

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Economics



Diploma Thesis

Foreign Trade with Hops

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DIPLOMA THESIS ASSIGNMENT

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Economics and Management

Thesis title

Foreign Trade with Hops

Objectives of thesis

Main objective of the thesis is evaluation of foreign trade in hops in practice.

To chart the share of each hop growing region on the overall production and the share of individual hop varieties.

Analysis of the main (hop) export destinations of chosen company, its trade development in last decade.

Evaluation of the future opportunities and threats of trade in hops.

Methodology

Comparison and synthesis of scientific literature

Basic statistical methods

Interviews with specialists

The proposed extent of the thesis

60 – 80 pages

Keywords

Hops, Export, Trade, Czech Republic, Saaz, Beer

Recommended information sources

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Declaration

I declare that I have worked on my diploma thesis titled "Foreign Trade with Hops" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 30.11.2016

Iva Pelikánová

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Zahraniční obchod s chmelem

Souhrn

Tato diplomová práce se zabývá analýzou zahraničního obchodu s českým chmelem. První část práce představuje úvod do problematiky a pojednává především o vývoji chmelařství v České republice na zvolené časové řadě, a to na základě zkoumání změn sklizňových ploch, hektarových výnosů a podílů jednotlivých chmelových odrůd. Druhá část práce pojednává o zahraničním obchodu s českým chmelem, mapuje hlavní importéry a druh zpracování vyváženého chmele. Tři nejdůležitější exportní destinace Čína, Japonsko a Německo jsou podrobněji analyzovány. Je zkoumán vliv směnného kurzu CZK/EUR na objem vývozu chmele do Německa. Třetí část práce se zaměřuje na analýzu zahraničního obchodu s chmelem v praxi na příkladu vybrané obchodní společnosti. Dále je hodnoceno konkurenční prostředí na českém trhu s chmelem a na základě provedené SWOT analýzy jsou pro společnost vyvozeny příležitosti a hrozby do budoucna.

Klíčová slova: Chmel, Žatecký poloraný červeňák, vývoz, zahraniční obchod, pivo, chmelařství, chmelové odrůdy, Česká Republika

Foreign Trade with Hops

Summary

This thesis deals with the analysis of foreign trade with Czech hops. The first part is an introduction to the issue and primarily discusses the development of hop growing in the Czech Republic during chosen time series, based on the examination of changes in the acreage of cultivation areas, average yields and shares of individual hop varieties. The second part deals with foreign trade with Czech hops, maps the main importers of Czech hops and type of hop processing of the exports. Three most important export destinations China, Japan and Germany are analyzed in detail. There is also investigated the impact of the exchange rate CZK/EUR on volume of hops exports to Germany. The last part focuses on analysis of foreign trade in hops in practice on example of selected trade company. Further is provided evaluation of the competitive environment on the Czech market with hops Based on conducted SWOT analysis are drawn opportunities and threats for the company in the future.

Keywords: Hops, Saaz, export, foreign trade, beer, hop growing, hop varieties, Czech Republic

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1 Introduction

Hops, in Latin called *Humulus lupulus* L., belong to a group of perennial plants which are able to remain on the same site from 20 to 25 years. Czech Republic belongs to the world leaders in the cultivation of this plant. In the Czech Republic, hops are grown in the three hop growing regions. They are as follows: Saaz, Auscha and Tirschitz. Just the Saaz hops is the most respected aromatic hops in the World. The most important hop variety grown in the Czech Republic is Saaz, which covers majority of the total domestic hop growing area. Other varieties of Czech hops include Sládek, Harmonie, Bor, Premiant, Agnus, Kazbek, Saaz Late, Bohemie and Saaz special.

Saaz belongs with its quality to world leaders, which originated and was naturally selected on the conditions of today's hop-growing areas. Saaz hop is considered to be the standard of quality and all the other varieties are compared with the quality of Saaz hops. Since 1998, organized by the Saaz Hop Institute Ltd., International tastings at which all varieties are tested and compared with the Saaz hops held. After the amendment of the hops law in 1995, it became possible to cultivate also other hop varieties than just Saaz. Despite its success, these varieties were grown at a significantly smaller area than Saaz hops. Saaz is grown up to 87 % of the hop growing area in the Czech Republic.

Up to 80 % of the hop produced quantity is exported abroad. The biggest consumers of the Czech hops are Japan, Germany, China and Russian Federation. Czech Republic ranks amongst the leading and most respected producers of hops in the World. The area of the Czech Republic for the production of hops occupies approximately 9.4 % of the world's hop growing area. The biggest hop-producer in the world is currently the USA followed by Germany and the Czech Republic.

For the future of the Czech hop growing it is essential to succeed in international competition. These days it is important to adopt a number of actions relating to the production, processing and especially market knowledge for the development of trade. Core goal is to achieve higher and more stable revenues. For the economic growth of hop production is necessary to stabilize the rising costs and to restore the old forests hops.

Nowadays, the Czech hops industry is supported by grants and subsidies from the state, such as TOP – UP, which are national additional payments to direct aid, further SAPS - the single area payment, EAFRD - European Agricultural Fund for Rural Development 2007 – 2013 and also the STATE AID - support from the state.

2 Objectives and Methodology

2.1 Objectives

Main objective of this thesis is to analyze foreign trade in hops in practice. Main target is divided into several intermediate objectives, they are as followed:

- Evaluation of development of the Czech three hop regions in terms of hop acreage, average yields as well as the share and development of the most spread hop varieties in particular hop regions.
- Provide an analysis of the export destinations for the Czech hops.
- Examine if volume of exported hops to Germany depends on the exchange rate CZK/EUR.
- Analyze trade in hops of chosen company, evaluate its strengths, weaknesses, opportunities and threats in the future; assess position of the company on the Czech hops market according to the competition.

2.2 Methodology

The thesis consists of two main parts:

- Theoretical part is prepared under comparison and synthesis of scientific literature and specialized internet sources.

In practical part:

- Analysis of the time series is used to evaluate the development of acreage and average yields of hop gardens in particular hop regions in period from 2002 to 2015;
- With a help of Simple linear regression and correlation analysis is examined the dependency of volume of exports to Germany on the development of exchange rate CZK/EUR;
- SWOT analysis is used to assess strengths, weaknesses as well as opportunities and threats and the Porter's Five Forces analysis helps to identify various subjects in the competitive environment of chosen trade company;
- Interviews with specialists are used as additional source of data by elaboration of the development of trade in hops of the chosen company.

3 Hop growing in the Czech Republic

3.1 History of hop growing in the Czech Republic

Hops were known as a wild growing plant in the antiquity. Its use as a cultured plant appears first in the Middle Ages.

At the beginning, hops were used as an herbal curative. This is proven by numerous records in old herbaria. Flavoring and conservation of barley beer was first practiced by eastern Slavs. Czech hops industry has a long and storied tradition. Historical records about growing hops go back to the 11th century. Written records about establishment of Czech abbeys from 1086, 1092 and 1100 confirm that even then hops were cultivated in Bohemia and the abbeys were always brewing good beers. According to written records, hops were exported from Bohemia at the beginning of the second millennium into the neighboring countries. Equally in Moravia, hops' growing was expanded already in the 13th century.

Hops cultivation has really grown under the rule of King Charles IV., who was aware of the excellent quality of the Bohemian hops. This is substantiated with the ban on exports of Bohemian hop plants under the penalty of death. During the ensuing centuries, hop growing in Bohemia and Moravia varied between more and less successful. These times were mostly related to economic and political situation in Europe.

During the 20th century, the growth of the Czech hop industry has begun. It was managed thanks to Karel Osvald, who provided the basis for specialized hop research.

Nowadays, hops cultivation in the Czech Republic is divided into three areas. In Bohemia, there are the Saaz and Auscha regions and the Tirschitz region lies in Moravia. The greatest growing area is taken by the traditional "Saaz fine aroma hops". Since 1987, newly Czech-developed hops' hybrids are also being cultivated.

Czech hops are without a doubt an agricultural commodity with the longest tradition. Perhaps there is no one in the brewing and the hop industry, who does not know Czech hops, represented by the Saaz fine aroma hops. The optimum composition of bitter and aromatic substances of this variety gives beer its specific pleasant bitterness. Its basic characteristic is the very fine hop aroma. The quality of the hop aroma depends not only on the genetic origin of the variety, but also on the unique climatic and soil conditions of the hop growing regions.

3.2 Hops and its importance

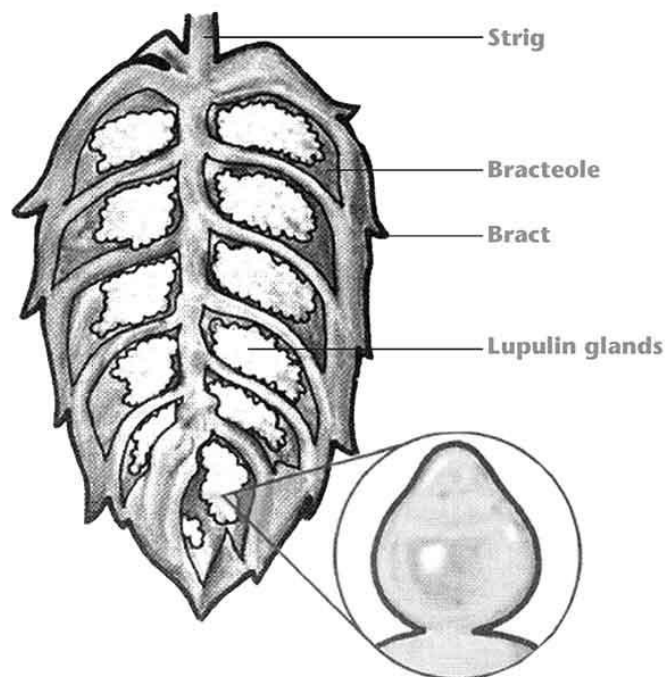
Hops are important technical crop, grown for harvest of the hop cones. Hop cones represent a basic raw material during beer brewing. Just the hop cones give the beer its characteristic bitter taste and crucially contribute to the overall beer flavor while acting as a preservative. Only a small part of the hop production is used in cosmetics and pharmaceutical industry.

The shape of hop cones is very variable. They may be of ovoid, round, conical, cylindrical or transitional shape. Cones grow to an average length from 15 to 35 mm. Their basic color is green, which may be affected by external (natural) influences.

Hop resins

From the brewing point of view, the most important ingredient in the hop cones are the hop resins because they are source of bitter flavor of the beer. It is a mix of very hardly soluble substances. The total resins are divided into soft and hard hop resins.

Picture 1 – Cut through a hop cone



Source: <https://s3-us-west-2.amazonaws.com/homebrewassoc/wp-content/uploads/2015/04/hops1.jpg>

Hop tannins

Hop tannins have previously been considered as harmful ingredients in hops. The tannins are represented in hop cones and subterranean parts of the hop plant. During maturation of the hop cones the tannin content decreases, while the content of resins and oils rises.

Hop oils

Hop oils are a mixture of hydrocarbons and oxygenated terpene series. Hop oils are practically insoluble in water, but easily volatilized with steam. Because of this fact it is not applied in the production of beer by the processing of fresh hops. More than 90 % of the total amount flows out during the hop boiling. Hop oil is applied only during the business assessment of hops. There can be also recognized by the smell, to which group a certain hop belongs.

Accompanying substances and water

Besides resins, tannins and hop oils, hops contain many other substances such as sugars, nitrogenous compounds, lipids, sulfur dioxide, heavy metals and many others. These hop components do not significantly affect the brewing technology and the quality of beer. Heavy metals are getting into hops mostly by various spray substances for the protection of hops. In the production of wort, they are mostly absorbed into the bitter sediments.

Hop cones are mostly made up of water. In freshly harvested cones the water content varies between 76 and 80 % of the hops. Immediately after drying the share of water varies from 5% to 7 %. After drying, the humidity is adjusted back to 11 % or 12 %. It is necessary for further manipulation with the cones because at moisture content below 10 % can be the cones easily broken.

3.3 Hop growing regions in the Czech Republic

In the Czech Republic it is the hop cultivation concentrated in three hop regions: Saaz, Auscha in Bohemia and Tirschitz in Moravia. Extraordinary climatic and soil conditions clearly contribute to exceptional aromatic character of the Czech hops.

Largest and best known Czech hop growing area is the Saaz region. Cadastral territory consists of the city districts of Louny, Rakovník, Kladno, Chomutov, Pilsen-north and Rokycany. Nowadays there are no longer grown hops in the districts of Pilsen-nord and Rokycany.

Majority of soils located in Saaz region are known as Permian red. Their main positive is a high content of minerals. For the fine aroma hops are therefore ideal and contain particularly iron and manganese compounds. Other types of soil encountered in this area are then brown soils (highland slopes of Džbánské), alluvial soils (Ohře river

valley and its tributaries) and rendzinas (partly in Džbánské Highlands). Climatic conditions rank the Saaz region to slightly warm and dry areas. Average temperature in Saaz moves at 8.5 degrees Celsius, the average length of sunshine 1800 reaches hours a year. Annual rainfall is 441 millimeters a year and the growing period falls averaging around 260 millimeters.

Picture 2 – Map of the hop growing regions in the Czech Republic



Source: Maier, 2015, Economics of Brewing Industry (VI) – hops

Auscha hop area is immediately adjoining to the Saaz region and includes cadastral areas in the districts of Litoměřice, Česká Lípa and Mělník. The brown soils prevail, rarely appear black soils. The annual rainfall is 489 mm, in the growing season around 284 mm.

Tirschitz region is situated in the Moravian districts of Olomouc, Přerov and Prostějov. There are typical brown soils, usually deep, moderate heavy, aluminum, but also clay soils. Annual rainfall is 600-650 mm. Most of the hop gardens are planted at an altitude of 260-300 meters above the sea level.

3.3.1 Protected Destination of Origin

The Regulation No. 2081/92 from 14th July on the Protection of Geographical Indications and Designations of Origin for agricultural products and foodstuffs regulates two particular groups of protected geographical names: designations of origin and geographical indications.

Protected Designation of Origin (PDO) means the name of a region, a specific place or, in exceptional cases, a country, used to describe an agricultural product or a foodstuff:

- originating in that region, specific place or country,
- and the quality or characteristics of which are essentially or exclusively due to a particular geographical environment with its inherent natural and human factors, and the production, processing and preparation of which take place in the defined geographical area.

The European Union provides via Regulation No. 2081/92 the protection of designation of origin and geographical indication of selected regional agricultural products whose reputation extends beyond national borders and helps the promotion of these products. On the base of Regulation No. 503/2007 from 8th May 2007 the designation ZATECKY CHMEL (PDO) was registered in the List of Protected Designations of Origin and Protected Geographical Designations. In the European Union this is the first given designation for hops and one of the first designations given to Czech agricultural or food products.

The mark ZATECKY CHMEL can only be used for fine aroma hops of Saaz variety (all its registered clones) grown in Zatec (Saaz) hop growing region. As ZATECKY CHMEL (SAAZ HOPS) can be designated only these clones of the Saaz variety: Lucan (registration in 1941), Blato (1952), Osvald's clone 31 (1952), Osvald's clone 72 (1952), Osvald's clone 114 (1952), Sirem (1969), Zlatan (1976), Podlesak (1989) a Blsanka (1993).

3.3.2 Saaz hops and proof of its origin

Hops in the Czech Republic are subjected to certification according to Act No. 97/1996 Co., about hop protection and also to Regulation of EU (Counsel Regulation 1952/2005, Committee Regulation 1860/2006). The institution accredited for certification of hops in Czech Republic is the Central Institute of Supervising and Testing in Agriculture (further only Institute).

