

RESEARCH SUBJECT ON HOP - CROP 2012

Saaz, Semptember 12, 2012

THE SITUATION DURING THE CROP YEAR AND THE QUALITY

At the enclosure please find the monthly Hop Reports 2012, 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 2012, compared to the same period of 2011 and to the long-term average covering the period of 1961 to 1990.

A/ Development of the Weather and the Situation in Production 2012

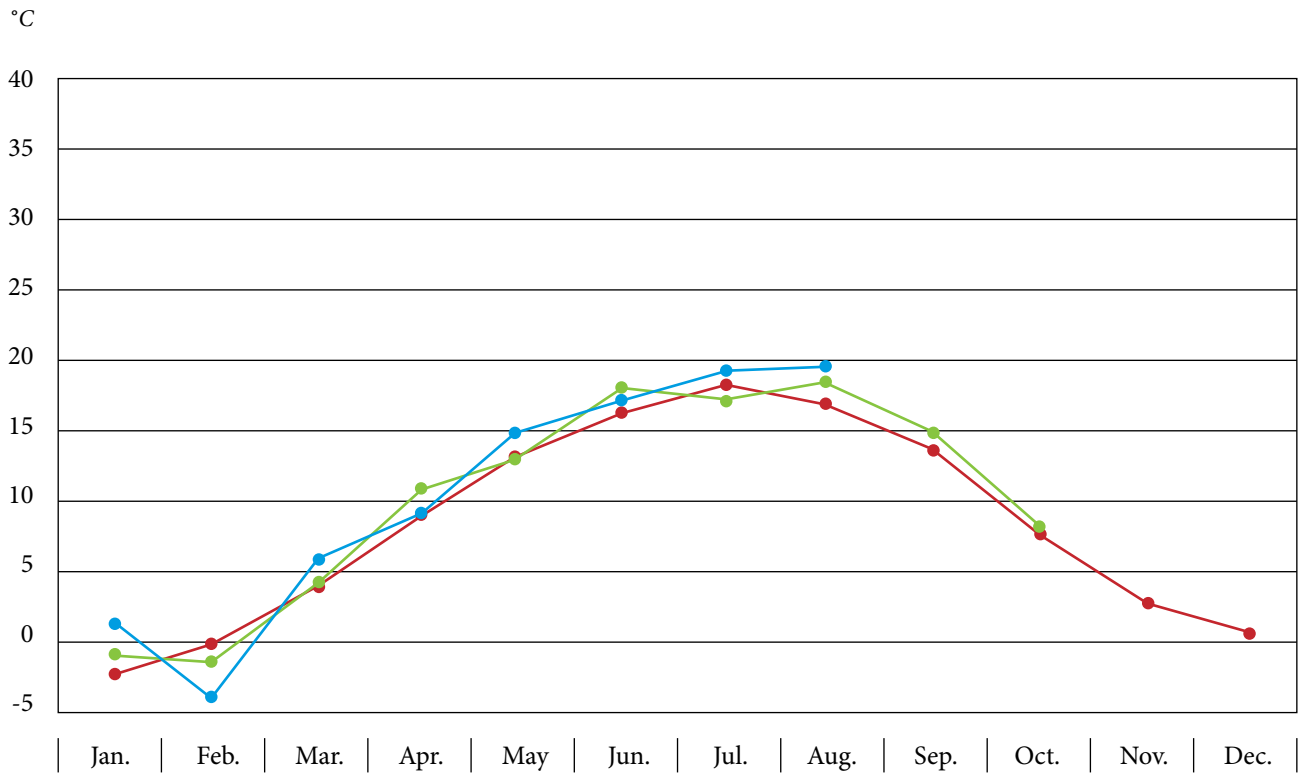
Table No. 1 – Temperature (°C):

