

Hop report - crop 2018



1. The situation during the crop year and the quality

A/ Development of the weather and the situation in production 2018

The monthly Hop Reports 2018, regularly published on the web sites of Bohemia Hop, a.s. Žatec - www.bohemiahop.cz are enclosed to this Report. Tables 1 and 2 indicate summarized data concerning the whole vegetation period (April–August) in 2018, compared to the same period of 2016 and to the 30 years' long-term average (1981–2010).

Table 1 – Temperature (°C)

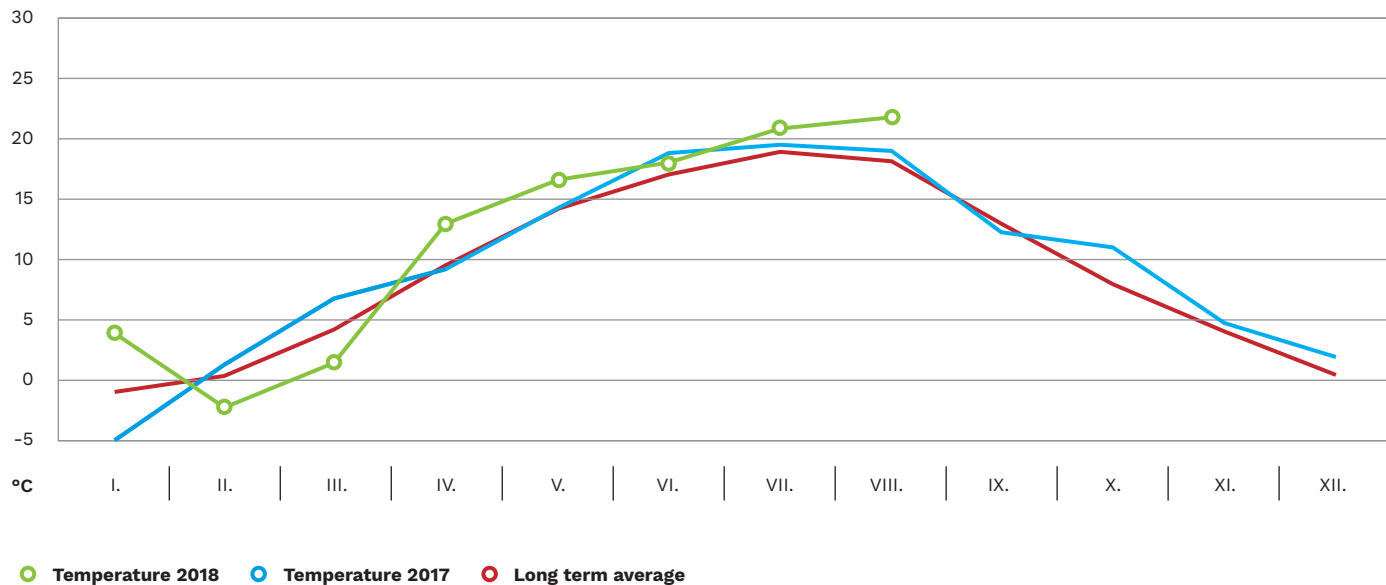
Month	Average temperature		Difference + -	30-years average	Difference + -
	2018	2017			
April	12,60	8,40	+ 4,20	9,10	+ 3,50
May	16,50	14,50	+ 2,00	14,20	+ 2,30
June	18,20	18,90	- 0,70	17,00	+ 1,20
July	21,00	19,70	+ 1,30	19,00	+ 2,00
August	21,20	19,10	+ 2,10	18,30	+ 4,10
Total	89,50	80,60	+ 8,90	77,60	+ 11,90

Table 2 – Precipitations (mm)