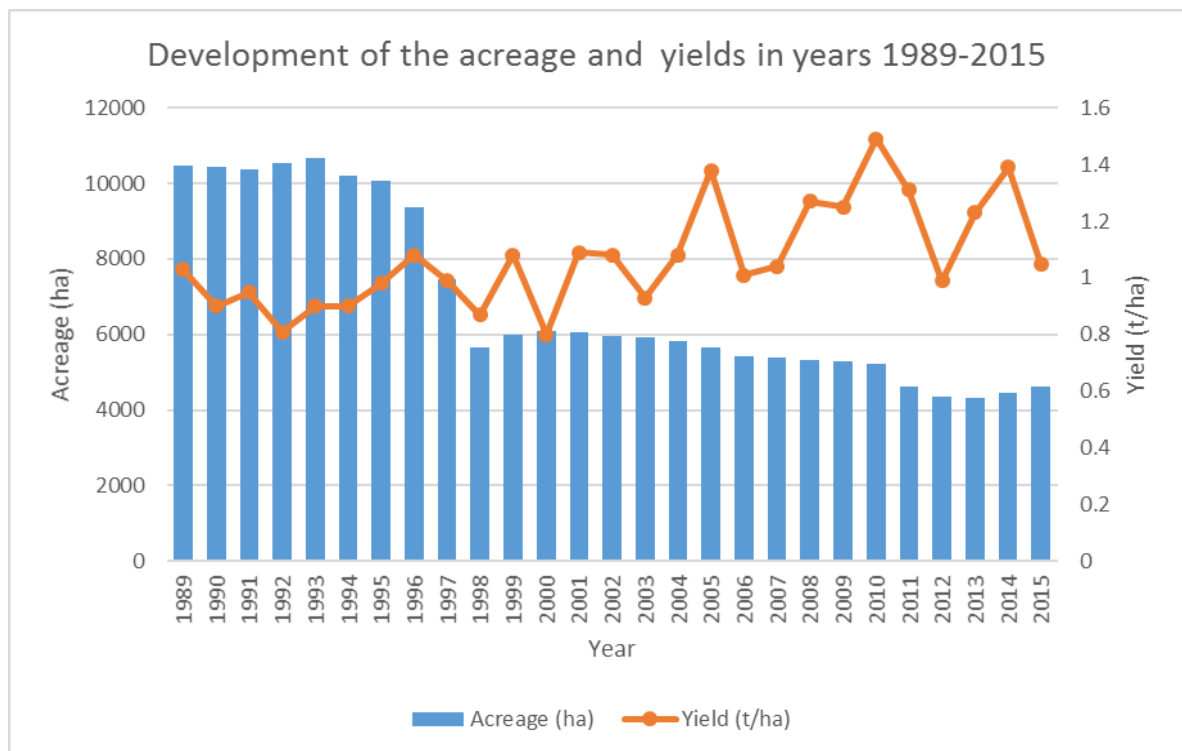
The certification of origin is guaranteed by process which is regulated by law. Hops is labeled, weighted, numbered and sealed according to cadastral district of origin and type of varieties. The Institute does verifying of labeled hops and hops products with a written verifying document (certificate of origin) and assures checks for fulfilling of responsibilities set by Act about hop protection and by Regulations of European Community.

3.3.3 Development of hop-growing areas in the Czech Republic

In general, there is a persistent mismatch between supply and demand for hops. Worldwide, the acreage of hop growing area has a downward trend, which is caused mainly by the overproduction of hops. Hops growers are therefore having marketing problems. The most affected are aromatic hop varieties in Germany, Slovakia, Poland, Czech Republic and some other states.

Over the past 15 years has the acreage of hop gardens in the Czech Republic decreased by 49 %, the most affected was the main grown hop variety - Saaz. Czech aromatic hops were particularly disadvantaged because of low prices for bitter hop varieties. The development is also influenced by the exchange rate of the Czech Crown and reducing the amount of hops used during beer brewing by the breweries.

Graph 1 – Development of the acreage and yields of hop gardens in the Czech Republic



Source: Ministry of Agriculture, Situační a výhledová zpráva: Chmel, Pivo, 2015, Own elaboration.

The graph 1 shows the development of hop cultivating areas in the Czech Republic from 1989 to 2015. There is a noticeable crucial turning point from 1995 to 1998. According to the hop growers, this change was caused by the response of American breweries and the attempted privatization of brewery Budweiser Budvar. After this

unsuccessful effort they stopped buying Czech hops and in connection with the mentioned overproduction has the problem begun.

With the ever increasing integration and interconnection of markets we can see how deeply our society is dependent on other countries, processes and events. The latter shocks (1995 - 1998) are closely connected with the development of the global hop market. In a given period they reflect the ever-increasing globalization, the rapid development of new technologies, changes in the consumer basket and other significant aspects.

3.3.4 Hop varieties grown in the Czech Republic

These days there are more than 15 hop varieties grown in the Czech Republic. There are Saaz varieties and hybrid varieties.

All the world's hop varieties are divided into four groups:

- Fine aromatic hops of bitter acids from 2.5 to 4.5 % (for example the Saaz and its clones).
- Aromatic hops with bitter acids containing up to 7.5 % (Sládek, Perle and German Hallertau).
- Bitter hops contain bitter acids with up to 10 % (in the Czech Republic f. e. Bor).
- High alpha hops containing more than 10 % of bitter acids (Premiant, Magnum).

3.4 Saaz hops and its use

The variety Saaz is the most important one. It is grown up to 87% of the hop-growing area in the Czech Republic. It was named after the Czech city of Žatec (German: Saaz). Saaz has a very distinctive flavor. When used in beer, the resultant aroma is very mild, earthy, herbal and spicy. This hop is generally used for Bohemian style Lagers and Pilsners.

Saaz is characteristic by its delicate hop aroma, soft spindle, low content of Myrcen and balanced content of Alpha and Beta acids. The composition of hop resins is specific by relatively low content of Alpha-bitter acids in the range of 2.5 up to 5.5 %. The content of Beta-bitter acids is higher than content of Alpha-bitter acids, their mutual share is in range of 0.60 – 0.80. The content of Myrcen is in the range of 25 % – 40 %. Other typical feature is a high amount of Beta-farnesene (14 % - 20 %) in content, which is in minimal amount

in content in another hop. The overall character of aroma of Saaz hops is set by mutual share of particular components of hop essential oil.

Saaz Hops has changed the world of brewing forever, as it is an esteemed and honored variety that helped to define beer styles such as the European Lagers and Bohemian Pilsners. Saaz is a natural variety from Czechoslovakia (Czech Republic) that originated from the area around the town of Saaz which lies in the North-West of Bohemia. This hops is also grown in Belgium and the United States and has several descendants from New Zealand including Motueka (B Saaz), and Riwaka (D Saaz). The Czech Saaz is highly sought after for use in Czech Pilsners, Lagers, and European and Belgian styles of these types of beer.

All Czech hops are designated, certified and then supervised by Central Institute for Supervising and Testing in Agriculture (issues essential certificate of origin).

3.5 Other hop varieties grown in the Czech Republic

Besides the Saaz in the mid-nineties, Czech hop growers were able to introduce also other hop varieties. In 1995, the List of accepted hop varieties was expanded to include these varieties: Bor and Sládek in 1996, the variety Premiant in 2001, Agnus in 2004, varieties Harmony and Rubín in 2007. These varieties meet the requirement of higher content of alpha bitter substances and higher yield, while their other features are qualitatively similar to traditional Saaz hops. New varieties seem to be particularly suitable for the so called "Second hopping" and in the case of variety Agnus also for the first hopping.

In 2008, there were two newly registered hop varieties. The first one is Kazbek, a variety of aromatic type suitable for example for the second hopping, not only in traditional domestic types of beers, but also foreign ones. Kazbek is also used for cold hopping for their specific spicy - lemon flavor. This variety is categorized into category called flavor hops. The second variety registered in 2008 is called Vital. This bitter variety is grown especially for pharmaceutical and biomedical applications (high content of xanthohumol or DMX). In the brewing industry is used for the first and second hopping and categorized into the category of "dual purpose".

In 2010, other two hop varieties were registered. Saaz Late variety is slightly aromatic type and exhibits, thanks to its origin from the Saaz variety, very similar brewing

properties like the Saaz. Unlike the Saaz, Saaz Late achieves a higher yield. It is also suitable for second and third hopping. Variety Bohemia belongs to the group of aromatic hops and their genetic origin is part of varieties Sládek and Saaz.

3.6 Saaz hops substitutes

As already mentioned, Czech Saaz hops is recognized as one of the best hops in the World thanks to its characteristics. Because the price for the Saaz hops is high on the global market, some other countries (USA, Poland) seek to grow its substitutes.

Saaz (U.S.) Hops

U.S. Saaz Hops was taken as seedling from the venerated Saaz Hops of Czechoslovakia.

Saaz Hops from the United States carries the same esteemed qualities as its European counterpart including a low alpha acid content of 3.0 %-4.5 % with a low alpha beta ratio of 1:1, giving a mild smooth bitterness in beers. The aroma in U.S. Saaz is earthy, with a mild spice, and comes from balanced essential oils including farnesene.

U.S. Saaz is difficult to grow in the United States and is low on the production side. The small loose hop cones are difficult to harvest after a weak growing cycle. It is still common to find the U.S. variety of Saaz in commercial beers, and they are mainly used in Lagers and Pilsners.

Lublin (Lubelski) Hops

Lublin, or Lubelski, Hops joins Marynka Hops as being one of Poland's most widely grown hops. Poland has roughly 2,500 hectares of hops which is mostly grown around the city of Lublin, including Pulawy. Lublin was bred from the Saaz and carries with it many of the same characteristics.

Lublin Hops is an aroma variety with an alpha acid rating of 3.0 %-5.0 %. Lublin is compared to the noble varieties, and has a long tradition in Polish brewing. It has very high farnesene oil content, which itself has hints of magnolia and lavender. As for Lublin hops, there is pride for its aroma in the region, and it has made its way around the world in various beers.

Lublin Hops is on the very low side as far as yield pulling in 900-1250 lbs/acre after a moderate growth cycle. The medium size loose cones harvest early and Lublin Hops has

tolerance to Downy Mildew. This variety is mostly used in Lagers, including Strong Lagers, but can be found in various Ale styles as well.

Sterling Hops

Sterling hops was developed in 1990 is a diploid variety bred from 21522F and 21361M. In the end Sterling Hops ended up as 1/2 Saaz (Saazer) Hops, 1/4 Cascade, 1/8 64035M (German Aroma X Open Pollination), 1/16 Brewers Gold Hops, 1/32 Early Green, and 1/32 unknown. Sterling Hops was released in 1998.

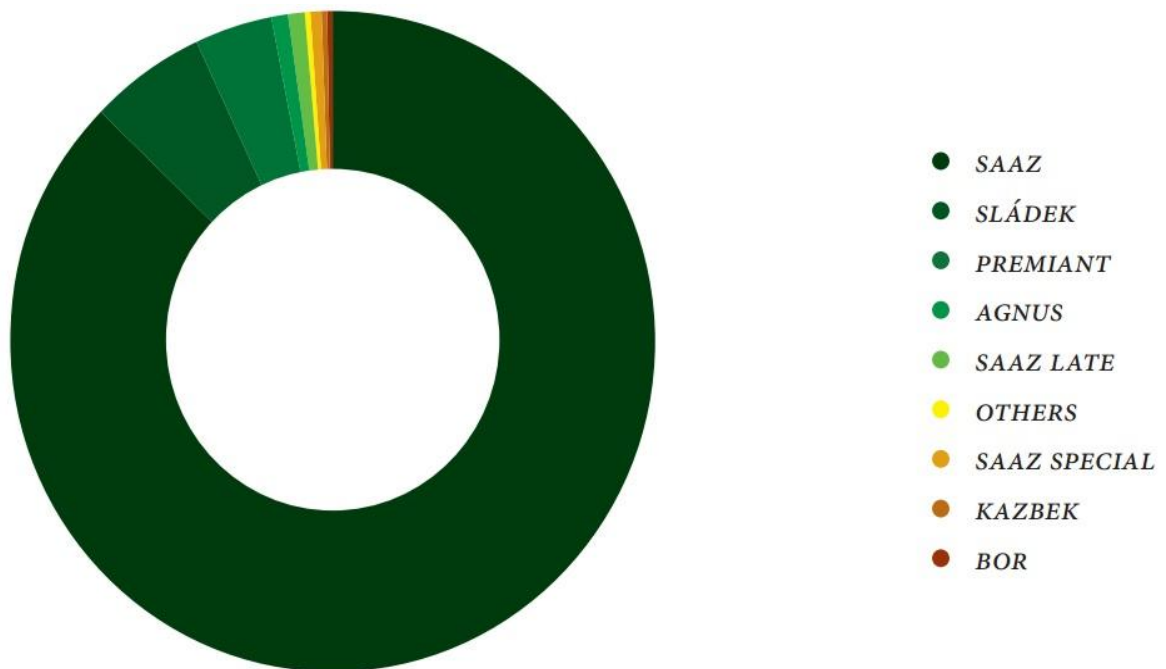
Sterling Hops is a dual use variety and the range of the alpha acid content is 4.5 %-9.0 % with it likely ending up on the higher side of that scale. Sterling has a low to moderate co-humulone content as well and is sometimes dubbed as a noble variety. Sterling is compared to Saaz in many ways and brings a choice delicate bitterness. The oils lay in a unique pattern with very high content for farnesene, elevated myrcene and humulene and lower than most varieties for caryophyllene oil. The result is a slightly spicy fragrance with a herbal floral punch with notes of citrus.

Sterling Hops is a relatively good yielding hops plant on the global scale and yields 1800-2000 lbs/acre. This is moderate for the Northwest U.S. varieties. The medium size compact hops cones are harvested mid-season after a moderately vigorous growing cycle. Sterling Hops was bred as a replacement for Saaz which has both a low yield and susceptibility to disease and fungus. Sterling hops, however, overcame both and is tolerant to both Downy Mildew as well as Powdery Mildew. Sterling hops is a popular variety for beer, largely in the U.S. craft brewing market. It is a versatile hops variety and stays true to its diverse heritage. Sterling Hops is well suited for beer styles such as American Ales, Czech Lagers and Pilsners, and Belgian Style Ales.

3.7 Czech hop regions and its current hop varieties

The Saaz variety occupies the largest part of the acreage in all hop regions across the Czech Republic. Sládek and Premiant are the second and third most common variety. Agnus, Saaz Late and Kazbek are also grown almost in every region, but their acreage is so far quite small.

Graph 2 – Proportion of hop varieties in the Czech Republic



Source: Hájek, 2015

From the table 1 is evident, that the traditional Saaz is a variety with the lowest yield per hectare in all Czech hop growing regions. New varieties, such as Agnus and Kazbek belong to the varieties with the highest yield per hectare. However, their share in the total production is small due to its limited cultivation area.

Average yields per hectare are distinctly the highest in the Tirschitz region. All hop varieties (except Kazbek in Auscha region) grown in this region achieve higher yields than elsewhere. In general, the least profitable region in the Saaz followed by Auscha. It is important to consider the total acreage of hop gardens. Saaz region occupies over 77 % (3576 hectares in 2015) from the overall cultivating area of 4622 hectares. Production of the Saaz region accounted for nearly 72 % (3469 tons) of total Czech production in absolute numbers.

The table below shows all the Czech hop-growing regions, a list of hop varieties, the acreage of growing area in hectares, production of hops in tons and also the average yield in tons per one hectare. All data is valid for 2015.

Table 1 – Comparison of yields of the Czech hop varieties and hop-growing regions (2015)

Hop-growing area	Hop Variety	Area (hectare)	Production (ton)	Average Yield (ton/hectare)
Saaz	Saaz	3190	2894	0.91
	Sládek	163	277	1.7
	Premiant	100	137	1.37
	Agnus	35	64.3	1.84
	Saaz Late	32	35.2	1.1
	Kazbek	12	20.2	1.68
Saaz – total		3576	3469	0.97
Auscha	Saaz	433	495	1.14
	Sládek	22	36	1.62
	Premiant	37	55	1.48
	Agnus	3	5.7	1.89
	Kazbek	2	5.3	2.66
Auscha – total		497	597	1.2
Tirschitz	Saaz	416	514	1.24
	Sládek	82	172	2.1
	Premiant	43	76	1.77
	Kazbek	5	9.9	1.98
	Saaz Late	2	3.7	1.86
Tirschitz – total		549	777	1.39
Czech Republic	Saaz	4039	3903	0.97
	Sládek	267	485	1.81
	Premiant	180	268	1.49
	Agnus	38	70	1.84
	Saaz Late	34	38.9	1.14
	Kazbek	19	35.4	1.86
Czech Republic – total		4622	4843	1.05

Source: Czhops.cz, Own elaboration.

3.8 Analysis of the development of acreage and yields in the Czech hops regions

Data is studied by the use of time series analysis. Full data set is provided in the appendix. For the analyses are always used the main hop varieties that are being cultivated for a longer time period (at least since 2002) on an area larger or equal to 35 hectares.