Month	average temperature		difference + -	30-years average	difference + -
	2012	2011			
April	8,70	11,30	- 2,60	8,50	+ 0,20
May	14,80	13,20	+ 1,60	13,40	+ 1,40
June	17,20	17,60	- 0,40	16,70	+ 0,50
July	18,80	17,20	+ 1,60	18,00	+ 0,80
August	19,00	18,30	+ 0,70	17,40	+ 1,60
Total	78,50	77,60	+ 0,90	74,00	+ 4,50

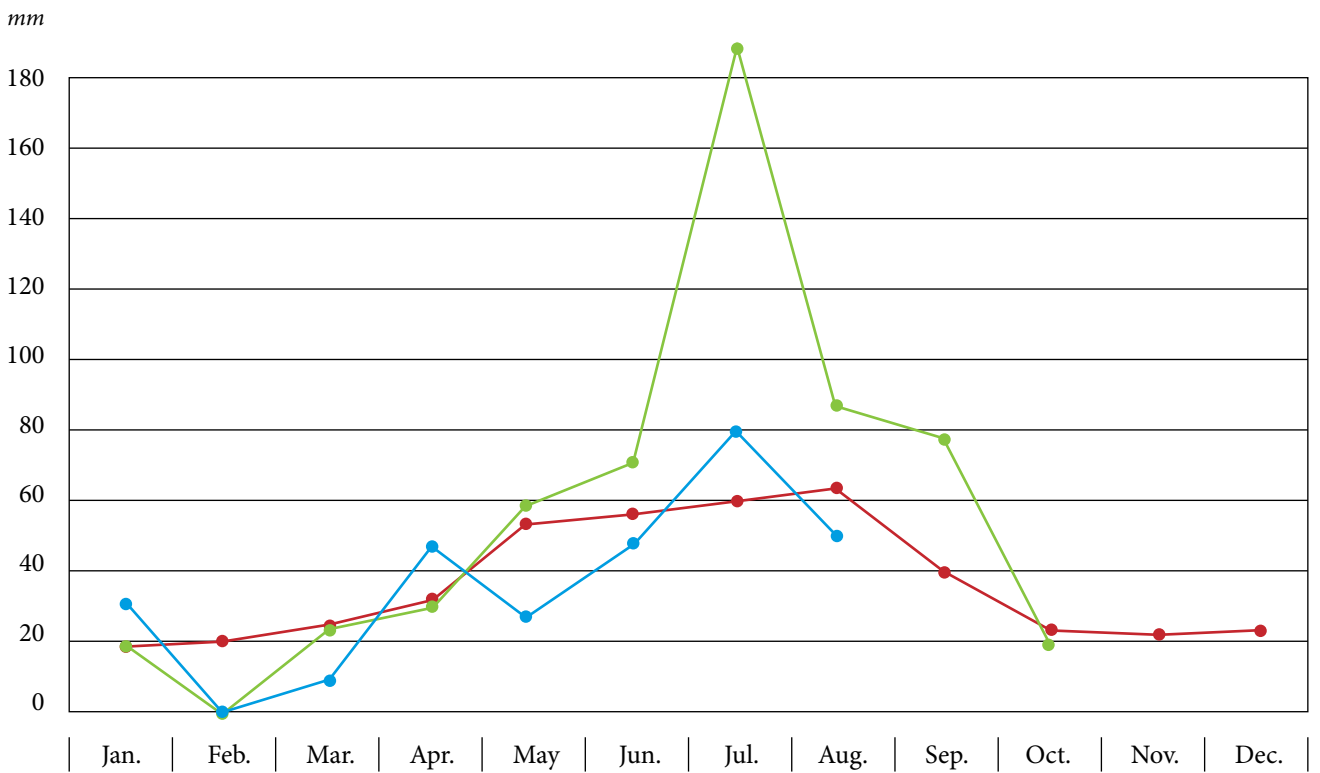
Table No. 2 – Precipitations (mm):

Month	Total precip. per month		difference + -	30-years average	difference + -
	2012	2011			
April	45,80	28,00	+ 17,80	32,00	+ 13,80
May	25,60	59,80	- 34,20	54,00	- 28,40
June	51,40	70,50	- 19,10	56,00	- 4,60
July	80,80	194,20	-113,40	59,00	+ 21,80
August	48,20	89,60	- 41,40	62,00	- 13,80
Total	251,80	442,10	-190,30	263,00	- 11,20

The data indicated above are accompanied by Graphs illustrating the average temperatures and the total of the precipitations per month covering period of January 2011 to August 2012.