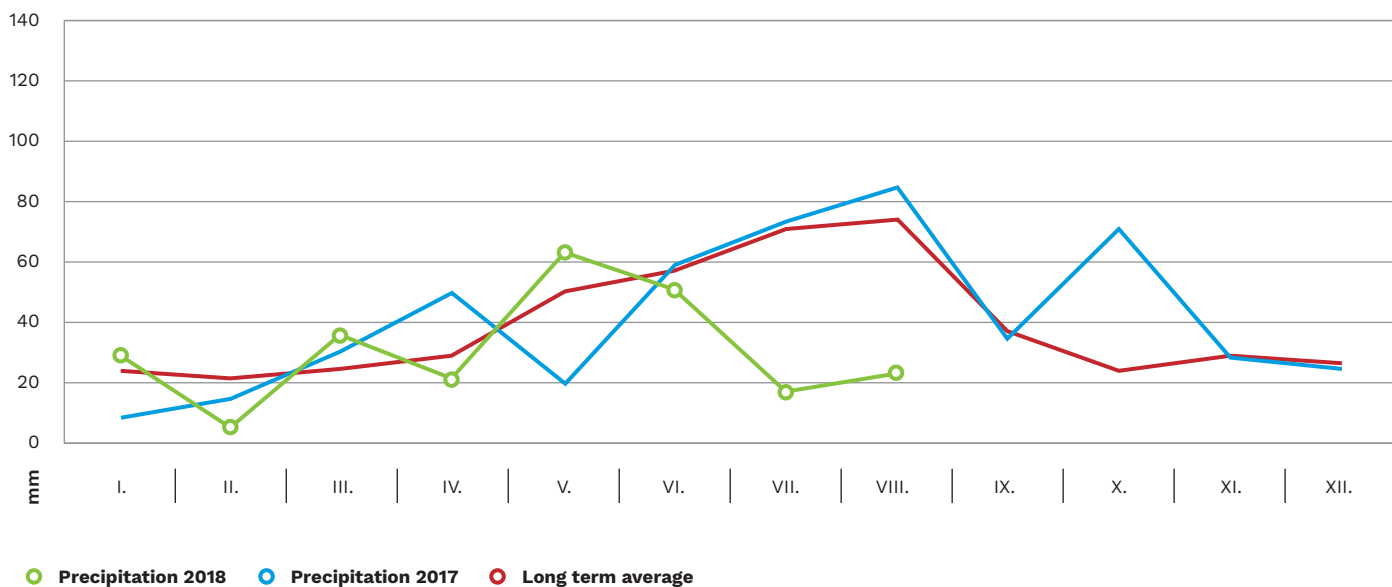
Month	Total precip. per month		Difference + -	30-years average	Difference + -
	2018	2017			
April	21,60	46,40	- 24,80	30,70	- 9,10
May	60,80	21,00	+ 39,80	52,00	+ 8,80
June	52,80	59,40	- 6,60	59,10	- 6,30
July	17,40	72,00	- 54,60	69,40	- 52,00
August	22,00	85,80	- 63,80	70,80	- 48,80
Total	174,60	284,60	- 110,00	282,00	- 107,40

The data indicated above are accompanied by graphs illustrating the average temperatures and the total of the precipitations per month, covering period of January to August, 2018. (Graphs 1 and 2)

Graph 1 – Temperature in 2018 and 2017 compared to a long average



Graph 2 – Precipitation in 2018 and 2017 compared to a long average



Similarly to previous years, the nature of the weather during the first quarter of 2018 was characterized by large differences in the average temperatures of individual months, both in comparison to the same period of 2017 and in comparison to the long-term average. Noticeable differences in temperatures were recorded in January when the average monthly temperature was 8. 1°C higher than in previous year and 2. 7°C higher than the long-term average. This January was the warmest in the last several decades. On the contrary, the weather in February 2018 was very cold and dry. The low temperatures lasted until the beginning of March and together with the negative temperatures of the period between March 17 and March 21, 2018, they influenced significantly the March average temperature.

Nowadays we can state, that the first trimester of this year marked in its own way an anomalous development of the climatic conditions as far as the temperature during the whole vegetation period of hops is concerned. Precipitation in the first trimester of this year was very unbalanced. The lowest precipitation was recorded in February, when it reached only 4 millimetres. As it became a tradition during last several years, the winter was practically without a snowfalls. Such a state, repeating every year, influences very negatively the level of underground water, which is very important for the optimal development of hops, especially for the creation of the root system.

April temperatures were extraordinary above-average. The summer started practically in the second decade of that month. The average temperature was incredibly 3. 5°C above the long-term average. On the other side, the precipitation were below-average (only 70% of long-term average) and out of them only the rainfalls of April 16, 2018, when it rained 14, 0 mm of water, were significant for the hops growing.