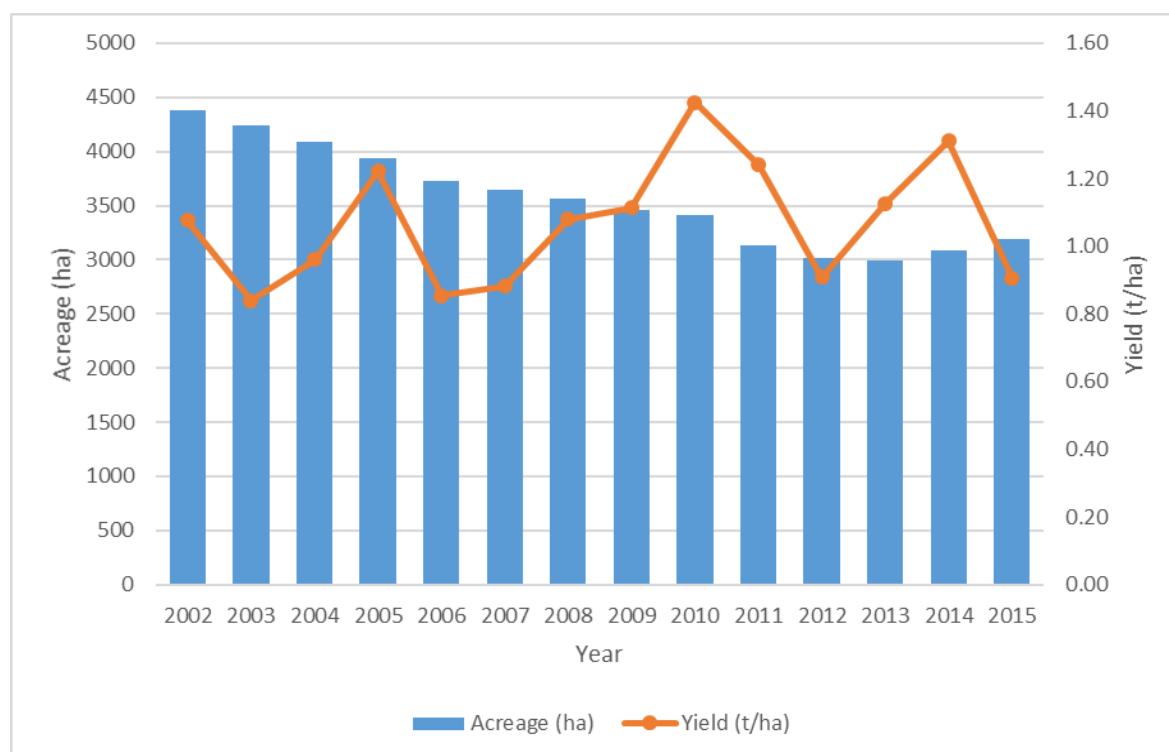
3.8.1 Saaz region

The Saaz region is the most important hop region in the Czech Republic given the size and the share on the production of hops. The most widespread hop varieties are as followed: Saaz (3190 ha), Sládek (163 ha), Premiant (100 ha) and Agnus (35 ha).

Variety Saaz

Hop variety Saaz in the Saaz region nowadays occupies an area of 3190 hectares, which is about 89 % of the total hop gardens in this region. According to observed data, since 2002 its acreage was slowly decreasing from year to year. The decline amounted to over 1000 hectares during last 15 years. Just in 2015 the acreage of hop areas started to grow again. Yields per one hectare strongly depend on the weather during the hops vegetation cycle, as well as on the age of the hop gardens. It is possible to observe quite sharp growth of productivity (yield per hectare) in 2010 with a slight decline in the following year and other significant slump in 2012. Variety Saaz contributed with a yield of 2897 tons to almost 84 % of hop production of this region. However, the average yield in 2015 was one of the worst ones during observed time series, reaching only 0.91 ton/ha.

Graph 3 – Development of the acreage and yields in the Saaz region, Saaz variety

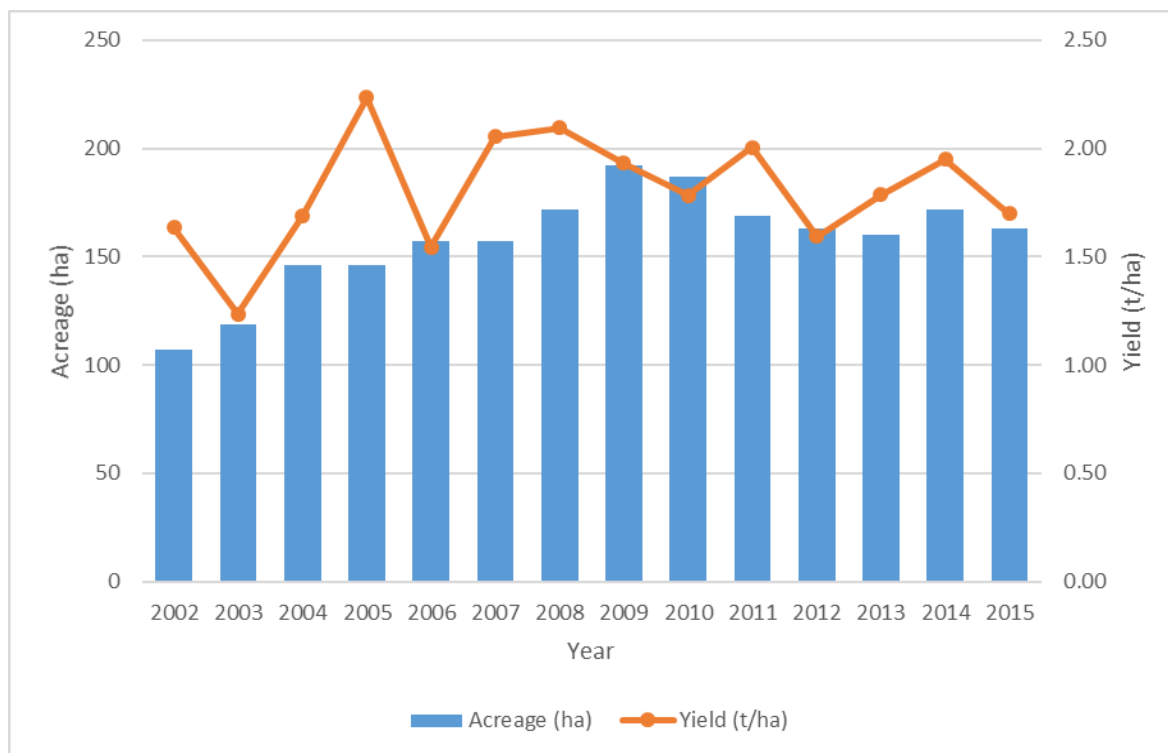


Source: Own elaboration.

Variety Sládek

Sládek is the second hop variety considering its current position according to its spread in the Saaz region. Sládek belongs to varieties with a higher profitability in the view of yields per hectare. In 2002, this variety occupied an area of 107 hectares with some fluctuations on the both sides (either slight increases or falls) resulting in current 163 hectares. In absolute terms, Sládek covers only 4.5 % of the Saaz hop area, but its share has reached 1.52 multiple of the acreage in 2002. Variety Sládek contributed with a yield of 277 tons to 8 % of the production in the Saaz region. As well as in the case of the Saaz, average yield in 2015 was low for this variety (1.7 ton/ha).

Graph 4 – Development of the acreage and yields in the Saaz region, Sládek variety



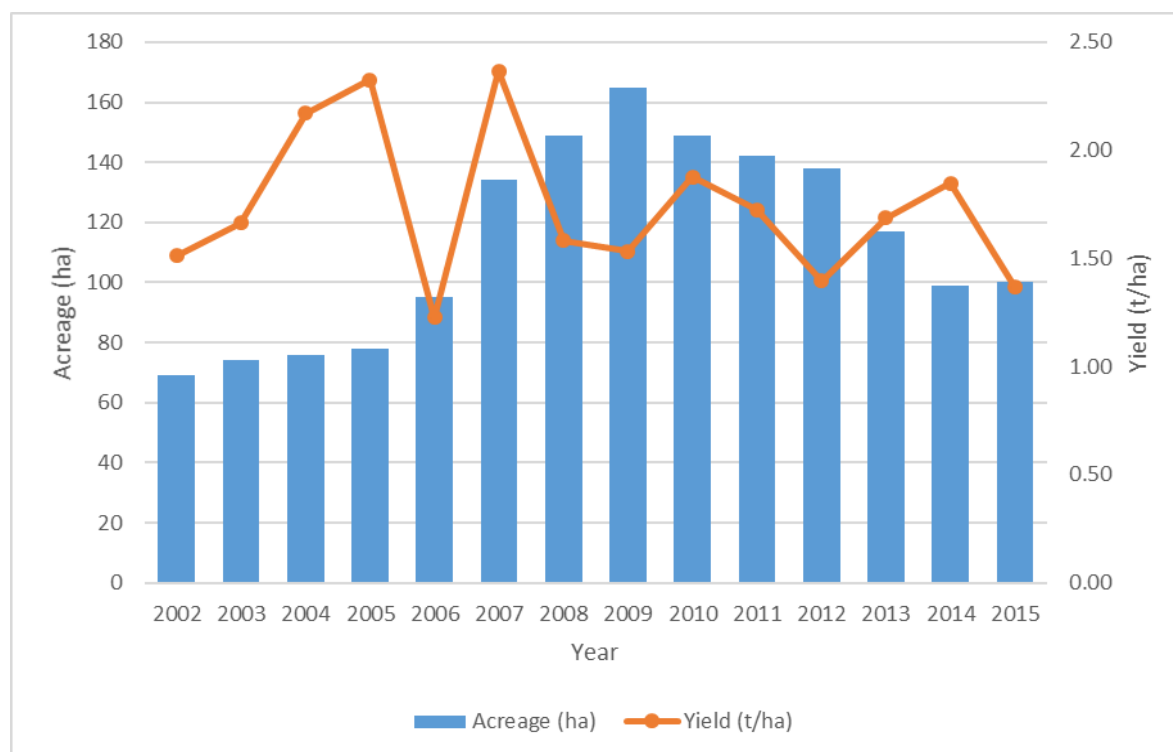
Source: Own elaboration.

Variety Premiant

Premiant is another important hop variety grown the region of Saaz. Its area experienced a significant growth from 2007 to 2009 reaching its peak of 165 hectares in 2009. After this year a gradual decline began. In 2005, the acreage of Premiant amounted 100 hectares which is similar to the value before the growth in 2006. Regarding profitability, there are large swings observed in particular years. In 2015 this variety covered less than 3 % of the cultivated area and contributed with 137 tons to approx. 4 %

of the regions' production. The crop year 2015 was also not suitable for this variety with a result of 1.5 ton per hectare.

Graph 5 – Development of the acreage and yields in the Saaz region, Premiant variety

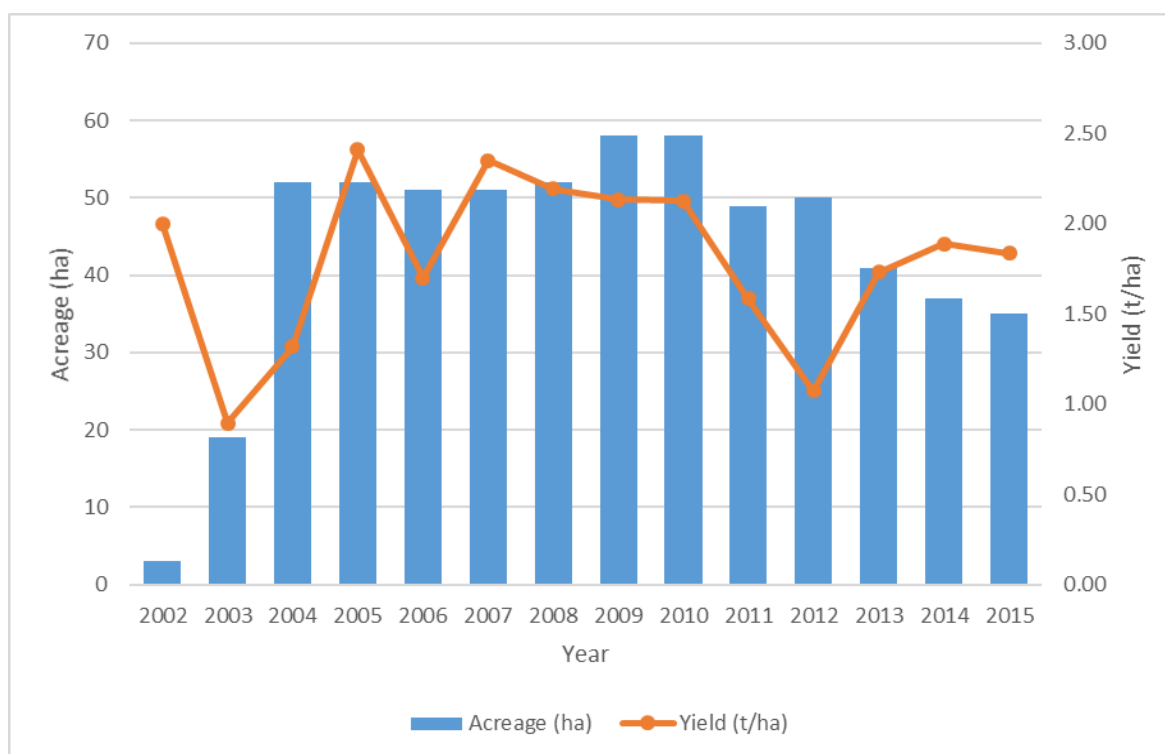


Source: Own elaboration.

Variety Agnus

Agnus is the last variety in the Saaz region which is being stably grown since 2002. These days Agnus covers an area of 35 hectares of hop gardens. However, this variety has undergone a powerful rise in 2004 reaching its top in 2010 (58 hectares). Thenceforth only year-to-year decreases were recorded. In the terms of average yields, Agnus is quite volatile but is able to reach high yields in case of favorable weather conditions. Unlike other varieties in the region of Saaz that were examined, in 2015 Agnus reached a yield of 1.84 ton/hectare. It was the best result from all hop varieties cultivated in this region.

Graph 6 – Development of the acreage and yields in the Saaz region, Agnus variety



Source: Own elaboration.

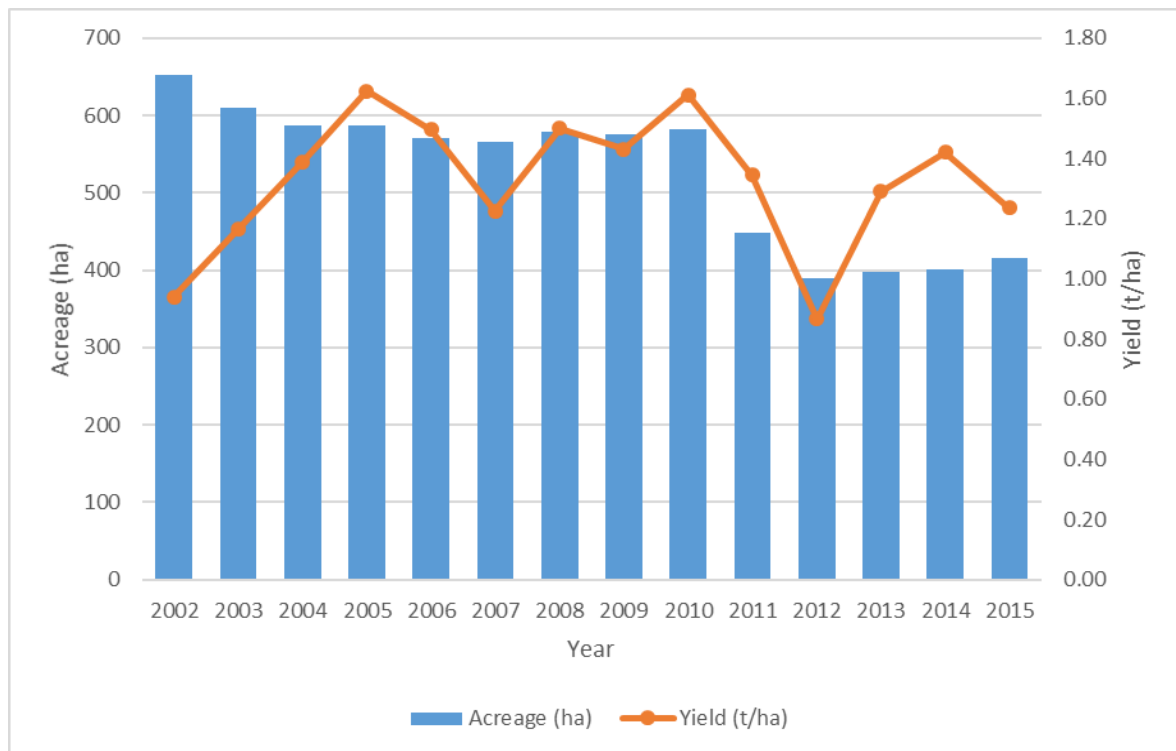
3.8.2 Region Tirschitz

Tirschitz is the only hop region in the Czech Republic which is located in Moravia. With its acreage of 549 hectares it is the second largest hop region out of three, although the area occupies only 11 % of the total. This region is characterized by highest average yields per hectare by almost all cultivated hop varieties during the observed time series. Most widespread hop varieties grown in this region are: Saaz (416 ha), Sládek (82 ha) and Premiant (43 ha).