- LONG AVERAGE
- TEMPERATURE 2012
- TEMPERATURE 2011



- LONG AVERAGE
- PRECIPITATION 2012
- PRECIPITATION 2011

Character of the weather in winter and within the period of the first trimester of 2012 was completely different from weather of previous two years. Temperatures of the first three months were higher than the temperatures of last year as well as the long-term average. This situation was caused by high average temperatures in January and in March. On the other side, February was extremely cold with record-breaking frosts. The lowest temperature recorded by the meteorological station of Chmelařský institut (Hop Research Institute) in Žatec dropped to -20,2°C. Precipitations in the first trimester were deeply below long-term average – they reached only 72%. Especially low precipitations were in February (19%) and March (39% of long-term average). In the hop growing regions – Saaz, Auscha and Tirschits regions – practically did not fall any snow within these months. Strong and long frosts in February, called “black frosts”, influenced very unfavourably the state of hop gardens, as it turned out later on during the vegetation period. Overall lack of precipitations in the first trimester of current year caused the decrease of the level of ground water and general loss of the moisture in soil. Although April seems to be an average month as far as the temperature is concerned, the weather was cold until 25th of April. Sharp warming came within the last days of April, more specifically between 26th and 30th April. The temperatures increased to the level of summer temperatures during these days, from 25,3°C up to record-breaking 28,9°C. If we take into consideration, that morning temperatures on the beginning of April often decreased below the freezing point (8th April: -5,3°C; 9th April: -7,9°C), then we find that there were an extreme variation of temperatures during one month. This situation was not optimal for the growth of agricultural crops not even for the development of hops in the given period. Precipitations of April exceeded the level of long-term average (143%). Main factors, which contributed to this result, were the rainfalls on 12th April 2012 (9,4 mm) and on 24th April 2012 (18,8 mm). Otherwise April was relatively dry month, in fact without precipitations.

When evaluating climatic data, we consider May 2012 as slightly above-average from the point of view of the temperatures and considerably below-average concerning precipitations (only 47% of long-term average). Worth noting was a relatively big difference

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

Climatic conditions of the first trimester and April 2012 did not cause any serious problems to the growers as far as the basic agrological measures in hop gardens are concerned.

All the labour proceeded well and without serious problems. The pruning of the hop vines and the stretching and fastening of hop-leading wires were finished until the end of April. Due to the warm weather by the end of the month also the training of hops, although exceptional, was started (Sládek variety). The training of Saaz semi-early red-bine hops variety started around 10th of May.

Unfortunately, some problems with the health condition of root stocks arose already in this period, what became evident by insufficient emergence or even non-emerging of the hop plants. Incurred situation had to be investigated with the help of the operatives of Chmelařský institut (Hop Institute), the Administration of Plant Protection and the Research Institute of Arable Farming.

From the point of view of the plant protection it was necessary to carry out the treatment everywhere, where the occurrence of alfalfa snout weevil (*Otiorrhynchus sulcatus* R.) exceeded the number of five beetles to one hundred plants. In this year, as well as in previous year, the preparation Actara 25 WG was registered for the period from 24th of March to 10th of May 2012. This preparation liquidates also the spring generation of flea beetle (*Psylliodes attenuata* K.).

between day and night temperatures. Night temperatures were low during major part of the months, just eight times they increased over 10°C and two times even dropped below zero. Precipitations of May were deeply under long-term average and daily summary of precipitations was very low in majority of cases.

Also June was not very favourable for the growth of hops from the point of view of climate conditions. Unceasing oscillations of temperatures in the course of the month, big differences between day and night temperatures, and – first of all – lack of precipitations during the first two decades of June influenced negatively the growth and development of hops in this period.

