant variety is very small and without informative value.

Estimation of acreage and yields according to regions

The harvested acreage in 2015 is shown in following table. The data indicated were kindly conceded by ÚKZÚZ Žatec. (up to 28th August, 2015).

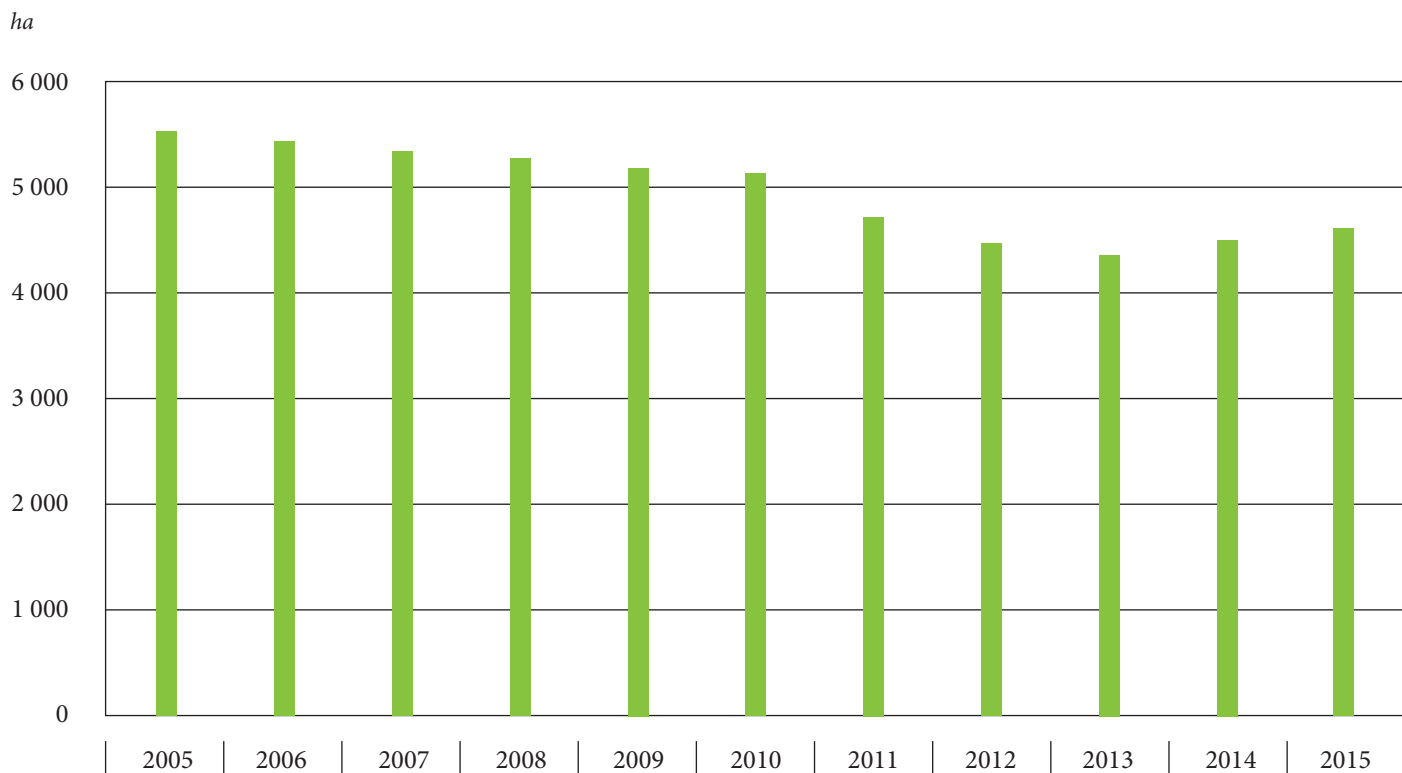
Table No. 4 – The acreage of hop gardens in the Czech Republic (ha):

Region	up to 20.8.2015	up to 20.8.2014
Saaz	3 576	3 451
of it Saaz var	3 190	3 086
Auscha	497	474
of it Saaz var	433	407
Terschitz	549	535
of it Saaz var	416	401
Czech Republic	4 622	4 460
of it Saaz var	4 039	3 984

The trend of increasing of acreage, initiated in 2014, continued also in this year's crop. In total there were added 162 hectares of hop gardens, out of this number then 145 hectares of newly planted Saaz semi-early red bine hops.

In order to illustrate the development of the acreage of hop gardens in the Czech Republic we enclose the graph covering the period of 2005 – 2015.

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 are rather difficult view to yield differences between individual growers and even particular hop gardens. The exact results of the crop 2015 will be known only on the beginning of December, after the 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”**, which will be made out by UKZUZ Žatec.