Variety Saaz

Saaz variety covers the largest part of the hop gardens – around 76 %. Its acreage significantly shrank during the observed years. There was only very tiny increase of the area in 2008 and 2010. Average yields of this “least profitable” variety are unusually high there. In case of good growing conditions, it reached 1.62 ton/hectare in 2005 respectively 1.61 in 2010. As the crop of 2015 was not favorable for any region, yields of the Saaz reached 1.24 ton per hectare in Tirschitz, which is still quite adequate result.

Graph 7 – Development of the acreage and yields in the Tirschitz region, Saaz variety

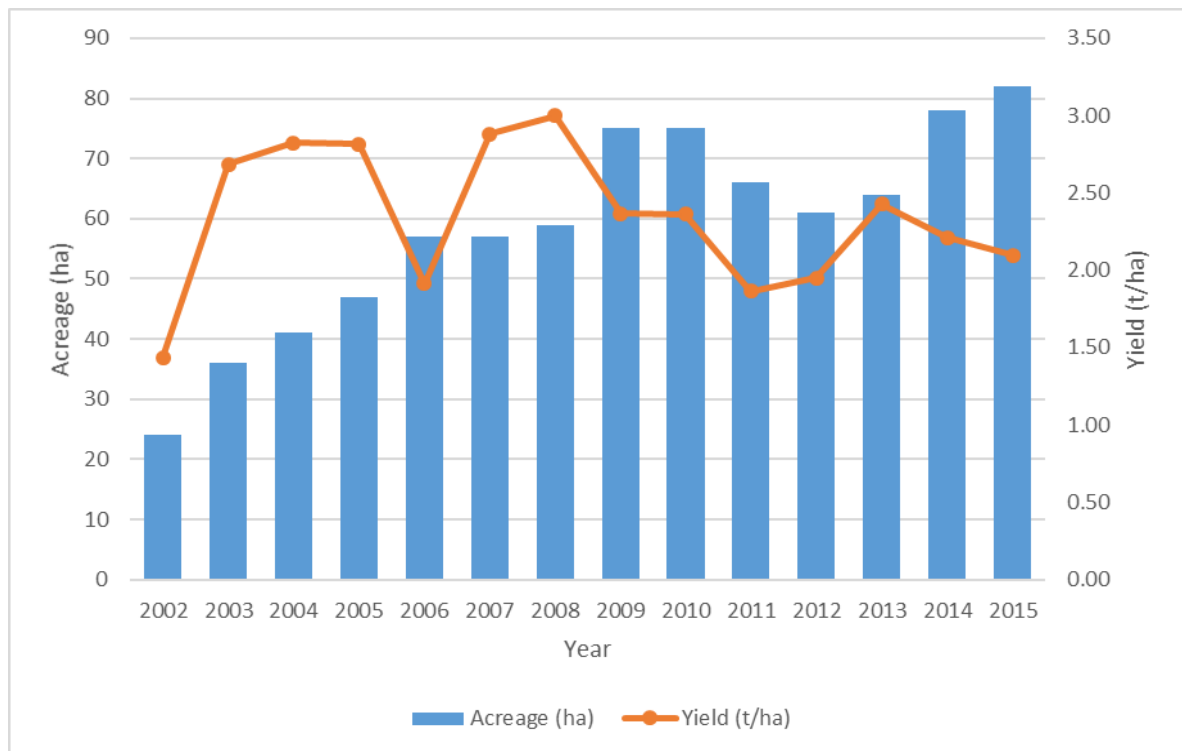


Source: Own elaboration.

Variety Sládek

The acreage of the Sládek variety has significantly risen during the observed period. The initial level of area under Sládek which was only 24 hectares in 2002 reached more than its triple in 2015 with an area occupying 82 hectares. Yields of this variety usually exceed the value of 2 tons per hectare. In case of suitable conditions Sládek is very profitable, amounting to a record value of 3.00 ton/hectare in 2008. In contrary to the variety Saaz, crop year 2007 was also a good one for Sládek (yield 2.88 t/ha). Crop year of 2015 was not favorable for this variety earning under average yields just slightly over 2 tons per hectare.

Graph 8 – Development of the acreage and yields in the Tirschitz region, Sládek variety

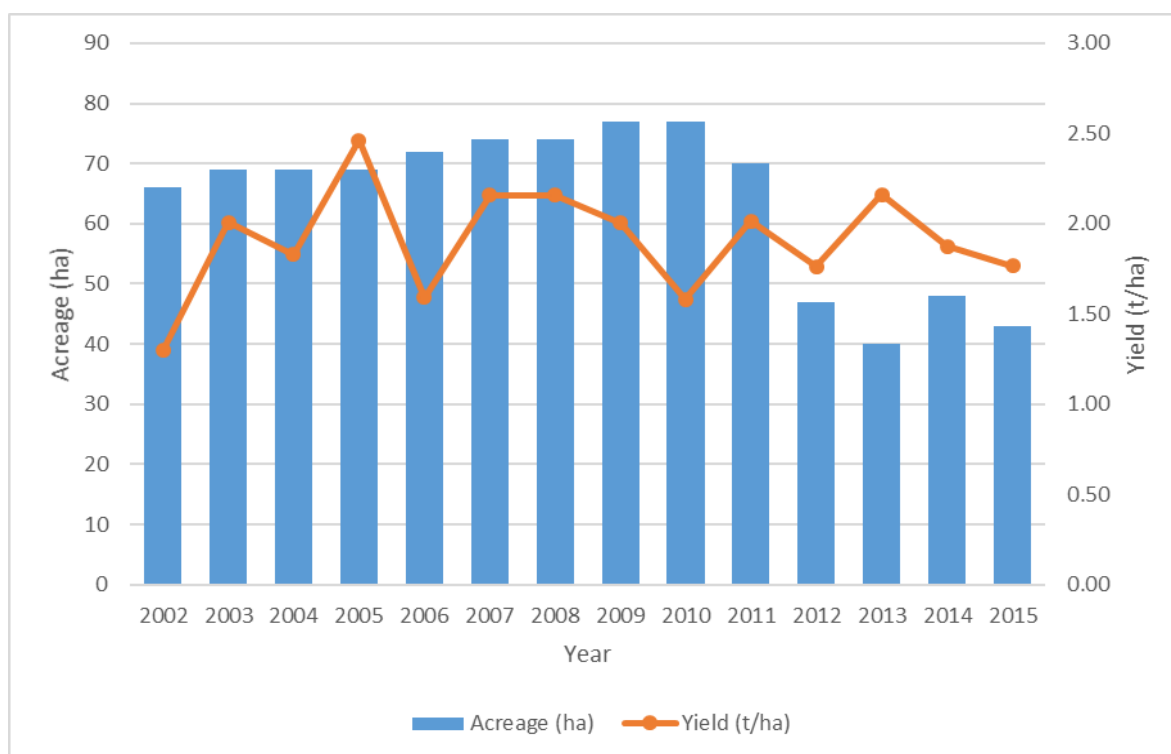


Source: Own elaboration.

Variety Premiant

Premiant used to be relatively frequent variety grown in Tirschitz hop region from 2002 to 2011. Crop year of 2012 recorded a marked decrease in terms of acreage of this variety, which has slightly risen only in 2014, but fell again in 2015 to a current acreage of 43 hectares. According to the yields, this varieties' average productivity in the Tirschitz area ranges from 1.30 t/ha in 2002 to 2.46 in 2005. In 2015 were the yields per hectare by Premiant below average due to unfavorable weather conditions. In the same year, Premiant contributed approximately 10 % (76 tons) to the overall hops production of the region.

Graph 9 – Development of the acreage and yields in the Tirschitz region, Premiant variety



Source: Own elaboration.

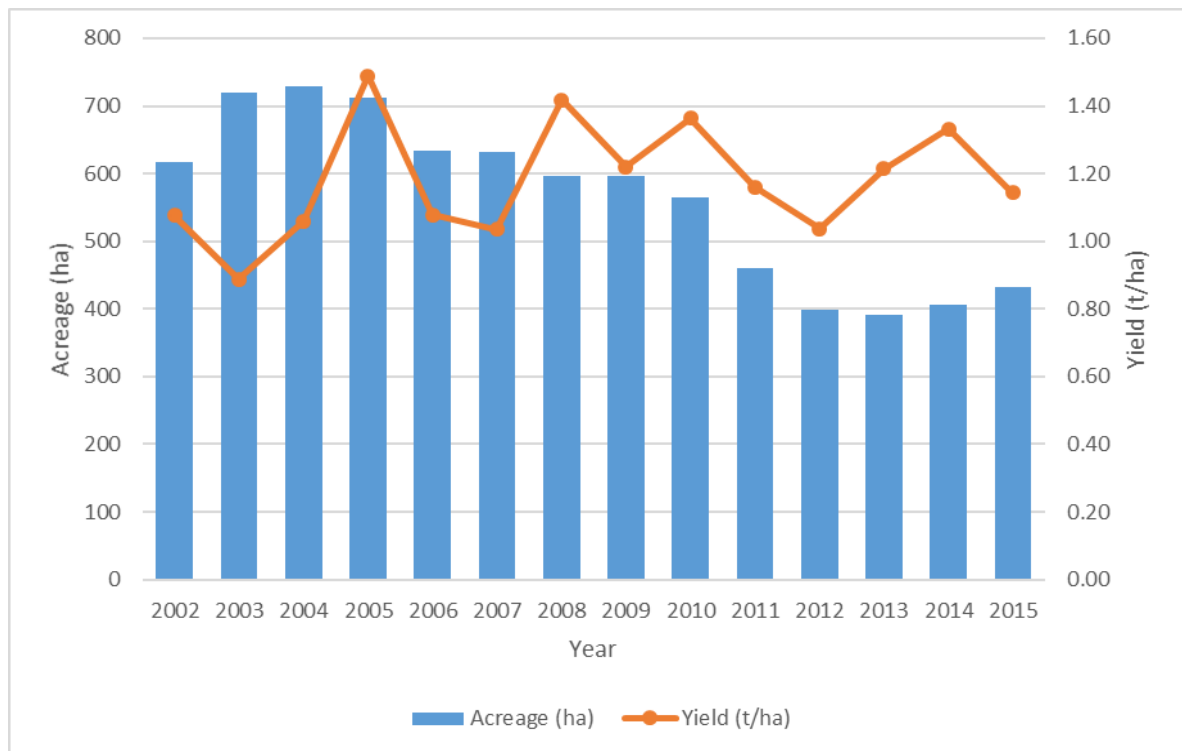
3.8.3 Auscha region

Region Auscha is the smallest one according to its acreage (497 hectares) as well as to the share on overall Czech hops production (597 tons in 2015). Although the acreage of the area is comparable with the Tirschitz region, average yields per hectare keep regularly at a lower level. Hop varieties occupying the largest part of the area are the Saaz (433 ha) and Premiant (37 ha).

Variety Saaz

Saaz variety is the most spread one as well as across all other Czech hop regions. Saaz covers 87 % area of this region. Since 2002, acreage of Saaz has grown only in two years (2003, 2004), after this period kept declining or at the same level. First in 2014 a small increase occurred. Slightly increasing trend is also expected in the upcoming years. Yields per hectare are fluctuating between 0.9 t/ha (worst harvest in 2003) and 1.5 t/ha (best result in 2005). Last years' harvest belongs to the less favorable ones with a yield of 1.14 tons per hectare. Contribution of the Saaz variety to the crop of 2015 was 83 % in this region – 495 tons in absolute numbers.

Graph 10 – Development of the acreage and yields in the Auscha region, Saaz variety

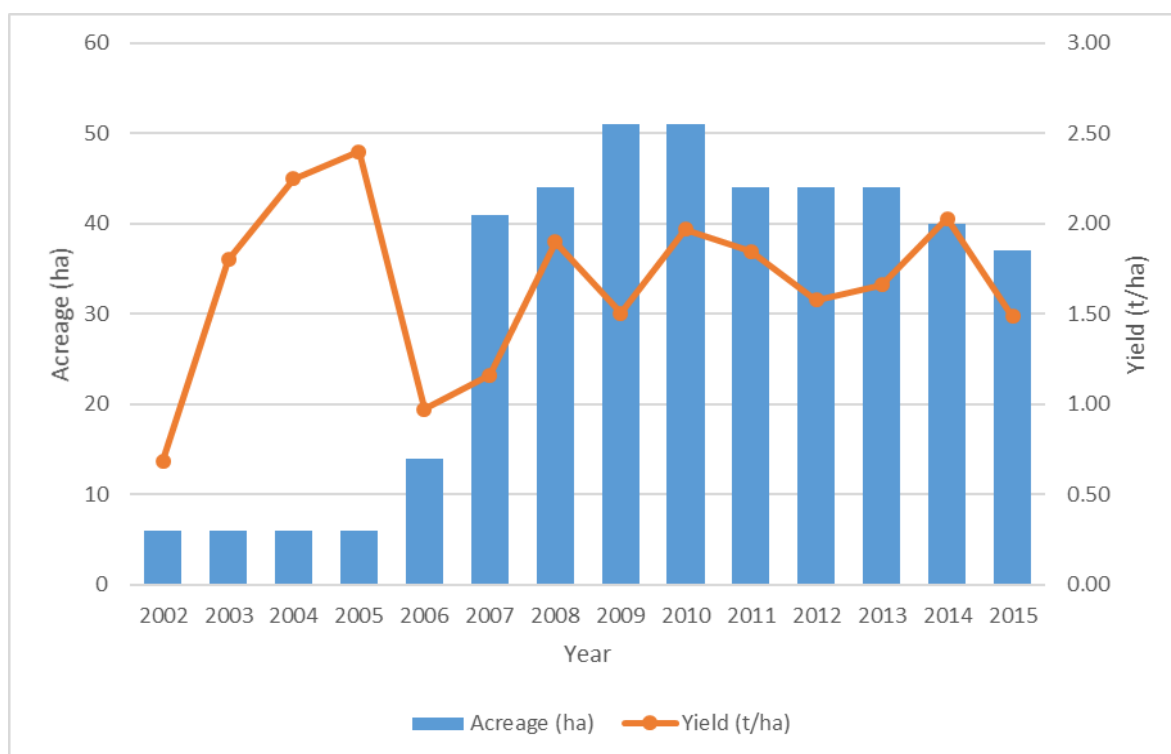


Source: Own elaboration.

Variety Premiant

Cultivation of Premiant in a larger volume is quite new in the region of Auscha. In 2002 and the three following years there were only 6 hectares of this variety. A steep increase was recorded in 2007 as the acreage exceeded 40 hectares. Maximum acreage of this variety was 51 hectares in 2009 and 2010. After this period, hop gardens with Premiant were declining again. Volatility in the average yields of Premiant tend to be huge at the beginning of observed time series (0.68 ton/ha in 2002 to 2.40 in 2005). Several factors contributed to this situation, such as cultivation introducing of this variety in 2002 and also favorable weather in the harvest of 2005. Average yields of Premiant in Auscha reached 1.49 t/ha in 2015. This result was better in comparison with the Saaz region, but worse than in Tirschwitz region.

Graph 11 – Development of the acreage and yields in the Auscha region, Premiant variety



Source: Own elaboration.

3.9 Main subjects on the Czech hop market

When observing the hop market in the Czech Republic, there are a few important Unions and trade companies, who affect the domestic market in hops. Those mentioned below are the influential ones.

Hop Growers Union

Hop growers Union (HGU) is a legal entity which is a voluntary, non-profit, autonomous, independent, non-governmental interest association whose activities are mainly focused on hops. Principal activity the Association is to defend and promote the economic and social interests of its members, to strive for the development of hop growing and rural areas, to assist its members in developing their business activities and for that purpose to provide them with services and consulting in a wide field: economic, social, business, commercial, legal and social (Agricultural Association of Czech Republic, 2016).