July's temperatures and precipitations were above the level of long-term average. Similarly to June, also in this month there were enormous differences between day and night temperatures, which – especially during the second decade of the month – influenced negatively the development of hops. Within the period between 25th of July and 28th of July 2012 the maximum day temperatures exceeded the limit of 30°C. Out of eighteen rainy days only two (1st of July and 2nd of July 2012) had more than 10 mm of rainfalls.

August 2012 completed the adverse development of hops with its weather conditions. This month was very poor as far as the precipitations is concerned and the temperatures oscillated considerably above the long-term average. Especially enormous high temperatures between 18th and 25th of August 2012 were rather unpleasant. The temperatures in some places exceeded even 40°C. Concerning precipitations, 50% of the rainfalls came on 30th and 31st of August, when it already did not have any impact on the development of hops. We can state, that practically since 2nd July up to the beginning of hop picking our country experienced dry and warm weather typical for arid desert regions.

Against this pest, which appeared on hop gardens already by the end of April, also the preparation Karate Zeon 5 SC was used. In this period the farmers paid attention to timely elimination of primary infection of downy mildew of hops (*Pseudoperonospora humuli* Myi et Takah). The hop cultures were treated in time, when the hop shoots reach the height of 10-15 cm, by the preparation Aliette 80 WG.

Not even in May the course of the climatic conditions was favourable for the growth of hops. Low night temperatures and lack of moisture caused unequal and weak growing of hop plants. It became evident by hop gardens, which were pruned in later period. The hop gardens, where well-timed pruning was applied, the situation was basically normal. This state caused problems mainly with training of the vines. The individual cultures in majority of cases could not be trained all at once, they had to be gone through and trained up to three times. In this period the growers' fear of the freezing proved true. In this year it manifested itself by formation of gaps in growth. Also in May many investigations of this state were done. By the end of May hops did not reach usual average height. The development of plants was delayed approximately by seven to ten days in that period. From the point of view of the treatment of hops the priority was given to the protection of plants

against downy mildew of hops. It was complicated by excluding of preparations Folpan, Ridomil Gold Combi Pepite and Pergado F, which contain the effective substance folpet. The internal analyses made out by Syngenta Company proved contamination of the effective substance folpet by agent captan in higher degree than it is approved by the specific action submitted in frame of registration process. All our suppliers were informed about this situation by registered mail, by which the use of above mentioned preparations was prohibited with immediate validity. Syngenta Company withdrew mentioned preparations from the market. The first sprayings by preparations Aliette 80 WP and Aliette 80 WG were applied. Preparations Aliette Bordeaux, Ortiva a Curzate K were recommended as a substitution of the rejected ones. The flyover of aphides (*Phorodon humuli* Schrank) was recorded the most frequently within the second decade of May. In case the critical number of 50 aphides for one leave was reached, the treatment by preparations approved against this pest was carried out.

The warm character of the weather was favourable also to the reproduction of red spider mite (*Tetranychus urticae* Koch). It's development was therefore followed and on endangered gardens the preparation Nissorun 10 WP was applied.

In June we already knew the first results of the analysis of root stocks, which did not emerge any plants from. The most probably reason of this dying is the synergic effect of abnormal weather conditions of past winter (high temperatures followed by sudden and very sharp cooling and by temperatures deeply below the freezing point). It is necessary to add also inundating of many localities within pre-harvesting and harvesting period of one and two years ago and – last but not least – the over fertilisation by nitrogen, what lead to higher sensitivity of the hop cultures to the complex of mycoses. Unfortunately the state of plants on such an affected hop gardens did not improve even in May and is irreversible. Probably it will be necessary to liquidate those cultures after the harvest. Hop gardens, which were not harmed and especially those, which were pruned in proper time, looked rather well by their growth. Overall, majority of hop gardens nevertheless did not reach the height of trellis. The plants were still about one week delayed, when compared to normal year. The stretching growth still continued, unfortunately the blossoming of hops did not manifest itself more expressively.