The trends of warm weather continued also in May. The average monthly temperature exceeded long-term average by 2. 3 °C. Its level was influenced by high daily temperatures during the whole month and in the last decade of the month also by extraordinary high night temperatures. Although the volume of precipitation in that month was on the level of long-term average, the rainfalls were of the stormy character with a big local differences. On May 22, 2018, the region between the communities Pálec and Dobroměřice was affected by the hail-storm, which damaged the hops of 43 hectares. On May 29, 2018. Then the hail-storm damaged the hops in Sedčice in Saaz region on the area of 20 hectares.

Also June of this year was warmer in comparison to the long-term average. Especially the first half of the month was warm, the night temperatures did not decrease below 10°C. The rainfalls were on the level of long-term average and the average of previous years. The rains of June 1, June 12, and June 28, 2018, were of the importance for the growers. Again, it was stormy rainfall with a great local differences. On June 8, 2018, the area of the community Chrástany was affected by the hail-storm, which damaged the hops on the acreage of 80 hectares.

The state of the weather, adverse for the development of hops, continued also in July and it can be stated, that it even escalated. High temperatures were increasing in a course of the month and the situation was aggravated by absolute lack of precipitation. The maximum daily temperature exceeded the level of 30°C, considered the tropical temperature limit, fourteen times. Concerning precipitation it can be spoken about catastrophe. According to the report of the Czech Hydrometeorological Institute the drought affected the most seriously the region of Louny, among all the regions of the Czech Republic. The soil in that region contained less than 10% of the utilizable water capacity.

Even August did not break out of unfavourable climatic conditions and so it finished the disastrous state of hops in the whole territory of our country.

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

The nature of the weather allowed hop growers to perform spring work in hop gardens in the usual times. The cut of hops took place in normal time but other work operations were influenced by very warm weather in the second and third decades of April, when hops grew rapidly at the first cuts and it was necessary to perform the training of some hop gardens already before the end of April – it concerned not only the hybrid varieties but also the Saaz semi-early red-bine hops. This year, there was a certain anomaly that was unusual, namely that in the same time the hops were cut, the training wires strung and the hops trained in some hop gardens. This situation required increased efforts by the growers on the organizational side, when they had to deploy the labour force operationally to the most important works. Due to the state of vegetation, the introduction of our main variety, the Saaz semi-early red-bine hops, began in late April 2018, whereas last year it was only after May 10.

Continuing record-breaking warm weather speeded up the vegetative development of hops. The training of hops was finished on majority of the hop gardens before May 20, 2018. By the end of month the hops already reached the height of trellis in some hop gardens and somewhere the first signs of blossoming appeared. Such a precipitous development of hops was never recorded before and compared to other years the hops was at least 15 days ahead.

Although very warm weather during the first half of June lead to gradual stopping of the elongation growth of hops, the development of hop plants was still advanced 15days, at minimum. In many hop gardens started the first blossoming during June and in some of them the first hop cones have already appeared. In spite of the stop of the elongation growth majority of hops reached the height of trellis. The difference between the habitus of younger and older hop gardens became evident again in favour of younger ones. View to the present development of hops we deduced, that for the final result of hop production in this year the most important will be the first decade of July. We presumed, that in this period the hops should elongate the lateral shoots in upper parts of the plants and to start the second blossoming.

Unfortunately, our supposition did not come true, but on the contrary. Due to the influence of extremely bad climatic conditions the state of hops in the course of July deteriorated. The development of hops was very unequal. The old hop gardens (over 10–12 years) already created the cones and in fact they were ready for the harvest in a short time. On the contrary, the young hop gardens, under 5 years of the age, only started to create cones and some of them were only blossoming. Based on the prognosis of further period without rains and with high temperatures there were the worries of the drying and non-development of the blooms and possibly also burrs. Under these conditions it was extremely difficult to forecast the quantity of hops to be harvested. Although in case of Saaz semi-early red-bine hops it was possible to predict the below average harvest, the question of the harvest of hybrid varieties remained open. For the growers it was also difficult to decide the time of beginning of the harvest in order that the right timing were optimal view to given state of the hop gardens. The decisive role was played by the age of the hop gardens, the percentage of the hybrid varieties and last but not least also the health state of the gardens. The development of hops in August was absolutely catastrophic and in a modern history of the hop industry never recorded. As a consequence of high temperatures in August and in fact the absence of the precipitation the hops set the cones poorly, did not close them and the underdeveloped blooms dried. The first growers started the harvest on August 4, 2018, and majority of them between August 12 and 15, 2018. Many growers, which produce also other varieties besides Saaz semi-early red-bine hops, e.g. varieties Premiánt, Sládek, Saaz Late, and Kazbek, interrupted the harvest due to unset cones of that varieties.