The Association publishes a scientific journal called “Chmelařství” and also fulfills the functions required by the EU legislation. Membership in the association is voluntary according to the statutes. HGU is as an entity with a strong voice when negotiating legislative and other market conditions in the hop sector.

Hop Research Institute

The tasks and importance of the Hop Research Institute (HRI) lie in the scientific-research activities in the area of hop cultivation, harvest and post-harvest treatment of hop cultivation of new hop varieties, maintenance of hop gardens, multiplication of hop varieties, solving ecological production and the environment of the zones, protection and quality of the hops and others. HRI also annually publishes a hop journal called “Ročenka” (Year book).

Department of hops of the Central Control and Testing Institute of Agriculture

Department of hops of the CCTIA in Brno based in Žatec was established for the purpose of implementation of tasks of state supervision in the hops sector. Its activities are given as legal provisions and consist mainly in supervision. The Department carries out recording and registration of hop gardens, marking hop oversight responsibilities of businesses in hops and acts as an administrative authority.

Union of hop traders and producers

This Union brings together companies who focus their activities in hops production as the trade in hops. There are six main companies in the Czech Republic, who deal with the trade, hop processing and the sales of hop products. They are as followed:

- **Chmelařství, cooperative Žatec**, brings together hop growers with an area of 4.265 ha of hop gardens, about 94 % of the total acreage. Chmelařství develops, distributes and provides services of technology for mechanization and various materials for hop growing. It buys hops from hop growers from all the hop regions in the Czech Republic and stores it in a large warehouse. Hops are then processed and traded through its subsidiaries Bohemia Hop, stock company and Moravia Hop, ltd.
- **Top-hop, ltd.** owns another six hop cultivation companies in the Saaz hop growing region, owns stock and processing lines in a village of Hořesedly. This company also operates a hop research laboratory V. F. Humulus, ltd.
- **Arix, stock company**, is another trade company based in Žatec, which owns 382 ha of hop gardens in the capital related companies. It has quite strong representation in the USA and in Russian Federation. Arix also owns a warehouse with a capacity of 750 tons of raw and 320 tons of processed hops.

- **Emil Bureš Hopservis, ltd.** based in Holedeč cooperates with the German company Joh. Barth & Sohn. Their activities include comprehensive service: closing purchase contracts with hop growers from the Czech and Slovak Republic, organization for the trainings for the protection of hops, preparation of financial advances to hop growers, inspection advisory services and other.
- **Žatec Hop Company, stock company**, is a trade company focusing mainly on purchase and sale of Saaz hops. Žatec Hop Company exports more than 90 % of Saaz hops from its turnover. It has been a member of Hopsteiner-Group since June 2008.
- **Svoboda-Fraňková, ltd.** offers hops also for home beer brewing (in small quantities). Company owns a stock with air conditioned boxes in Čeradice.

4 Foreign trade in hops

Hops is an important commodity in the international trade. Individual hop growing countries differ from each other not only by the climate and the quality or type of its soil, but also by the hop varieties grown in their area. For some countries, as for the Czech Republic, hops represent an important export item, which helps to maintain a positive trade balance.

4.1 Hop products in foreign trade

Czech hops is used for beer brewing and also exported abroad according to customer's requirements in following types of hop processing:

Pressed hops

Pressed hop cones is the simplest form of hop processing. Dried hop cones shipped from the grower are cleaned of any hops and non-hops admixtures. If necessary, hops are dried to the required moisture content. The cones are then pressed by hydraulic pressers into ballots or cubes of varied weight. Selling price of the pressed hops is lower when compared to the hop pellets of both types. On the other hand, it is necessary to use significantly larger amount of pressed raw hops to brew a batch of beer in comparison with the hop pellets.

Hop pellets – TYPE 90

Dried hops cones are cleaned of any hops and non-hops substances and then hops are dried to 7 % – 8 % of moisture. The hops are milled and granulated. The pellets' dimension is 6 mm. This type of processing contributes to the product's homogenization. The pellets are packed in layered-aluminum foil bags, where the air is replaced with nitrogen or a mix of nitrogen and carbon dioxide. The bag's weight depends on the customers' needs (usually 10 kilograms). The bags are then placed in cartons and then on pallets. There is also an option of bulk packaging of the ZEWATHENER type. The final product, from the standpoint of brewery valued substances, is compatible with the hops cones product. It does have a number of other advantages, for example, a better use of all present substances during the brewing process, longer lasting and smaller product volume, easier storage, handling and shipping. Czech hops are mostly processed into this type of hop pellets.

- *100 kg of hop cones in an equivalent of 90 kg of hop pellets (Type 90)*

Hop pellets – TYPE 45

Dried hops cones are cleaned of any alien substances and dried to 7 % – 8 % of moisture. At a temperature of –35°C, the hops are pulverized and the lupuline part is separated from the plant matter on the vibration sieves. Based on initial analyses of the lupuline fraction, it is possible, by re-mixing with precisely set amounts of plant fraction, to obtain concentrated product with the required volume of alpha acids. This type of powder is then granulated and packaged in aluminum foil bags; same as in case of hop pellets type 90. The air in the bags is also replaced by inert gases. The plant fraction (waste) is granulated and used for example as animal feed. The advantage of the pellets type 45 is mainly a higher concentration of hop resins, long shelf life and significant decrease of material volume in handling, shipping and storage. Type 45 is significantly more expensive compared to Type 90.

- *100 kg of hop cones is an equivalent of 45 kg of hop pellets (Type 45)*

Another option of hop processing is the **hop extract**. This extract is manufactured by maceration of brewing-active substances in an extraction agent, e.g. liquefied CO₂. Final product is a dark liquid stored in tins. For the production are used high voluminous hop varieties. Extracts can be used by the “first hopping”. Extraction significantly reduces the number of bitter substances. From this reason, there is a necessity of using additional flavor-enhancing substances in the beer brewing (for example “tetrahop”). These days, hop extracts are not being produced in the Czech Republic (and therefore, hop extracts are imported, particularly from Germany).

4.2 Legal Aspects of the trade in hops

Trade in hops is an important item of agrarian foreign trade of the Czech Republic. Trade in hops is influenced by many effects; the most important from the side of the Czech Republic and EU are as followed:

- Regulation of entrepreneurship and trade within the EU
- External trade policy of the EU
- Tax policy of the Czech Republic
- Subsidy policy of the state
- Legislation in the hops sector
- Collaboration of professional practice and civil service

- Protected Designation of Origin “Saaz hops”
- Protected geographical indication “Czech beer”

Regulation of entrepreneurship and trade within the EU

The basic laws of the Czech Republic related to foreign trade are:

- Law no. 13/1993 Coll., Customs Act, as subsequently amended
- Decree no. 201/2005 Coll., On statistics of exported and imported goods and method of reporting on trade between Czech Republic and other member states of the EC, as amended by Decree no. 563/2006 Coll., 393/2008 Coll. and 317/2010 Coll.
- Act no. 235/2004 Coll., On Value Added Tax, as subsequently amended
- Law no. 90/2012 Coll., on Business Companies and cooperatives (Business Corporations Act)
- Act no. 563/1991 Coll., On Accounting, as subsequently amended,
- Law no. 17/2012 Coll., On Customs Administration of the Czech Republic,
- Decree no. 285/2012 Coll., On territorial departments of customs offices, which are not located in their settlements.

External trade policy of the EU

EU is a customs union established in accordance with the WTO rules. The EU has a common Customs Code and the Common Customs Tariff. For importers, customs tariff is in the form of so-called TARIC (Integrated Tariff of the European Communities, published in accordance with the Commission Regulation EEC no. 2658/87). The electronic form can be found at: http://ec.europa.eu/taxation_customs/dds2/taric or at www.celnisprava.cz. Each year tariffs are also published in the EU Official Journal. Czech Republic as an EU Member State participates in bilateral agreements which the EU has concluded with non-EU countries (Third countries). Forms of such agreements are different and affect different sections and levels of cooperation.

Legislative measures in the hops sector

Since 1 May 2004, the trade in hops in the Czech Republic is subject to the Common Market Organization of the European Union. The legislation is anchored in the regulations of the Council and the EU Commission. Rules of the Common Market Organization have precedence over national legislation, while the Czech legislation does not regulate matters that are already covered by European regulations. National legislation therefore only

addresses the areas of issues that are specific to each country and therefore cannot unite common legislation, e.g. determination of the zones and areas that are not regulated by European laws for the time being (Altová, 2012a).

The common market organization is based on the following basic principles:

- **Dealing with certified hops only.** The certificate is awarded exclusively to such hops that meets the minimum requirements of the business;
- **Registration of trade in hops.** First, in terms of registration of pre-agreed contracts for the purchase or the sale of hops in the future. Further on the registration of sales contracts including the realized prices;
- **Support for hop growers.** Growers support includes subsidy programs in the form of direct area payments and aid from the European Agricultural Fund for Rural Development;
- **Monitoring of trade with third countries.** Imported hop products are being watched in order to allow prompt intervention in the event of disruption of the common market in hops which does not meet the required quality characteristics (Altová, 2012) and (Štanglerová, 2012).

European regulations governing hops

The fundamental rule of European law in the handling of agricultural products, including hops, is the Council Regulation no. 1234/2007 establishing a common organization of agricultural markets. Other European legislation directly related to the commodity hops can be divided into following main areas:

- **The Association of hop producers.** Commission Regulation no. 1299/2007 on the recognition of hop producer groups (Czech Hop Growers Union in the Czech Republic);
- **The certification.** Commission Regulation no. 1850/2006 laying down rules for verification of hops and hop products;
- **Registration of agreements.** Commission Regulation no. 1557/2006 establishing rules when it comes to registration of contracts in the hops sector, as well as the data communication;
- **Contributions to the hop growers.** Council Regulation no. 73/2009, laying down rules for the grant of direct aid under the common agricultural policy. Council Regulation no. 1698/2005 on support for rural development by the

EAFRD, Council Decision 2006/144 / EC on the Community strategic guidelines for rural development, etc.

- **Market with the third countries.** Commission Regulation no. 1295/2008 on the imports of hops from third countries and Commission Regulation no. 267/2007 amending Regulation no. 1295/2008 (Ministry of Agriculture, 2011).

National legislation concerning hops

The most important legal national standards related to commodity hops is the Act no. 322/2004 Coll. and its implementing decree no. 325/2004 Coll. in the Czech Republic. This law also contains an exhaustive definition of the zones and hop positions of legislative regulation of almost all activities around hops, yet unadjusted by common EU policy.

The law mentioned above primarily addresses the placing of hops into circulation, as well as the performance of monitoring and penalties applicable to infringements. In the national legislation, there is also enshrined handling with hop plants in the form of Act no. 332/2006 Coll. on mother crops and planting material of hops and its putting into circulation, or Act no. 219/2003 Coll., On the placing of seed and planting into circulation (Altová, 2010a).

Subsidy policy

Czech hop growing provides remarkably efficient use of subsidies. This is mainly due to the high initial costs of the technology, hop gardens, mechanization and harvesting equipment, but also because of the high current expenditures. The introduction of a system of direct area payments and the SAPS national additional payments Top-Up has begun by the Czech Republic's accession to the EU.

Measurable effect, according to the Institute of Agricultural Economics and Information has become a slight improvement in corporate profitability, which is nevertheless negative in the long-term. Support in 2014 amounted to CZK 5 997.23 per hectare. Subsidies also included national additional payments Top-Up which amounted to CZK 4 937.65 per hectare in 2014.

Out of the direct payments, farmers can also receive subsidies for construction and rehabilitation of hop fields and forests, as well as for the construction of irrigation systems to be technologically able to ensure the harvest. The volume of funds paid out from the program 3.h.) "Support for preventing the spread of viral and bacterial diseases of hops"

from 2006 to 2014 and the acreage of hop gardens planted with the support of the grant program according to the locations is shown in the table no. 2.

Table 2 – Subsidies across the Czech hop regions

Region	Paid Funds (in million CZK)	Acreage (hectare)
Saaz	71.92	1687.9
Auscha	12.19	302.1
Tirschitz	9.09	218.6

Source: Slonka, 2015, own elaboration.

As may be seen, the grant program is an important element in renewing plantations and forests, which aims to maintain the current scope and the quality of production in the future. Also the construction of irrigation systems is an important element for the stabilization of results of the harvest.

4.3 Other factors influencing foreign trade in hops

There are also other factors which influence the foreign trade in hops outside the legal regulations. No less important are the economic ones.

Price for agricultural producers

Prices for agricultural producers are for example influenced by the quantity of hops produced in the harvest as well as by the situation on the domestic and also the global market (supply vs. demand). The higher is the price, the better for the agricultural producers.

Table 3 – Price for agricultural producers during last 16 years

Year	1999	2000	2001	2002	2003	2004	2005	2006
CZK/ton	132 068	133 603	134 121	107 690	118 113	130 708	120 347	129 579
Year	2007	2008	2009	2010	2011	2012	2013	2014
CZK/ton	149 524	200 521	170 042	124 623	129 568	137 811	151 978	169 217

Source: Ministry of the Agriculture, own elaboration.

According to the data of the Czech Statistical Office, average price for agricultural producers reached 169,217 CZK/ton which was 113.3 % of the amount of the comparable period of 2013. The price level of the compulsory registration of contracts based on EU legislation does not have a full evidential value, as it recorded only a part of the contracts,

which can also come from earlier times. The new Common Agricultural Policy does not introduce this obligation anymore.

Costs of hop producers

Costs for the producers are high; on the other hand, hops branch has a potential to remain profitable – in case of a good harvest. The table below displays the cost developments and profitability over the past years in the Saaz hop region.

Table 4 – Costs of hop producers

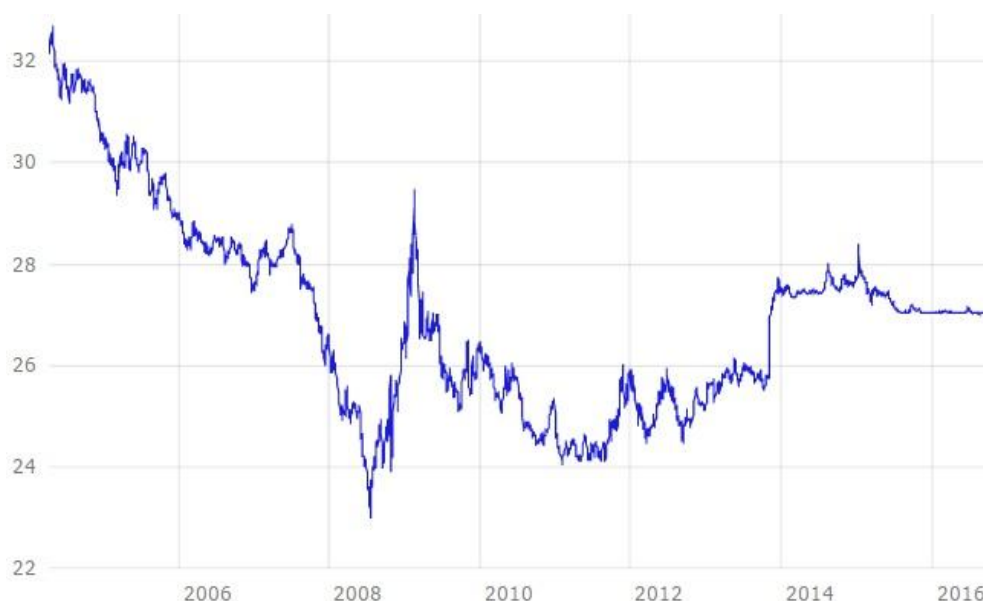
Year	2010	2011	2012	2013	2014
Direct costs	64 740	48 878	52 656	48 532	73 700
Chemicals	13 045	12 742	18 899	12 414	18 900
Amortization	14 245	16 055	14 757	15 335	13 800
Total Costs	228 077	166 256	184 031	190 439	220 327
Revenues	259 000	172 057	183 340	198 240	298 600
Profitability (%)	13.56	3.49	-12.71	4.09	26.2

Source: Slonka, 2015, own elaboration

Development of the exchange rate (CZK/EUR)

Level of the exchange rate is an important factor in foreign trade. As the Czech Crown is relatively weak against the Euro, Czech exporters are receiving more CZK for supplies of hops exported abroad. Therefore the “weaker” Czech Crown is convenient for the (hop) exporters but unfavorable for importers.