Table No. 5 – Estimation of the crop according to regions (total):

Region	Harvested area (ha)	Production (t)	Yield in t per ha
Saaz	3 576	3 210	0,90
of it Saaz var.	3 190	2 550	0,80
Auscha	497	610	1,22
of it Saaz var.	433	500	1,15
Terschitz	549	700	1,27
of it Saaz var.	416	480	1,15
Czech Rep.	4 622	4 520	0,98
of it Saaz var.	4 039	3 530	0,87

A/ Expected replacement of the varieties and hypothetic production of individual varieties:

Table No. 6 – Comparison as per the variety composition in 2013 – 2015:

Variety	2015 (ha)	2014 (ha)	Diff. (ha) 15/14	2013 (ha)	Diff. (ha) 15/13	Diff. (ha) 14/13
Saaz var.	4 039	3 894	+ 145	3 786	+ 253	+ 108
Agnus	38	40	- 2	44	- 6	- 4
Bor	1	3	- 2	4	- 3	- 1
Kazbek	19	18	+ 1	0	+ 19	+ 18
Premiant	180	187	- 7	201	- 21	- 14
Sládek	267	270	- 3	240	+ 27	+ 30
Saaz late	34	15	+ 19	0	+ 34	+ 15
Saaz special	20	11	+ 9	9	+ 11	+ 2
Others	24	22	+ 2	35	- 11	- 13
Czech Rep.	4 622	4 460	+ 162	4 319	+ 303	+ 141

B/ Expectation of the planting of new varieties and the yields:

In this year the growers ordered by the producers of certified planting stock the quantity of rhizomes corresponding to about 300 hectares of hop gardens. As the demand for the Czech hops have increased, the renovation and eventually enlargement of hop gardens can be expected also in 2016-2017, so that the current area will be maintained, at least, or even slightly increased. It is very difficult to make estimation concerning planting of new varieties. Everything will depend on the interest of the buyers in individual varieties. We are of the opinion that the offered assortment is relatively wide. The leading variety will be certainly Saaz semi-early red-bine hops. Also other varieties – Sládek

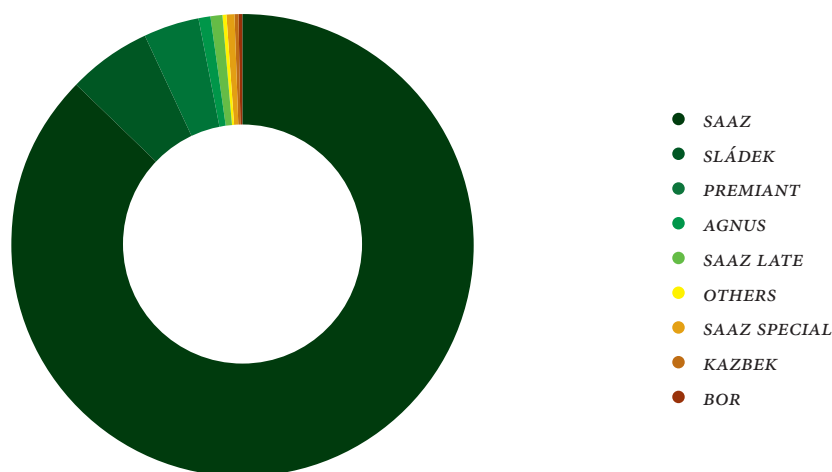
and Premiant - will probably maintain their positions on the market. Lately, the interest in the variety Kazbek and Saaz Late have increased. If we give some thought about the development of the yields of the Czech hops, then we must state that view to higher interest of the growers in renovation of older hop cultures the average yield per hectare should increase. Of course, we are aware of the fact that we work with biological material, which is subject to the influence of climatic conditions and certainly it will be influenced by them every year. We believe, that the climate development will not be so adverse in the future as it was in the current year.

C/ Expected production areas :

Table No. 7 – Composition of individual varieties on harvested area in 2015 and in 2014 (ha):

Variety	area 2015	%	area 2014	%
Saaz var.	4 039	87,39	3 894	87,31
Agnus	38	0,82	40	0,90
Bor	1	0,02	3	0,07
Kazbek	19	0,41	18	0,40
Premiant	180	3,90	187	4,19
Sládek	267	5,77	270	6,05
Saaz late	34	0,74	15	0,34
Saaz special	20	0,43	11	0,25
Others	24	0,52	22	0,49
Czech Rep.	4 622	100,00	4 460	100,00

Graph No. 4: Composition of individual varieties on harvested area in 2015



TRENDS ON THE HOP MARKET

A/ The purchase movement from big buying countries

Crop 2014 was above average as to harvested quantities but a little bit lower as to alpha acid content. Such situation allowed us to deliver all missing volumes left from previous poor crops 2012 and 2013. Also in other European countries was 2014 crop very good and breweries got all contracted volumes. Nevertheless there was practically no spot market of aroma varieties. Whole Czech harvest of aroma varieties was sold to traditional customers and we had no chance to meet requirements of new customers even if we got many new demands. According to our estimation we could sell approx. further 300-400 tonnes. New important acreage was planted in autumn 2014.