B/ Chemical protection of the Hops

The chemical protection of the hops in April was concentrated on the elimination of downy mildew of hops (*Pseudoperonospora humuli* Miy et Takah.), Alfalfa snout weevil (*Otiorrhynchus ligustrici* L.) and Flea beetle (*Psylliodes attenuata* Koch).

Downy mildew of hops – in order to eliminate the primary infection in time the growers used the preparation Aliette 80 WG, above all by younger virus free growths. In case of stronger infection pressure it was recommended to repeat the intervention after 14 to 21 days.

Alfalfa snout weevil – it was possible to observe the adult specimens – view to warm weather – already before the time of pruning. The treatment was carried out when the occurrence of beetles reached five individuals on 100 plants. The preparation Actara 25 WG was applied

Flea beetle – the harmfulness threshold of flea beetle is considered when 5 – 10% of the leaf blade is damaged. The preparation Actara 25 WG was used as well.

Beginning of May was not favourable to the dissemination of downy mildew of hops, what became evident also by lower occurrence of spike shoots. The rains of the end of May nevertheless created prerequisites for the development of this pest. It was recommended to carry out the second treatment of hops by the preparation Aliette 80 WG and alternatively by the preparations Curzate or Revus. Concerning hop aphid (*Phorodon humuli* Schrank), whose occurrence was detected on hops around turn of the first and the second decade of May,

the growers were recommended to carry out the treatment by the preparation Tepeki. Very warm and dry weather and very strong incidence of red spider mite (*Tetranychus urticae* Koch) during the harvest of last year were the reasons why the typical symptoms of the occurrence of this pest were observed already in May. The growers were then recommended to carry out thorough monitoring of occurrence of red spider mite and – if necessary – to treat the gardens by acaricide Nissorun 10 WP or Ortus 5 SC or alternatively by Vertimec 1, 8 EC.

Thanks to precipitation in the beginning of the second decade the downy mildew of hops got appropriate conditions for its dissemination. Therefore the conditions for the second spraying against the secondary infection of this disease were met. For the treatment of the hop garden following preparations were recommended: Ortivy, Bellis or Revus and in case of incidence of spike sprouts also the preparation Curzate K. View to the development of hops (stopping of the stretching growth) it was recommended to use the preparation Movento 150 OD against hop aphid already in the second half of June. The existing nature of the weather is optimal for the development of red spider mite, which has appeared very soon in this year. We have already informed about the preparation Movento 152 OD in connection to the liquidation of hop aphid, but this preparation has also good acaricide effect. In the hop gardens where already came up to the overpopulation of red spider mite the treatment by Acramite 480 SC was recommended.

According to short-term prognosis of downy mildew of hops the conditions for the fourth fungicide spraying were not fulfilled. Nevertheless, it was recommended to follow the prognosis of the development of this disease and after exceeding of the index of downy mildew weather to carry out the treatment of the hop gardens by the preparations Bellis, Ortiva, Revus, or Orvego. The occurrence of hop aphid was practically eliminated by the use of the preparation Movento 150 OD, however, due to faster development of hops and stop of the elongation, the effectiveness of this preparation against red spider mite was not on the level to which we were accustomed during previous years. Because of good conditions for the development of red spider mite it was than necessary to treat larger areas against this pest. The preparations Ortus 5 SC and Acramite 480 SC were applied. In spite of these interventions some of the areas were damaged by red spider mite. In August than the hop gardens were treated against the downy mildew of hops by the copper based preparations. Although very warm weather during the first half of June lead to gradual stopping of the elongation growth of hops, the development of hop plants was still advanced 15days, at minimum. In many hop gardens started the first blossoming during June and in some of them the first hop cones have already appeared. In spite of the stop of the elongation growth majority of hops reached the height of trellis. The difference between the habitus of younger and older hop gardens became evident again in favour of younger ones. View to the present development of hops we deduced, that for the final result of hop production in this year the most important will be the first decade of July. We presumed, that in this period the hops should elongate the lateral shoots in upper parts of the plants and to start the second blossoming.