Graph 12 – EUR/CZK Exchange rate development (2003-2016)



Source: European Central Bank

Exchange rate developments and especially weakening of the Czech Crown against major world currencies did not only increase the value of hops exported abroad, but also significantly influenced the overall competitiveness of the industry in terms of the costs development.

The Czech National Bank decided to keep the exchange rate at level approx. 27 CZK/EUR. This level is quite favorable for the Czech hop exporters and therefore they choose the Euro as currency of contracts in most of the cases.

4.4 International hops market and hop growing in the World

International Hop Growers Convention (IHGC) consists of 32 members from among the national federations and unions, major hops retailers and significant breweries. A list of members is enclosed in the Appendix. Aims of the IHGC are as followed:

- to facilitate cooperation and coordination and hop-related fields throughout the world by monitoring of market developments;
- harmonization of legal provisions;
- Cooperation in research and development.

The Economic Commission annually publishes reports on the development of the production acreage, yields, production of alpha bitter acids, registered hop varieties, contracts and about the sale prices.

Among the most important hop growing states (besides the Czech Republic) belong the USA, Germany and China. Poland and Slovenia are also relatively important hop growers. Among hop growers with the acreage smaller than 1000 ha can be named the UK, France and Austria. Most important hop producers are shown in the following table. Figures in the table are valid for 2016. Some changes occurred during the past few years, as Germany had been the biggest hop grower in terms of the hop acreage as well as production of hops for a long time. Now it ranks second because the hop acreage in Germany significantly decreased.

Annual hops production worldwide varies between 80,000 and 100,000 tons, corresponding to the amount from 8,000 to 10,000 tons of alpha acid. Demand for alpha acid is on the average estimated at about 8,000 tons, assuming that 4,1 g of the alpha acid are needed to brew one hectoliter of beer. Hop content varies depending on the type of beer concerned, particularly how bitter it is, and the variety of hop used. As a result of

technological progress and consumers' growing preference for less bitter beers, hop content is falling year by year (it still stood at 6.3 g alpha per hectoliter in 1995).

Table 5 – Most important hop growing countries in the World (2016)

Rank	Country	Production (tons)	Alpha acid (tons)	Acreage (ha)	Average yield (t/ha)
1	USA	44 000	4 100	20 750	2.12
2	Germany	37 000	3 900	18 400	2.01
3	Czech Republic	6 000	240	4 750	1.26
4	China*	6 000	440	2 500	2.40
5	Slovenia	2 550	200	1 528	1.67
6	Poland	2 557	200	1 524	1.68

* Values for China are an estimation of IHGC

Source: IHGC – International Hop Growers' Convention, 2016, own elaboration.

Although the World's beer production is on the rise, demand for alpha acid is not increasing so significantly. Since supply currently exceeds demand, average prices on the hop contract market and the free market have been fairly low since 2009.

The acreage of the hop growing areas had worldwide a downward trend since 2007. However, in 2014 a slight increase in the acreage has occurred and the growing trend still continues. When compared with the previous year, the world hop gardens acreage rose by 3,849 hectares reaching 54,614 hectares in total; mainly due to an increase in the acreage of hop gardens in the USA, Germany, Czech Republic, Slovenia and Poland. In contrast, the only country with a significant decline in the acreage of hop gardens was China.

In 2016 global production of hops increased again by 13,685 tons compared to 2015 amounting to 100,568 thousand tons. Production of alpha bitter acids increased as well to a volume of 9,612 thousand tons. Average yield per hectare was 1.84 tons. Highest yields were recorded in China (2.40 t/ha) and the USA (2.12 t/ha). Czech Republic had the lowest yields among the top hop producers (1.26 t/ha).

Hop growing in the EU member states

Some 2 600 farms in the European Union grow hops, covering 26,500 ha which reaches 60 % of the total surface area used for hop-growing worldwide. Hops are grown in 14 EU countries. Around 18,400 hectares are used for hop cultivation in Germany, accounting for approx. 60 % of the EU's hop-growing acreage and about one third of the surface area devoted to hop cultivation worldwide. The other main EU producers are the Czech Republic, Poland, Slovenia and the UK.

The EU produces about 50,000 tons of hops annually. Its alpha acid output regularly exceeds 5,000 tons.

4.5 Trade in hops in the Czech countries

4.5.1 Historical view

A first mention about hop exports from the Czech area dates back to 1879, as the Saaz hops started to be exported to America. Since 1901, Saaz hops began to be exported to Japan as well. At that time, a further capacity building for storage and processing of hops took place.

After Czechoslovakia was established, the activity of the town “Hop Grading Barn” began to be regulated by law in 1922. Its activity continues till this day (Anonymous author, 2012).

During the World War I., the hop growing industry had undergone a major crisis due to the reduction in the acreage of hop gardens, a slump in prices and the deliberate destruction of hop crops. The World War II. also caused an unfavorable development for the Czech hop industry. Significant part of the hop growers and merchants in the Czech area had German nationality; property of the Czech and Jewish hop growers was expropriated and distributed among the Germans.

In the postwar period, the expulsion of German-speaking population (at that time constituting the vast majority of growers and hop merchants) had a strong impact on the Czech agriculture as a whole – as well as on the hop industry. There was established a new institution “Chmelařství” to centralize the production and trade, including the foreign trade. In addition, new hop research institutions were established and developed.

After the Velvet Revolution, "state enterprise Chmelařství" was transformed to another legal form: "Chmelařství, the cooperative Zatec". Growing enterprises have been privatized and transformed. There were also newly emerging businesses and other trading companies appearing on the market. As a result of the sales crisis which reached its peak in 1998, there was a significant reduction in the acreage of the hop gardens.

A big challenge for the hop growing industry was the Czech Republic’s entry into the European Union. It was followed by the opening of foreign markets not only for hops, but also for cheaper labor force from other countries. In spite of the moderate production growth after joining the European Union, acreage of hop gardens in the Czech Republic

continued to decline. This fact was also caused due to abnormally high harvests in 2010 and 2011 which led to lower sales; low prices of hops in the world; the amount of hops in the world market and especially the long-term cost increases for the Czech hop growers.

A risk can be seen in the potential growth of the acreage of hop gardens in countries with lower (labor) costs – particularly in China, and the move of traditional trading partners who are currently demanding Czech hops to cheaper ones. Czech hop traders continue in their efforts in finding new export destinations and business partners. At the same time, there is also visible a return of some former business partners to beer brewing from the Czech hops again – because of its unique characteristics, despite its high price.

Foreign trade in hops in the Czech Republic

Czech Republic belongs to the traditional hop exporting countries due to the self-sufficiency of 118 % (Humpál, 2015).

4.5.2 Hop imports

However is the Czech Republic self-sufficient in the hops production, some hop imports are annually realized. Foreign hop varieties have different characteristics that are sometimes needed for the beer brewing of unconventional types of beers which are produced especially in micro-breweries. For example, bitter hop varieties are demanded when brewing American Pale Ale or Indian Pale Ale, which popularity has dramatically risen during last years.

Another reason of hop imports is its purchase for a purpose of “in house” processing and its further resale.

As we look closer to the statistics of the hops imported from foreign countries, we can discover a preferred hop processing during following monitored years which is displayed in the table no. 6. In hop imports from all the countries (except Slovakia) are the hop pellets of type 90 the preferable way of hop processing because of its ease of use and preservation of the desired properties of hops by beer brewing. Hop pellets of type 45 constitutes a significant volume only in imports from Germany.

Table 6 – Imports of hops to the Czech Republic, including trade within the EU (in tons)

Calendar year	2010	2011	2012	2013	2014
Non-crushed hop cones	88.9	11.2	37.5	114.9	53.6
Crushed hop cones, hop pellets type 45	75.1	87.5	61.7	55.5	312.5
Crushed hop cones (other), pellets type 90	119.2	109.1	200.3	173.2	N/A
Hops - total	283.2	207.8	299.5	343.6	366.1
Juices, hop extracts	121.0	169.7	141.1	140.7	111.9

Subheading: 12101000, 12102010, 12102090, 13021300, 33019021

Source: Foreign trade statistic, own elaboration.

Hop imports to the Czech Republic flows in the largest quantities from Germany followed by Slovakia. One reason for it is the fact, that Germany is the second biggest hop producer in the World; producing also the bitter hop varieties which are quite scarce in the Czech Republic. Other motives can be the quality of aspect and equally the small distance allowing lower transportation costs for both of the mentioned countries. Hop extracts are imported from Germany because none of the hop companies in the Czech market specializes on this kind of hop processing.

Table 7 – Hop imports in various processing according to countries

Rank	Country	Non-crushed hop cones	Crushed hop cones, pellets type 45	Crushed hop cones, pellets type 90	Total (tons)
1	Germany	7.6	80.8	179.3	285.7
2	Slovakia	38.2	x	30.0	68.2
3	Ukraine	x	x	18.7	18.7
4	Belgium	2.7	x	17.7	17.7
5	USA	x	x	11.1	11.1
6	UK	x	0.5	1.0	1.0

All data is valid for 2014, all figures are measured in tons.

Source: Kratochvíle, 2015, own elaboration.

4.5.3 Hop exports

As mentioned before, Czech Republic's hop exports are much higher than its imports. From 70 % to 80 % of the Czech hops production is being exported abroad annually. The rest of the Czech production is sold to local breweries and microbreweries.

For example, exports of non-crushed hop cones accounted almost 95 % of the volume of the Czech Republic's trade in non-crushed hop cones (imports were below 6 %) in 2014. The balance would be similar also in other types of hop processing.

Table 8 – Export of hops from the Czech Republic, including trade within the EU (in tons)

Calendar year	2010	2011	2012	2013	2014
Non-crushed hop cones	1217.5	936.0	948.6	698.1	951.2
Crushed hop cones, hop pellets type 90	3220.6	3214.1	3376.3	2875.1	2618.3
Hops – total	4438.1	4150.1	4324.9	3573.2	3569.5

Subheading: 12101000, 12102010, 12102090

Source: Foreign trade statistics, own elaboration.

As in the case of hop imports, also by exports from the Czech Republic are the hop pellets the favorable form of hop processing throughout all the monitored years (2010-2014).

The biggest and most important export partners for the trade in hops are on the long-term Japan and Germany. Other, relatively new partners are China and Russian Federation. Vietnam is a country, which appeared in the top 5 export destinations for the first time.

Table 9 – Hop exports without distinction of the processing according to main export destinations (in tons)

Rank	Country/Year	2010	2011	2012	2013	2014	2015
1	China	506	847	829	685	872	963
2	Japan	1 831	1 197	1 160	923	1 266	879
3	Germany	1 065	897	957	722	921	827
4	Russian Federation	244	308	526	510	319	260
5	Italy	84	44	10	9	10	109
Σ	Exports - Total	3 730	3 293	3 482	2 849	3 388	3 038

Source: Foreign trade statistics, own elaboration.

Balance of foreign trade in hops

Hops remain to be one of the few items of agrarian foreign trade, in which the Czech Republic still has a positive trade balance. Foreign trade in hops and hop products recorded a positive balance in 2015, which amounted to 716.1 million CZK; when compared with 2014, there was a slight decrease in surplus by about 34 million CZK. It was caused by poor harvest in 2015 (there was not enough hops for export).

Growing hops in the Czech Republic regularly shows a positive balance and strengthens the gross domestic product.

Table 10 – Balance of foreign trade in hops

Calendar year	2012	2013	2014	2015
Balance in tons	4 025	3 229	3 634	3 668
Balance in million CZK	687.1	655.3	750.0	716.1

Subheading: 12101000, 12102010, 12102090

Source: Foreign trade statistics, own elaboration.

4.5.4 Evaluation of the harvest and trade in hops in 2015

In calendar year 2015, according to Czech Statistical Office: 3 668 tons of proven and certified Czech hops was exported abroad. The hop certification system for Czech hops is indispensable for the foreign trade. It declares the authenticity and quality of purchased raw materials for beer production - and customers require it.

Compared to the last year, there has been a decrease in volume of export of hops. It proved to be adversely affected by last year's drought as well as high temperatures – which resulted in low yield per hectare and lower content of alpha acids. Failure in revenues at a level of particular farmers reached more than -250 mil. CZK.

The total value of hops exports amounted to 877 mil. CZK, reaching its fifteen-year average. This result was achieved in one hand by the demand for high quality raw material, but also the more favorable exchange rate CZK/EUR for Czech exports. However, if the Czech National Bank quits interventions in the future, it will most likely develop in the opposite direction.

Foreign trade in hops reached a positive balance of 716.1 mil. CZK. Hop exports again moderated the overall negative result in the balance of agricultural foreign trade of the Czech Republic in 2015, thus facilitating the Czech economy in the last year's growth.

More than two-thirds of total exports were directed outside the EU. Asian market is currently the dominant one. In the long term, most of the processed hops travel to Japan. Exports to China keep expanding. Within the EU 28, the biggest amount of Czech hops is exported to Germany. Trade with Italy and Belgium strengthens. In addition, trade with the USA is starting to develop again.

Despite the unfavorable crop year, hop growers continue with their efforts to do their best to meet the current demand for the best-quality Czech hops. Over last three years, more than one thousand hectares of old, inefficient or frost and floods damaged hop gardens were replaced and grown by approximately 300 ha of new ones. There is estimated a slight increase in the hop gardens acreage also this year.

Important limits of the expansion of the hop gardens acreage are not only the high investment demands, but also availability of suitable soil in the hop growing regions, as well as the increasing rents for land. At the same time, hop growers are investing in better harvesting technology and special mobile machines. The lack of agronomists for generational change and also free labor for seasonal work seem to be apparent during last years.

Top four destinations for Czech hops remain the same, only the values and shares differ when compared to the calendar year 2014. Hop exports to China recorded a rise about 100 tons, on the contrary exports to Germany dropped around 100 tons.

Table 11 – TOP 10 destinations of Czech hops in calendar year 2015

Rank	Country	Export in tons
1	China	963
2	Japan	879*
3	Germany	827
4	Russian Federation	260
5	Italy	109
6	Belgium	88
7	UK	66
8	Vietnam	65
9	South Africa (RSA)	59
10	USA	58

* Decrease in volume relative to shifts in supply by the end of the calendar year

Source: Foreign trade statistics, own elaboration.

Italy for the first time exceeded 100 tons of hops imported from the Czech Republic. On the other hand, hop exports to Vietnam have fallen rapidly – they were double in 2014.

4.6 Analysis of the foreign trade in hops with chosen countries

For a more detailed analysis, three countries which are in a long term biggest importers of the Czech hops were chosen. These countries are China, Japan and Germany.

4.6.1 China

In China, hop growing continues to decline. Following a reduction in hops acreage of 13 percent in 2015, another decline is also expected by a further 14 percent in 2016. Since 2009, hop-growing acreage in China has shrunk by two thirds. China is increasingly

declining in importance as a hop growing country. Production of beer has fallen in most of the “beer nations” due to increasing unrest, the exertion of political influence, e.g. through restrictive legislation, and difficult economic conditions. China’s output dropped by more than 25 million hectoliters in 2015. However, with an output of 470 million hectoliters of beer, China remains the undisputed number 1 in the world top beer brewers.

China as an importer of Czech hops

For the Czech Republic, China has become one of the three biggest export destinations of the Czech hops five years ago. China’s interest in Czech hops keeps growing with some minor fluctuations. Table 12 displays a summary of hops exports to China since 2000 till 2015 in terms of volume (tons) as well as statistical value (CZK) and calculated price per ton. All data is valid for hop pellets as a type of hop processing. As China is merely focused on imports of hops in a form of hop pellets, there were no exports from 2000 to 2015 realized in a form of unprocessed hop cones. Current Czech hop exports to China consist almost solely of pellets Type 90 (cheaper ones).