Although in this year the dispersion of downy mildew of hops (*Pseudoperonospora humuli* Miy et Takah) was weaker than in previous two years, the conditions for the propagation and development of downy mildew mycelium were fulfilled by the end of the month. That is why the farmers were recommended to treat the gardens against secondary infection by the fungicides Aliette Bordeaux, Ortiva and eventually Curzate K. Within the second half of the month the high day temperatures created optimal conditions for propagation of red spider mite (*Tetranychus urticae* Koch). The gardens had to be treated by the preparations Nissorun 10 WP and Ortus 5 SC. As far as hop aphid (*Phorodon humuli* Schrank) is concerned, the last (sixth) flyover wave happened by the end of June. Strong to very strong incidence of winged hop aphid was registered on many hop gardens. Following preparations were recommended for the protection of hop gardens against hop aphid: Tepeki, Confidor 70 WG, Confidor 200 OD, Chess 50 WG, and eventually also the preparation Movento 150 OD with acaricide effect.

Unequal growth of individual hop gardens was confirmed in July. Unevenness was evident not only in botanical habitus and the height of hops, but also in its development. In some hop gardens (usually weaker and of lower height) the hops already created cones. In hop gardens of stronger habitus, which reached and sometimes even exceeded the height of trellis, the hops were just blossoming. The lateral shoots were in majority of gardens shorter than usually. We considered the first blossoming satisfactory. Due to the unequal condition of the gardens we estimated that the harvest would start between 18th and 20th August 2012.

Practically during the whole month of July the conditions for growth and spreading of downy mildew mycelium were favourable. The highest figures were recorded between 4th of July to 9th of July, when measured values exceeded the critical limit more than two times. Within the first and the third decade it was therefore indispensable to carry out the third eventually the fourth spraying against secondary infection. In spite of constricted list of preparations approved as agent against downy mildew of hops (Aliette Bordeaux, Ortiva, Curzate K) the hop cultures seemed to be healthy. With a view of already finished overfly of hop aphid in the third decade of June there were no problems with this plant pest in July. The course of the weather was nevertheless optimal for dissemination of red spider mite (*Tetranychus urticae* Koch). It was therefore necessary to carry out regular monitoring of this pest and in the gardens, where the occurrence of red spider mite exceeded the count of five exemplars per leaf, it was necessary to treat with the preparation Ortus 5 SC.

Climatic conditions in August intensified adverse weather character of almost whole vegetation period of this year. The lack of precipitation and high temperatures caused insufficient growth of hop cones, the hop plants did not initiate the second blossoming (if somewhere some sporadic new blooms appeared, they got dry due to high temperatures) and in some localities even the whole plants have withered. After first days of the harvest we estimated the yield of hops deeply below the average level of previous three years. The yields of Saaz hops should be around 0,85 tons per hectare, what represents a decrease of 37% in comparison with the year 2011. The hop-picking started in majority of farms within the period between 18th and 20th August 2012. The conditions during harvest were not favourable due to drought and high temperatures. The hop cones were neither fully developed nor closed and the picking was difficult. Due to the low yields the harvest went on rather quickly, so that the harvesting of Saaz hops was finished until the end of August, in majority of cases. Good news is the fact, that the harvested hops is of a nice colour, with low percentage of hops admixtures and the contents of alpha-bitter substances will be also above long-term average (the long term average is 3,4% for Saaz variety).

August of 2012 was very hard from the point of view of protection of hops against red spider mite, which had very good conditions for its fast reproduction, thanks to weather conditions. Moreover, the registration of preparation Omite 30W was finished. This preparation was very effective against mentioned pest just before the harvest view to short protective period. Although in some localities the hops was damaged by red spider mite, in general we can state, that overall health condition of hops is good.

Following table shows the content of alpha bitter substances according to individual regions and varieties, as per the analyses carried on by the laboratory of Chmelářství, co-operative Žatec.