Following Table demonstrates the results of alpha-bitter substances in hops according to individual regions and varieties, as analysed in the laboratory of Chmelařství, cooperative Žatec.

Table 3 – Contents of KH in original material according to varieties and regions (in %)

Region	Saaz	Sládek	Premiant
Saaz	2,95	-	-
Auscha	2,80	-	-
Terschitz	2,90	-	-
Czech Rep.	2,90	4,30	5,10

Obs.: The results of the analyses of other varieties are still not available.

C/ Estimation of acreage and yields according to regions

The harvested acreage in 2018 is shown in following Table. The data indicated were kindly conceded by ÚKZÚZ Žatec (data up to 20th August, 2018).

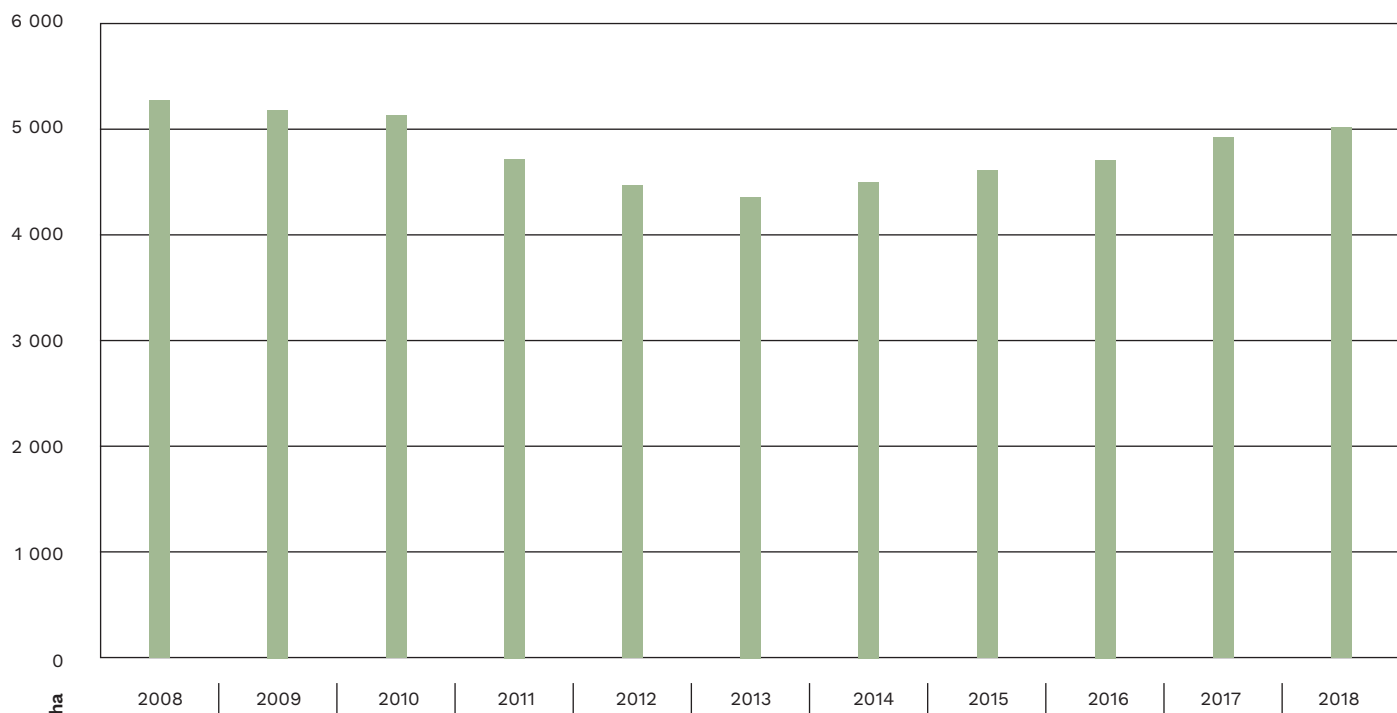
Table 4 – The acreage of hop gardens in the Czech Republic (ha)

Region	up to 20.8.2018	up to 20.8.2017
Saaz	3 856	3 815
of it Saaz var	3 395	3 399
Auscha	535	530
of it Saaz var	458	459
Terschitz	629	600
of it Saaz var	496	468
Czech Republic	5 020	4 945
of it Saaz var	4 349	4 317

The trend of the increase of acreage, although in much lower extent, continued also in this year. In total there were added 75 hectares of hop gardens. Majority of new hop gardens was planted with 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 2008 – 2018.