Table 12 – Export of crushed hop cones and hop pellets to China in years

EXPORT - CHINA									
121020	Year	2000	2001	2002	2003	2004	2005	2006	2007
	Netto (ton)	44.56	135.04	74.12	138.24	161.28	138.24	235.88	253.44
	Stat. Value (CZK)	8 440 000	25 382 000	12 450 000	20 850 000	30 052 000	23 011 000	35 975 000	46 582 000
	Price per ton	189 408	187 959	167 971	150 825	186 334	166 457	152 514	183 799
	Year	2008	2009	2010	2011	2012	2013	2014	2015
	Netto (ton)	235.57	432.18	505.67	847.08	829.16	684.55	872.34	962.96
	Stat. Value (CZK)	51 646 000	76 600 000	76 094 000	109 423 000	116 208 000	119 136 000	168 195 000	192 972 000
	Price per ton	219 243	177 241	150 481	129 177	140 151	174 035	192 809	200 395

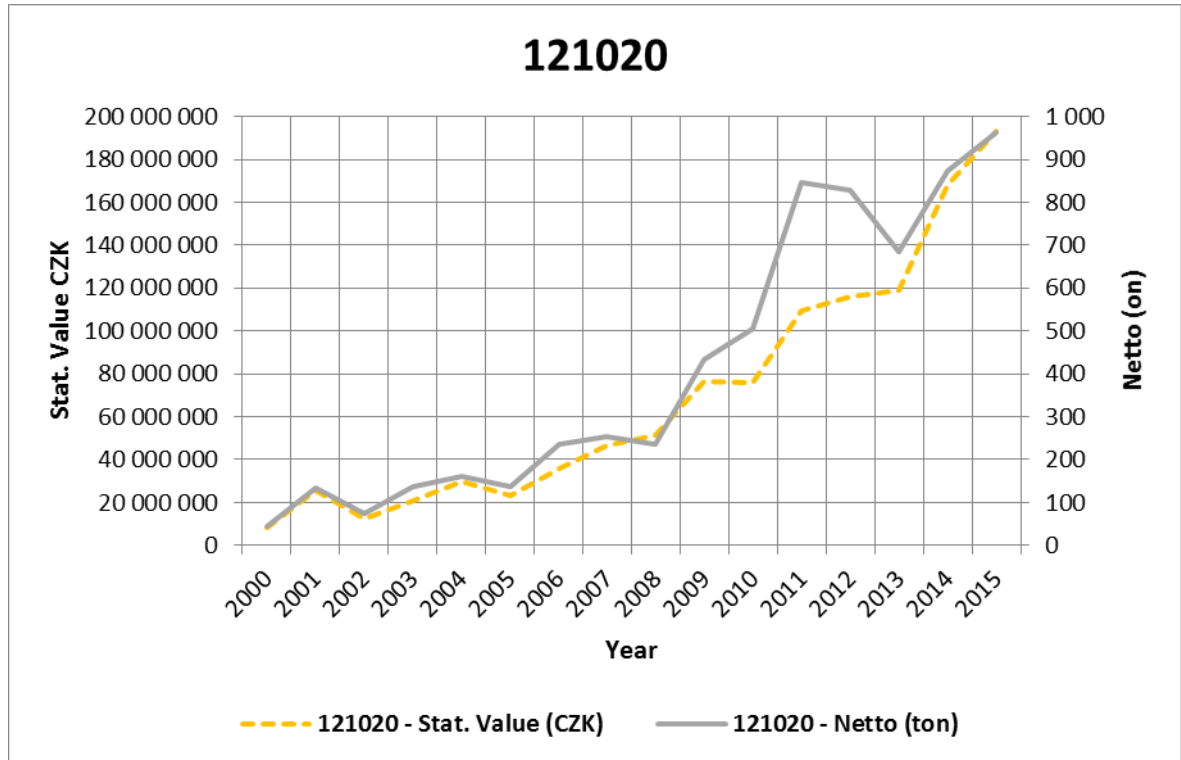
Source: Foreign trade statistics, own calculations and elaboration.

As we look closer on the table, hops exports in tons became to grow faster since 2008. Despite the Economic crisis that reached its peak in 2009, it did not negatively influence the volume of hops exports. On the contrary, volume of exported hops almost doubled when compared with the volume of 2008. Calculated price per ton was the highest just in year 2008; in 2009 a significant decline in price occurred. Price per ton in 2009 reached only 81% of the last years’ price and this declining tendency continued till 2011 reaching its bottom value of 129,177 per ton. Although there was an increase in exported quantity in 2010, statistical value of the export remained under the level of 2009.

In 2010 and 2011 supply of hops was considerably higher than the demand for hops on the World market. This situation had a negative impact on the price of the exports. But more likely, the change in price per ton reflected the shift in preferences of the hop

processing. Whereas up to 2008 China imported hop pellets with higher content of lupuline (Type 45), starting in 2009 hop pellets of Type 90 was demanded. This fact also explains the large increase in required quantity of hop pellets in 2009, as the breweries need much more hops to brew a beer with the use of pellets Type 90 than with the Type 45.

Graph 13 – Exports of crushed hop cones and hop pellets to China in years



Source: Foreign trade statistics, own calculation and elaboration.

First in 2012 price per ton began to increase from year to year again. Year 2015 was successful in all aspects – exported volume reached 963 tons in a statistical value of 192 972 ths., which are both the highest values in the trade. Price per ton in 2015 was with the value of 200 395 second highest after that in 2008.

Graph no. 13 displays the relationship between exported volume (ton) and the statistical value (CZK) through the observed time line. Disproportion between the statistical value and the volume is the biggest in period 2010 - 2013 as the price per ton was very low (because of switching to a cheaper type of the hop processing).

4.6.2 Japan

Beer production in Japan is steadily declining during the last few years. This trend is mainly due to the long economic recession, an aging population; high inventories of hops in the breweries, etc. The top four Japanese breweries Asahi, Kirin, Sapporo and Suntory typically consumed more than 40 % of the total exports of the Czech hops. For example, Kirin Brewery has been brewing beer with Saaz since 1907.

The highest beer production in Japan was recorded in 1994 with a total production of 71.1 mil. hectoliters. Starting that year, beer production kept declining. In 1994 a “cheap beer” called Happoshu was introduced and in 2003 a new category of cheap beers appeared. Low prices of these products could be reached through low taxes. In Japan, tax on alcoholic beverages is divided according to the content of raw materials and the manufacturing method. Each year, the production of these cheap beers is growing, and the overall production is declining. Customers in Japan tend to buy just these categories of cheaper beers.

Japan as an importer of Czech hops

Cooperation with Japan as one of the biggest export destinations of the Czech hops has a long history. Japan is aware of the quality of Czech hops, nevertheless a decline in the volume as well as the value of exports was recorded during the observed period 2000 - 2015. Table below displays a summary of hops exports to Japan in terms of volume (tons) as well as statistical value (CZK) and calculated price per ton. Table is divided into two parts: one displays exports of the non-crushed hop cones and the second exports of hop pellets (type 45 and 90 are counted together).

Non-crushed hop cones have never been exported in usual volumes for beer brewing (or further processing) during the examined period. The highest volume (6.3 ton) of unprocessed hop cones took place in 2007. These small numbers correspond only to volume of unprocessed hops requested by Japan breweries for own analyzes and quality control. There were no exports realized in 2008 and in period 2010 – 2012.

Table 13 – Exports of non-crushed hop cones, crushed hop cones and hop pellets to Japan

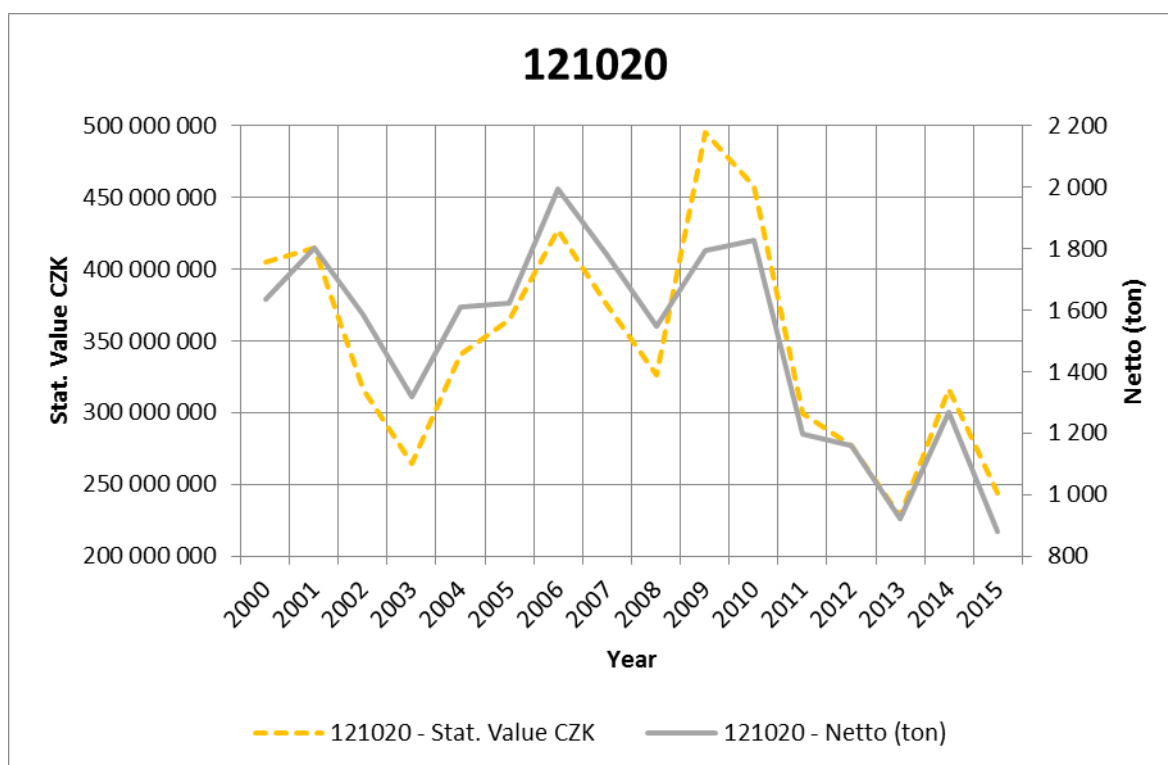
EXPORT - JAPAN									
121010	Year	2000	2001	2002	2003	2004	2005	2006	2007
	Netto (ton)	2.10	2.16	2.00	0.02	0.08	0.43	0.93	6.30
	Stat. Value (CZK)	391 000	406 000	332 000	3 000	29 000	77 000	252 000	1 114 000
	Price per ton	186 279	188 399	166 000	150 000	367 089	179 907	270 968	176 825
	Year	2008	2009	2010	2011	2012	2013	2014	2015
	Netto (ton)	0.00	0.06	0.00	0.00	0.00	0.04	0.34	0.56
	Stat. Value (CZK)	0	22 000	0	0	0	37 000	140 000	137 000
Price per ton	0	366 667	0	0	0	925 000	408 163	243 772	
121020	Year	2000	2001	2002	2003	2004	2005	2006	2007
	Netto (ton)	1 633.15	1 802.95	1 585.90	1 319.63	1 610.35	1 621.40	1 995.99	1 780.17
	Stat. Value (CZK)	404 765 000	414 361 000	316 742 000	264 072 000	340 222 000	364 465 000	427 137 000	375 216 000
	Price per ton	247 844	229 824	199 724	200 110	211 272	224 784	213 998	210 775
	Year	2008	2009	2010	2011	2012	2013	2014	2015
	Netto (ton)	1 549.48	1 793.02	1 826.67	1 196.75	1 159.83	922.91	1 265.90	878.81
	Stat. Value (CZK)	325 905 000	495 345 000	458 076 000	299 115 000	277 066 000	227 682 000	316 639 000	244 322 000
Price per ton	210 332	276 263	250 771	249 939	238 885	246 701	250 130	278 015	

Source: Foreign trade statistics, own calculation and elaboration.

Exports of hop pellets are incomparably more important. Japanese importers buy a combination of both types of hop pellets (90 and 45), hence the price per ton is higher when compared with Chinese importers, who specialize almost solely on Type 90. Share of exported volume of the Type 90 is approximately 2.5 times higher than those of the Type 45.

The decline in imported volume of hops is first visible in 2011, as it dropped by 35 % compared to the previous year. Proportion between the two types of hop pellets has not changed, just the volume fell. In 2011 Japan was hit by the destructive Tsunami, however, this incident had very little impact on the volume of the trade in Czech hops. For that crop year, Japan had contracted lower volume of imports of hops due to the situation on domestic beer market (surplus of stocks of hops from previous years, shift in preferences for cheaper beers and overall lower consumption of beer and hops in beer production). This declining trend continues till these days.

Graph 14 – Export of crushed hop cones and hop pellets (45, 90) to Japan



Source: Foreign trade statistics, own calculation and elaboration.

Proportion between the statistical value of hops and its exported volume did not have very dramatic fluctuations. Just in 2009 was the statistical value relatively high when compared to the volume.

4.6.3 Germany

In 2015 hop acreage increased by just seven percent worldwide, but only by three percent in Germany. These figures were given by Joh. Barth & Sohn, Germany’s leading provider of hop-related services, at the presentation of the new BARTH-REPORT Hops 2015/2016. The increase in acreage did not lead to an increase in harvested volume or alpha acids production, however. On the contrary: in Germany, the volume of harvested hops fell by more than 26 %, while alpha volume dropped by as much as 39 %. For the first time in 50 years, the USA is once again the biggest hop-growing country in terms of acreage.

Production of beer in Germany remains relatively stable, with a slight increase of 0.4 % to 95.6 million hectoliters, which is the fourth highest number among the beer producing

countries. Germany is also the only country among the top five beer producers whose output did not fall in 2015.

Germany as an importer of Czech hops

Although Germany is known for its highest quality hops, it regularly ranks among the top importers of the Czech hops. Germany's most common (and most favorite) type of beer is Pilsner; and right the Saaz hops is the best option for its production. Following table displays the evolution of hop exports to Germany divided by the type of hop processing. Unlike China or Japan, exports of non-crushed hop cones to Germany strongly prevail.

Table 14 – Exports of non-crushed hop cones, crushed hop cones and pellets to Germany

EXPORT - GERMANY										
121010	Year	2000	2001	2002	2003	2004	2005	2006	2007	
	Netto (ton)	1 229.07	1 857.66	1 816.68	1 171.64	1 035.49	1 134.53	290.76	58.31	
	Stat. Value (CZK)	162 407 000	245 394 000	219 641 000	141 936 000	145 365 000	145 525 000	35 414 000	8 464 000	
	Price per ton	132 138	132 098	120 902	121 143	140 382	128 269	121 799	145 155	
	Year	2008	2009	2010	2011	2012	2013	2014	2015	
	Netto (ton)	123.70	798.95	965.93	746.04	757.11	648.05	912.31	807.84	
	Stat. Value (CZK)	23 221 000	124 845 000	136 105 000	121 555 000	109 069 000	116 206 000	172 363 000	150 697 000	
	Price per ton	187 723	156 262	140 906	162 934	144 060	179 317	188 931	186 543	
	121020	Year	2000	2001	2002	2003	2004	2005	2006	2007
		Netto (ton)	1.85	30.96	44.38	46.79	206.00	157.25	33.92	30.91
Stat. Value (CZK)		388 000	4 925 000	7 952 000	7 503 000	40 166 000	21 957 000	5 756 000	6 418 000	
Price per ton		209 730	159 076	179 180	160 372	194 977	139 636	169 693	207 655	
Year		2008	2009	2010	2011	2012	2013	2014	2015	
Netto (ton)		1 220.98	148.82	83.80	194.79	199.33	64.92	26.76	18.77	
Stat. Value (CZK)		275 544 000	45 545 000	17 901 000	28 436 000	21 797 000	18 895 000	6 446 000	7 268 000	
Price per ton		225 674	306 041	213 608	145 983	109 349	291 064	240 882	387 193	

Source: Foreign trade statistics, own calculation and elaboration.