Table No. 3 – Contents of alpha (CV) in Original Material According to Varieties and Regions (in %) – crop 2012 – after analysis of approx. 40 % crop (average of laboratories of Chmelarstvi and Hop Research Institute):

Region	Saaz-ST	Saaz virus free	Saaz	Sládek	Premiant
Saaz	3,68	3,97	3,81	7,0	9,3
Auscha	3,60	4,00	3,82		8,3
Tirschitz	-	3,14	3,14		8,4
Czech Rep.	3,68	3,88	3,73	7,0	8,91

Obs.: The results of the analyses of the hybrid variety Sládek from Auscha and Terschitz regions are still not available.

Estimation of Acreage and Yields According to Regions:

The harvested acreage in 2012 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):

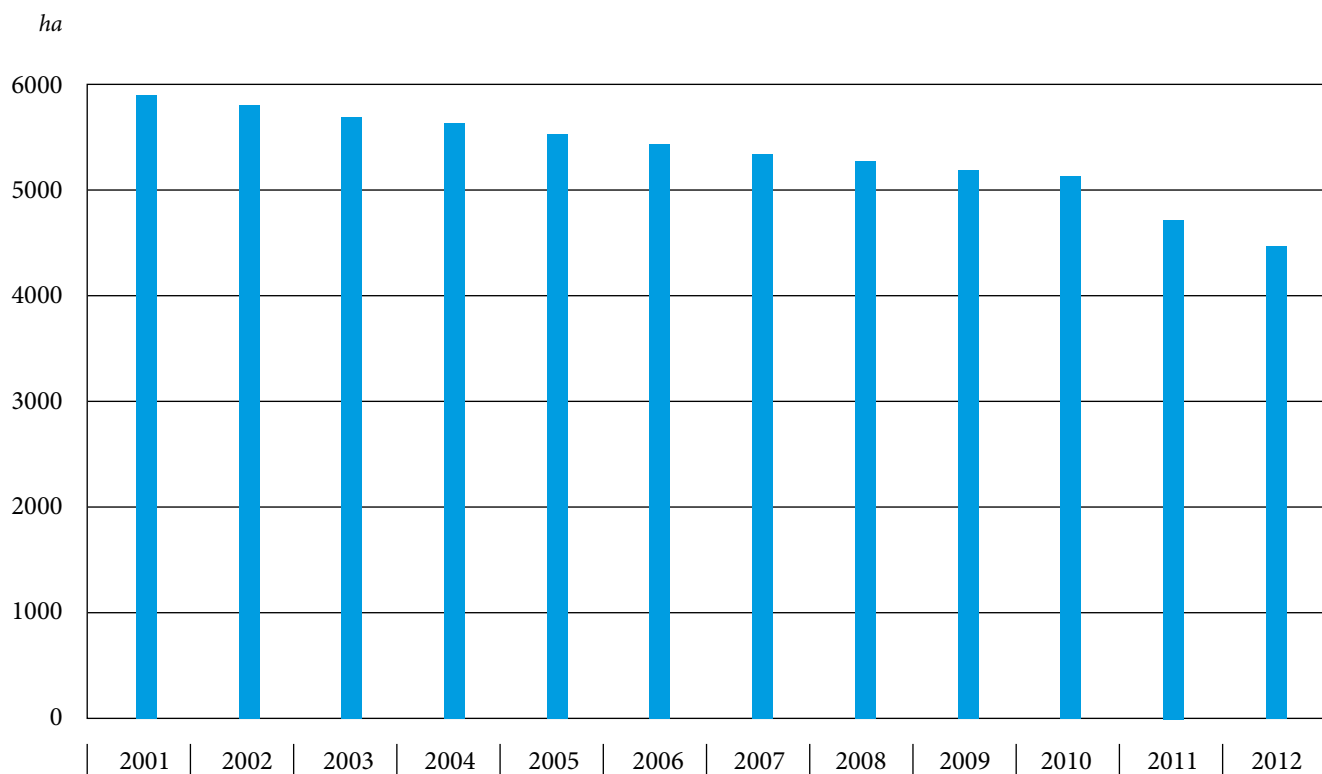
Region	up to 30.4.2012	up to 20.8.2012	up to 30.4.2011	up to 20.8.2011
Saaz	3 415	3 400	3 526	3 517
of it Saaz var	3 032	3 018	3 141	3 132
Auscha	465	466	551	524
of it Saaz var	398	399	484	460
Terschitz	555	500	667	591
of it Saaz var	424	389	510	448
Czech Republic	4 435	4 366	4 744	4 632
of it Saaz var	3 854	3 806	4 135	4 040