Graph 3 – The development of the acreage of hop gardens in the Czech Republic



It is very complicated to make the estimations of the production of hops in the Czech Republic in this year, view to differentness of the beginning of the harvest by individual growers, due to interruptions of the harvest because of non-creation of the cones, and due to big variation among the hop gardens. The exact results will be known 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 ÚKZÚZ Žatec.

Table 5 – Estimation of the crop according to regions (total)

Region	Harvested area (ha)	Production (t)	Yield in t per ha
Saaz	3 856	3 590	0,93
of it Saaz var.	3 395	2 890	0,85
Auscha	535	510	0,96
of it Saaz var.	458	410	0,90
Terschitz	629	590	0,94
of it Saaz var.	496	390	0,80
Czech Republic	5 020	4 690	0,93
of it Saaz var.	4 349	3 690	0,85

2. Forecast of the production in the future (2018–2020)

A/ Expected replacement of the varieties and hypothetical production of individual varieties

Table 6 – Comparison as per the variety composition in 2017–2018

Variety	2017 ha	2018 ha	Diff. ha 18/17
Saaz var.	4 317	4 349	+ 30
Agnus	42	42	0
Kazbek	34	34	0
Premiant	165	170	+ 5
Sládek	295	320	+ 25
Saaz late	44	46	+ 2
Saaz special	26	34	+ 8
Others	22	25	+ 3
Czech Republic	4 945	5 020	+ 75

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

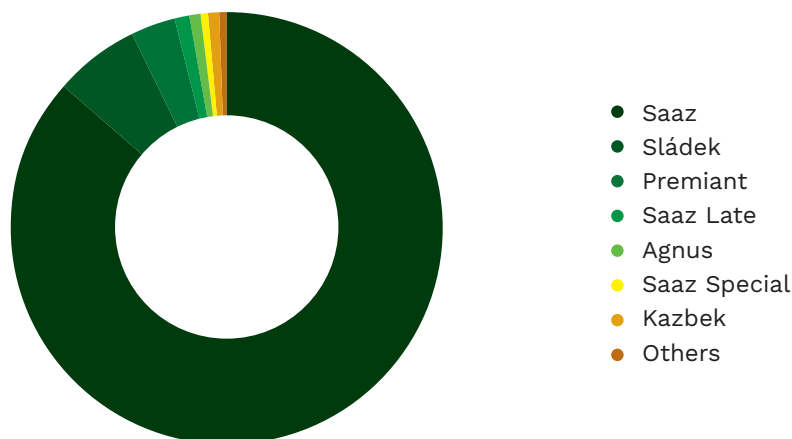
According to the information from the producers of seedlings the growers keep the interest in Saaz semi-early red-bine hop variety and then also in hybrid varieties Premiant and Sládek. Of the bitter hop varieties the most required by the growers is the Agnus variety. The quantity of the ordered rhizomes represents the area of 270 ha in this year. In majority of cases it will be used for the renovation of the growth. We do not expect the enlargement of the of hop gardens in a similar extent as in previous three years. The acreage will increase maximum several tens of hectares per year.

C/ Expected production areas

Table 7 – Composition of individual varieties on harvested area in 2017 and in 2018 (ha)

Variety	area 2017	%	area 2018	%
Saaz var.	4 317	87,30	4 349	86,63
Agnus	42	0,85	42	0,84
Kazbek	34	0,69	34	0,68
Premiant	165	3,33	170	3,38
Sládek	295	5,96	320	6,37
Saaz Late	44	0,89	46	0,92
Saaz Special	26	0,52	34	0,68
Others	22	0,46	25	0,50
Czech Rep.	4 945	100,00	5 020	100,00

Graph 4 – Composition of individual varieties on harvested area in 2018



3. Trends on the hop market

A/ The purchase movement from big buying countries

Crop 2017 was slightly over average as to the harvested volume and average as to the alpha acid content. Despite the fact that previous harvest 2016 was a record one and main customers fulfilled their stocks, crop 2017 found its place on the market. Especially high demand was for varieties Sládek and Premiant. We noted higher demand from middle size and smaller breweries as these breweries are more and more successful on the market with top quality lager brands.