Unfortunately crop 2015 is once more poor as to quantity and also very poor as to alpha acid content. It is now sure that once more we shall not be able to fulfil all our obligations.

Development of craft beer segment of beer industry is phenomenal, especially in US, Czech Republic, Italy and many other countries. These breweries are not so much economically oriented, they need top quality raw materials and are ready to pay reasonable prices. Their success on the market is very promising for hop industry.

JAPAN: some new contracts for future crops concluded

CHINA: even if sales of beer is now going down in CHINA demand of Czech hop is going up

USA: craft breweries need more and more top quality raw materials

OTHER COUNTRIES: all 4 largest brewing groups plus craft breweries are interested in future crops

B/ The purchase movement of domestic breweries

Trends continued – sales of mainstream and low quality beers is going down, sales of lager and premium beers are going up, nearly all breweries increased their exports. Significant increase of number of craft breweries. There are now over 320 producers.

C/ The estimated forward contract ratio

During autumn 2014 once more over 450 hectares were newly planted mainly to repair damaged hop gardens by floods in 2013. Similar plans are also for autumn 2015 and 2016. Production from existing acreage is covered by pre-contract until 2018 crop.

Crops 2016 – 2018 : 100%

Crops 2019-2020 : 80%

Farmers are now hesitating to conclude new contracts as they expect higher prices.

A/ The change of technology and packing material for crop 2015

Chmelařství, co-operative Žatec is continuing in the on-going process to maintain its processing facility up to the world standard. In September 2015 further investments were made for the packaging line. The line is newly equipped with the new automatic vertical and horizontal strapping machine and foil wrapping machine. Within the processing line the plant changed the tube lines in which hop is transported.

Chmelařství, co-operative Žatec and Bohemia Hop, Ltd. use for both processed and raw hops a cold storage with an automatic system of stocking and manipulation that enables Chmelařství, co-operative

Žatec to store all hops contracted by Bohemia Hop, Ltd. as well as some other suppliers in cold storage. The cold storage has sufficient capacity for the whole 2015 crop.

The laboratory of Chmelařství, co-operative Žatec is certified and carries out all usual analysis according to EBC or MEBAK. 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 Antaris™ II Fourier transform near-infrared (FT NIR) analyser from Thermo Electron Corporation that has enabled to set a new standard for process and quality control since autumn 2013.

PESTICIDE RESIDUA

A/ Supplement to the instruction regarding affusion within previous year

Basic trends of the hop protection, as well as protection of other agriculture commodities are fully subject to the rules valid in European Union.

B/ Newly used pesticides

By comparison of the Methodology of the Hop Protection in 2015 and 2014 we registered the inclusion of new preparations in 2015:

Name of preparation	Active substance	Effect
Acramite 480 SC	bifenazate	red spider mite
Vertimec 1, 8 SC	abamectin	red spider mite
Safran	abamectin	red spider mite
Vargas	abamectin	red spider mite
Defender	copper hydroxide	downy mildew of hops

The preparations excluded from the Methodology 2015 in comparison to 2014:

Name of preparation	Active substance	Effect
Confidor 70 WG	imidacloprid	hop aphid
Chess 25 WP	pymetrozine	hop aphid

C/ System of control of pesticide residues

Chmelařský institut, s.r.o. Žatec (Hop Research Institute, s.r.o. Žatec) did not receive any instructions in order to change the control system of pesticide residua, so that it goes on in compliance with the present trends. Connection to EUROFINS SOFIA GmbH Berlin, international certified laboratory, continues and in compliance with the facilities of the laboratory we extend also the spectrum of analyses of active substances.

D/ Protection of hops in the crop year 2015

The protection of hops carried out by our suppliers was subject of the Methodology of the Protection of Hops for the year 2015 and of the List of the Preparations Approved for the Protection of Hops in 2015, issued for the companies Chmelařství, co-operative Žatec, and Bohemia Hop, a.s. Žatec. View to the fact, that we have agreed in the Contracts for dried hops, concluded with the suppliers, an obligatory deadline for sending of the "List" until the 31st March of the current year, we need to know eventual requirements for the adaptation of allowed chemical preparations before that day, preferably up to 28th of February of current year.