Further decrease of the acreage of hop gardens did not stop even in 2011-2012. Altogether the reduction of acreage represented 266 ha, out of this 234 ha of Saaz variety.

The comparison of acreage of 2012 and 2010 is even more noticable. Within these two years the decrease of acreage was 844 ha and the acreage of Saaz hops fell by 751 ha. Those numbers are a warning. Nevertheless we should state that in the last two years the farmers took these measures due to requests of several breweries and in our cooperation to adjust the volumes to brewery requirements. Just to

remind: in 2010 several hundred tons of hops were taken to a POOL at a minimum price. In 2011 approximately 250 ha of hop gardens were not harvested which corresponds to 360 tons of quality hops, which was left in the gardens. If the purchasing policy of the buyers is not revised toward again long term contraction, hop growing would become one of most risky branches of the Czech agriculture.

In order to illustrate the development of the hop gardens acreage in the Czech Republic within previous 10 years we enclose the graph of the acreage in 1998 – 2011.

Graph No. 3: The Development of the Acreage of Hop Gardens in the Czech Republic since 1998

The estimations of the hop production in the Czech Republic corresponded to the development of vegetation. View to serious damages that suffered the hop gardens due to freezing and consequent damping off of the plants, more likely below-average yield was expected. But extremely adverse conditions in the final phase of maturing of hops worsened the situation even more. This year will

belong to the worst ones in the newest history. The exact results of the crop 2012 will be known only by the end of November, 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”**, 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	3 400	3 130	0,92
of it Saaz var	3 018	2 560	0,85
Auscha	466	550	1,18
of it Saaz var.	399	440	1,10
Terschitz	500	555	1,11
of it Saaz var.	389	390	1,00
Czech Rep.	4 366	4 235	0,97
of it Saaz var.	3 806	3 390	0,90

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

Table No. 6 – Comparison as per the Variety Composition in 2011 – 2012:

Variety	2011 (ha)	2012 (ha)	Diff. (ha) 12/11	2010 (ha)	Diff. (ha) 12/10	Diff. (ha) 11/10
Saaz var.	4 040	3 806	- 234	4 557	- 751	- 517
Agnus	52	53	+ 1	61	- 8	- 9
Bor	4	5	+ 1	4	+ 1	0
Fuggle	5	0	- 5	5	- 5	0
Premiant	256	229	- 27	277	- 48	- 21
Sládek	249	242	- 7	277	- 35	- 28
Others	26	31	+ 5	29	+ 2	- 3
Czech Rep.	4 632	4 366	- 266	5 210	- 844	- 578

B/ Expectation of the Planting of New Varieties and the Yields:

The acreage of hop gardens for the next year will probably decrease because the growers will liquidate the gardens damaged by vanishing of hops. The planting in the autumn 2012 will be however larger than in previous years but will not be able to substitute immediately fully the gardens that will need to be grubbed out. The future acreage development will also depend on the level of contracting. 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 any larger interest in newly registered varieties, namely Saaz Late and Bohemie.

If we want evaluate the development of the yields of the Czech hops, we must take into consideration the failure of this year and be very careful in our prognosis. In reality it is nevertheless possible to state that view to reduction of seriously damaged areas only the best and most profitable hop gardens will be kept, and so the yield per hectare should not decrease in the future. 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 year by year.