Also in other European countries crop 2017 was very good. Supplies of aroma varieties just met the needs of customers, on the other side supplies of alpha from bitter varieties were lower than needed even if acreage of bitter varieties went considerably up. It seems that there are too much of some flavour varieties as plantation went up more quickly than needs of craft breweries.

Czech farmers continued in replantation of old hop gardens and plantation of new acreage. Namely SAAZ was planted but due to high demand for other Czech registered varieties it would be necessary to increase acreage of these varieties. BHC offered to farmers long term contracts for „new“ varieties.

Crop 2018 seems to be very disappointing due to long lasting high temperatures without water supplies during whole summer period. Now (4th September) it is sure that Czech hop farmers and traders will not be able to fulfil all contracted volumes.

Japan: situation on Japanese beer market does not allow to conclude new contracts.

China: beer brands with Czech hops are running very well, new long term contracts were concluded, higher volumes of all Czech varieties are demanded for future crops.

USA: craft breweries need more and more Czech hop varieties.

A/B, InBev, Asahi Europe: their main brands are still running well and higher volumes are needed for future crops.

B/ The purchase movement of domestic breweries

In 2017 Czech beer industry was very successful in export when new export record was achieved. On the other side domestic consumption went a little bit down. The trend when higher quality beer consumption is increasing and sales of economic brands are decreasing continued. Also off trade was running better than on trade.

Actually there are approx. 420 craft breweries in the Czech Republic and their needs of Czech hop varieties is continually going up.

C) The estimated forward contract ratio

Crops 2019–2021: 100%

Crops 2021–2022: 85%

Crop 2023: 55%

Crops 2024–2025: 30%

4. Quality Control:

A/ The change of technology and packing material for the crop 2018

- the machine for the pressing of the pucks for the small breweries and for the cold beer hopping
- new boiler for the gas operated boiler house for the additional drying of hops
- new vibrational screen for the separation of crumbs of the pellets
- technology for the dust aspiration from the space of the packing machine and the dosing balance
- new surface of the floor in the ground floor of the New Packing Plant
- new surface of the platforms behind the New Packing Plant and the warehouse „Papírny“
- reconstruction of the part of packing for T-45, exchange of all the valves including safety valves

5. Pesticide Residua

A/ Supplement to the instruction regarding spraying 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 2018 and 2017 we registered the inclusion of new preparations in 2018:

Name of Preparation	Active Substance	Effectiveness
Profiler	fluopicolide + fosetyl-Al	downy mildew of hops
Takeo	azoxystrobin	downy mildew of hops
Folpan 80WG	folpet	downy mildew of hops
Pergado F	folpet + mandipropamid	downy mildew of hops
Ridomil Gold Combi Pepite	folpet + metalaxyl-M	downy mildew of hops
VitiSan	potassium bicarbonate	powdery mildew

The preparations excluded from the Methodology 2018 in comparison to 2017:

Name of Preparation	Active Substance	Effectiveness
Kocide 2000	hydroxide Cu	downy mildew of hops

C/ Control system for 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 residues, so that it goes on in compliance with the present trends. Connection to EUROFINS SOFIA GmbH Berlin, an international certified laboratory, continues and in compliance with the facilities of the laboratory we extend also the spectrum of analyses of active substances. Simultaneously, in this year we extended the cooperation with Chmelařský institut s.r.o. Žatec, which is equipped – since 2016 - with new laboratory facilities for analyses of pesticide residues.

D/ Protection of hops in the crop year 2018

The protection of hops carried out by our suppliers was subject to the Methodology of the Protection of Hops for the year 2018 and of the List of the Preparations Approved for the Protection of Hops in 2018, 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 possible requirements for the adaptation of allowed chemical preparations before that day, preferably up to 28th of February of current year.

Prepared by Jaroslav Hájek

Saaz, 3rd September, 2018