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

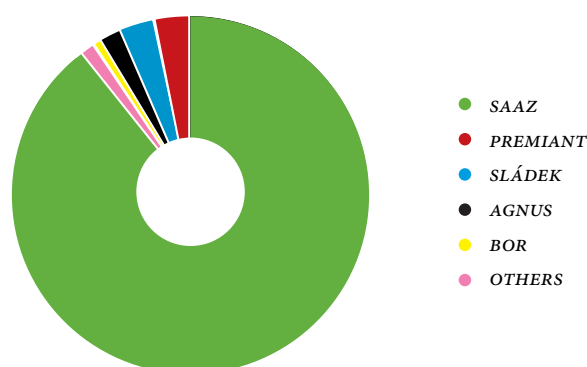


Table No. 7 – The Acreage of Hop Gardens in the Czech Republic (ha):

Variety	area 2012	%	area 2011	%
Saaz var.	3 806	87,17	4 040	87,23
Agnus	53	1,21	52	1,12
Bor	5	0,11	4	0,08
Premiant	229	5,25	256	5,52
Sládek	242	5,54	249	5,37
Others	31	0,72	31	0,68
Czech Rep.	4 366	100,00	4 632	100,00

A/ The purchase movement from big buying countries

After several years with very good harvests also crop 2011 was over average with once more relatively high alpha acid content. Just after harvest and during autumn it seemed that spot hops would be difficult to place on the market. One of the main reasons was small purchases of major Japanese breweries. Fortunately during winter and spring the situation quickly changed and whole remaining volume of SAAZ was placed on other markets. Smaller volumes of pre-contracts for future crops caused further reduction of acreage of SAAZ for 2012 crop and onwards.

But for the time being it seems that at least a part of declining Japanese market could be replaced by other clients oriented on high quality beers.

Harvest 2012 just finished and even if final results are not known yet it is evident that harvested volume of SAAZ will not cover contracted quantities. Estimated gap is approx. 40%. No free hops will be offered on spot market and some breweries counting on spot market could stay without SAAZ.

JAPAN: decrease of contracted quantities continues with all negative impacts on the Czech hop industry

USA: especially craft breweries are very promising and increase considerably their orders

BELGIUM: rising demand for high quality raw materials by mid size and smaller breweries

CHINA: very promising market with constantly rising demand for top quality raw materials

SOUTHERN ASIA: stable demand

OTHER COUNTRIES: stable demand

B/ The purchase movement of domestic breweries

Domestic sales of beer recovered and have now positive trend, especially lager brands are successful. Big boom of micro-breweries continues and this summer „radler“ type of beer is demanded.

C/ The estimated forward contract ratio

2013 crop – 95%

2014 crop – 80%

2015 crop – 50%

QUALITY CONTROL

A/ Change of the Technology and Packing Material for Crop 2012

- Building of new air-conditioned warehouse for cone hops as well as pellets with the capacity of 1500 pallets
- Purchase of an analyzer NIR for fast determination of alpha bitter acids (not for declaration of resulting values but for faster operating analysis)
- Purchase of new pelleting equipment (faster change of matrix when packing other varieties of hops)
- For this year's season only the production line in Mostecka Str. – processing plant for both pellets type 90 and type 45 will be in operation

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 Methodology of the Protection of Hops for 2011 and 2012 we recorded the enlistment of new preparations:

Newly enlisted:	The name of preparation:	Effective substance:
	Confidor 200 OD	imidacloprid

Discarded preparations of the methodology compared to 2011:

Discarded:	The name of preparation:	Effective substance:
	Aliette 80 WP	fosetyl – Al
	Ridomil Gold Combi Pepite	folpet + metalaxyl M
	Folpan 80 WG	folpet
	Kohinor 70 WG	imidacloprid

C/ System of Control of Pesticide Residuas:

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.

D/ Protection of hops in the Crop year 2012

The protection of hops carried out by our suppliers was subject of the Methodology of the Protection of Hops for the year 2012 and of the List of the Preparations Approved for the Protection of Hops in 2012, 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 with the suppliers an obligatory deadline for sending of the "List" until the 31st March of the every year, we need to know eventual requirements for the adaptation of allowed chemical preparations before that day, preferably up to 28th of February 2013.