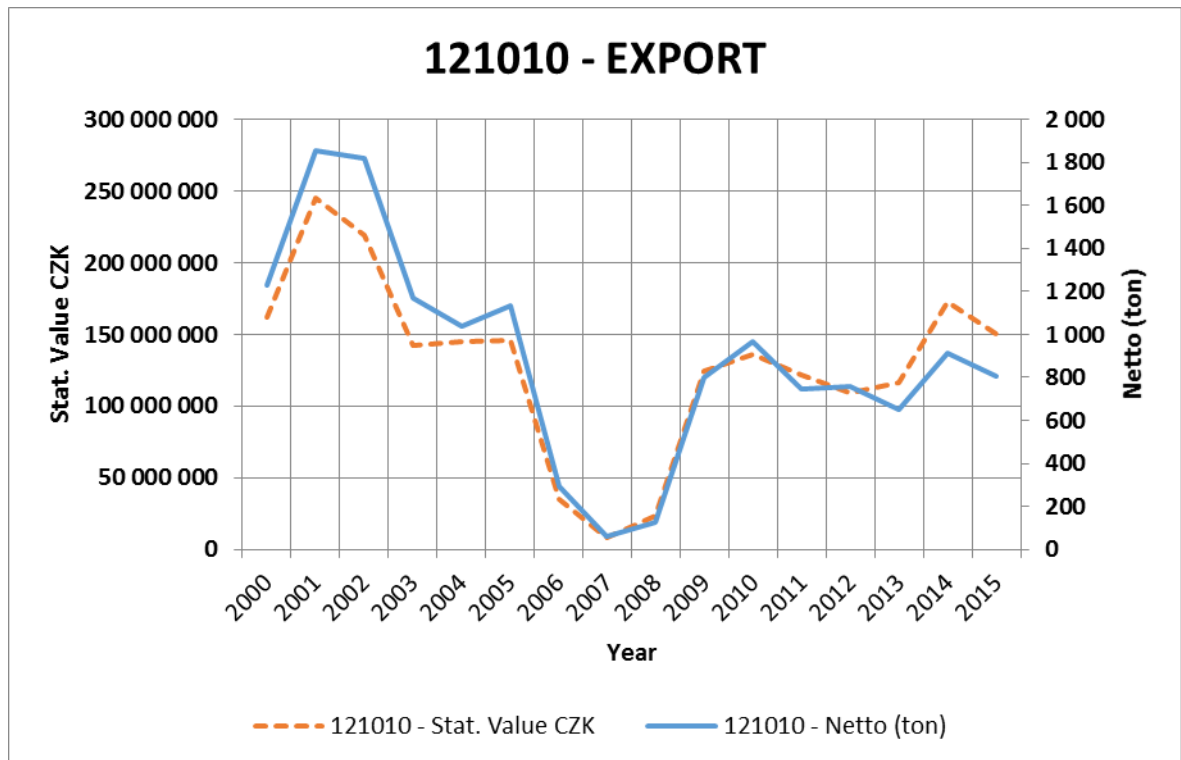
Highest volume as well as value of exported hops (unprocessed hop cones) was reached in 2011 (1858 tons). On the contrary, very dramatic slump was recorded in years 2006 and 2007, because the decline of exports of unprocessed hop cones was not replaced by export of different hop products from the Czech Republic. Operation of more factors caused this slump – first – hop production in both of the years was low in the Czech Republic and second, German breweries had large stocks of hops from the previous years and therefore didn't need additional supplies. Year 2008 was again very low in terms of non-crushed hop cones, but export of hop pellets exceptionally reached 1 221 tons and thus replaced this drop. It was also the only year with such high exports of hop pellets. This situation has not occurred again during the observed period.

From 2009, volume of exported hops to Germany didn't record any dramatic fluctuations. Price per ton of non-crushed hop cones varied from 121 ths. in 2002 to 189

ths. in 2014. Value of 2015 was the third highest (after 2014 and 2008) during the observed period.

According to the following graph 15, exports of non-crushed hop cones in terms of the statistical value display changes of the price of raw hops on the market from 2000 to 2015. At the beginning of the observed period, statistical value was proportionally lower to the exported volume. From 2005 to 2010 both lines almost copied each other. From 2012 is the price of exported hops relatively higher to the volume.

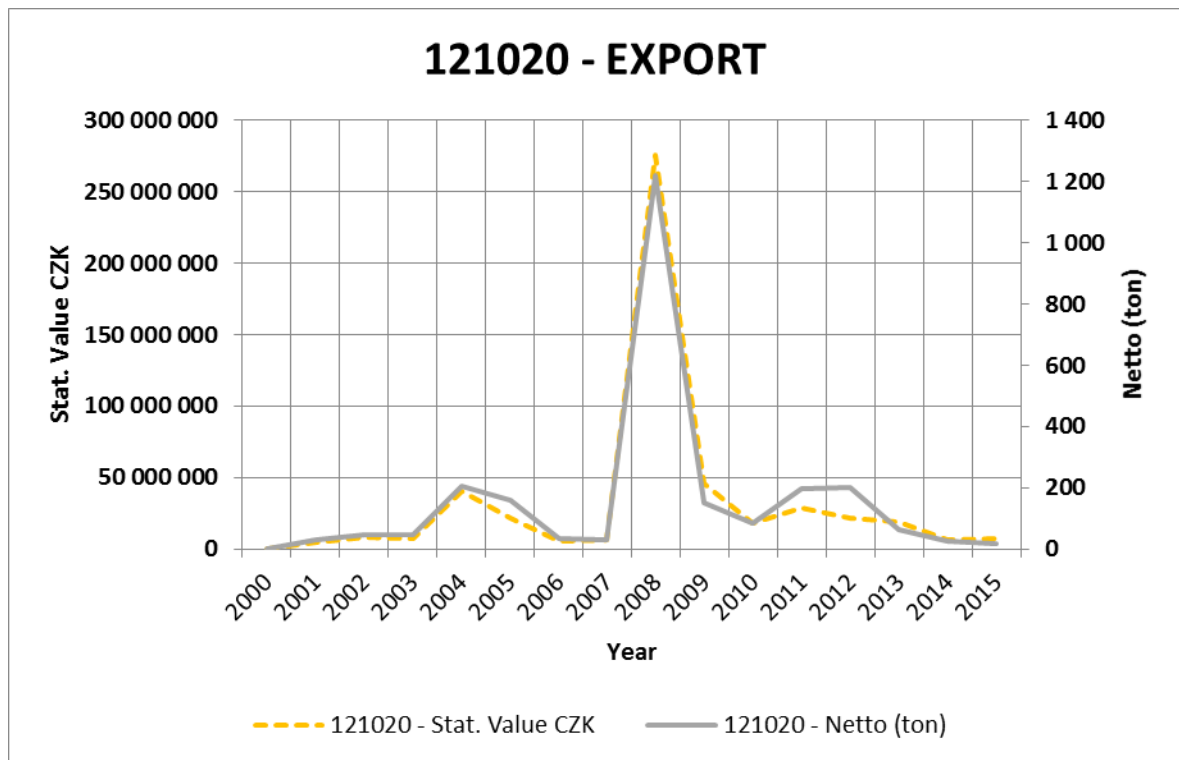
Graph 15 – Export of non-crushed hop cones to Germany



Source: Foreign trade statistics, own calculation and elaboration.

Graph no. 16 illustrates exports of hop pellets and highlights the abrupt increase in 2008 followed by the fall to the initial negligible level.

Graph 16 – Export of crushed hop cones and hop pellets (45, 90) to Germany



Source: Foreign trade statistics, own calculation and elaboration.

Czech Republic as an importer of German hops

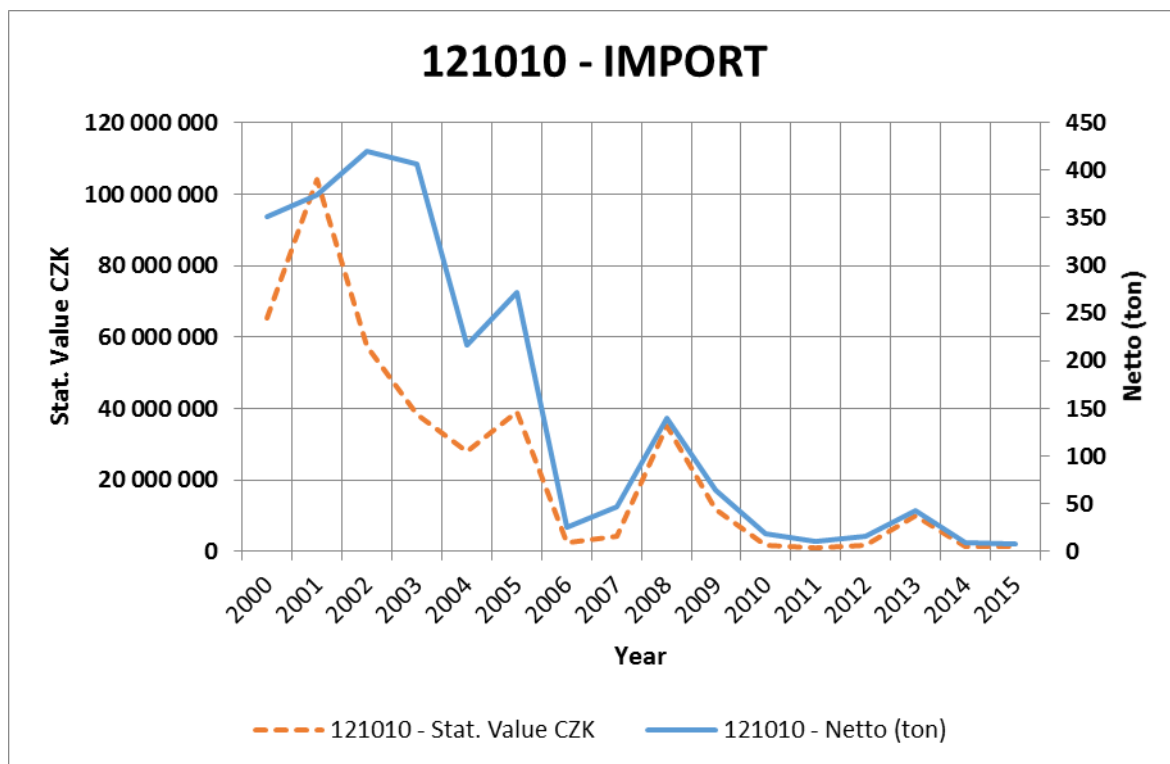
Germany is not only one of the top destinations for the Czech hops; some volume of the German hops is regularly imported to the Czech Republic. Most of the total imports of hops are realized from Germany or Slovakia.

Table 15 – Imports of non-crushed hop cones, crushed hop cones and hop pellets from Germany

IMPORT - GERMANY									
121010	Year	2000	2001	2002	2003	2004	2005	2006	2007
		Netto (ton)	351.26	374.71	419.52	406.72	215.96	272.26	25.67
	Stat. Value (CZK)	65 409 000	104 242 000	57 512 000	38 464 000	28 111 000	39 058 000	2 299 000	4 425 000
	Price per ton	186 211	278 198	137 089	94 572	130 169	143 459	89 570	95 556
121010	Year	2008	2009	2010	2011	2012	2013	2014	2015
	Netto (ton)	139.90	64.26	18.47	10.96	15.58	43.40	9.19	7.88
	Stat. Value (CZK)	35 198 000	11 931 000	1 713 000	1 140 000	1 858 000	10 165 000	1 274 000	1 334 000
	Price per ton	251 596	185 673	92 765	104 024	119 248	234 244	138 629	169 203
121020	Year	2000	2001	2002	2003	2004	2005	2006	2007
	Netto (ton)	113.75	106.78	47.10	24.25	54.52	175.56	196.11	319.63
	Stat. Value (CZK)	21 752 000	28 080 000	8 762 000	3 523 000	9 307 000	22 125 000	27 199 000	66 424 000
	Price per ton	191 230	262 968	186 034	145 266	170 711	126 028	138 690	207 819
	Year	2008	2009	2010	2011	2012	2013	2014	2015
	Netto (ton)	235.65	187.84	164.51	169.74	154.81	149.15	278.36	282.55
	Stat. Value (CZK)	98 919 000	43 377 000	24 908 000	23 644 000	23 830 000	26 164 000	45 313 000	75 794 000
	Price per ton	419 766	230 925	151 405	139 297	153 930	175 424	162 783	268 252

Source: Foreign trade statistics, own calculation and elaboration.

Graph 17 – Imports of non-crushed hop cones from Germany

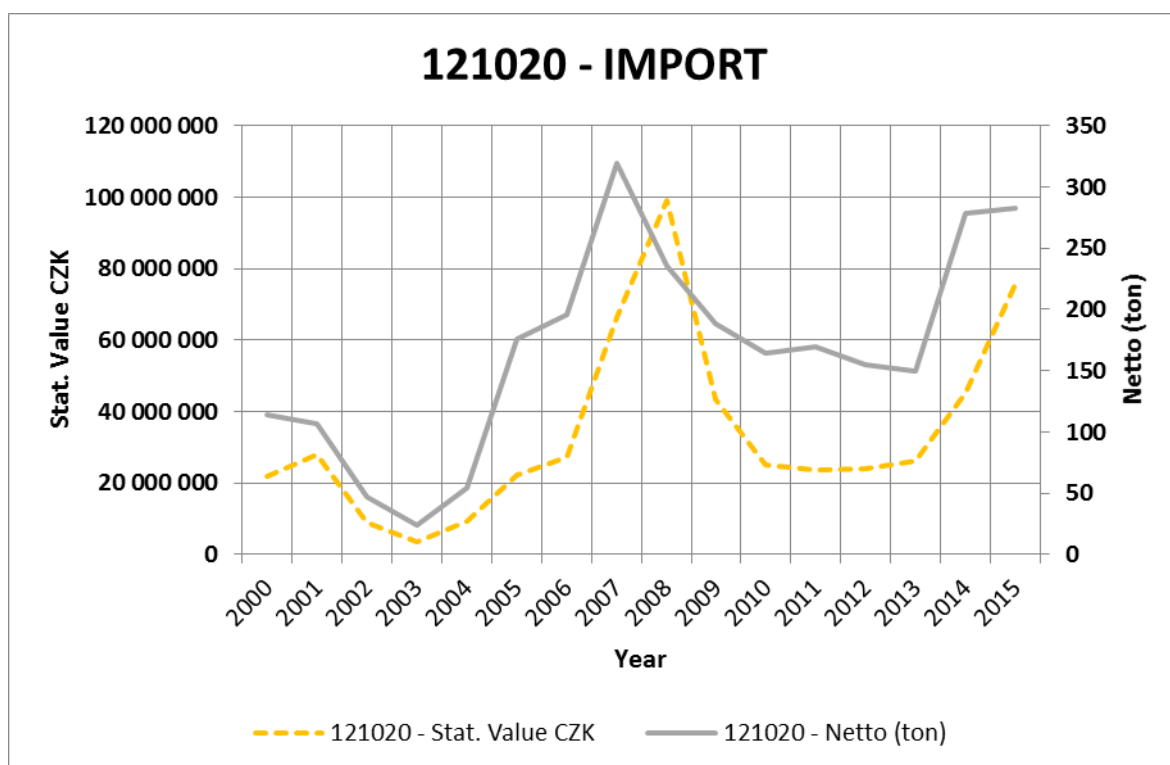


Source: Foreign trade statistics, own calculation and elaboration.

Part of the imported hops, especially those in a form of non-crushed hop cones are after processing in the Czech Republic subsequently exported abroad. This situation was more common in the past (period 2000 – 2005), nowadays is the share of imports of non-crushed hop cones not very significant (less than 8 tons in 2015). On the contrary, imports of hop pellets from Germany are slightly on the rise since 2005, reaching volume of 282.55 tons in 2015 in a value of approx. 76 million CZK. Price per ton tends to be volatile by both types of the hop processing during the observed period.

Evolution of the imports of fresh or dried hop cones is more clearly visible in the graph no. 18. First sharp slump was recorded in 2004, losing a half of the previous year's volume, second big fall followed in 2006. Year 2008 marked a part recovery with a subsequent fall. Second part of the table 15 illustrates the development of imports of processed hop cones in a form of hop pellets.

Graph 18 – Imports of hop pellets (45, 90) from Germany



Source: Foreign trade statistics, own calculation and elaboration.

Hop extracts

Hop extracts are also a part of the foreign trade in hops with Germany. These days, there is no place of processing of hop extracts within the Czech Republic. Main reason for not-building own production capacity was the fact, that hop extracts would be too expensive to find its buyers (the motive when replacing hops by using hop extracts is usually cost reduction). Czech hops are mostly not suitable for this type of processing. For hop extracts are preferred hybrid varieties with a high content of α -acids from 12 % to 16 %. From the Czech varieties, could be used only a bitter variety Agnus. Hop extracts are therefore made from high alpha or bitter German hop varieties, for example from Magnum, Taurus or Herkules.

Hop extracts are made with help of various extract agents, usually CO₂ or Ethanol. Once the extract is made, it can be processed further to isolate functional molecules found in hops. The result is a range of products called Isomerized hop extract.

Nowadays many of the big Czech breweries use hop extracts. They are namely Svijany, Rohozec, Staropramen, Braník, Bernard and others. These extracts can be used in beer as designer ingredients and surgically alter bitterness, aroma, deliver anti-microbial

activity, head retention, head cling (make the beer head cling better to the inside of the glass) or light stability.

Germany is the biggest supplier of hop extracts to the Czech Republic (except Germany, Czech Republic imports hop extracts in smaller quantities also from the USA, Belgium and the UK). Table below reflects the development of imports of hop extracts from 2000 to 2015.

Table 16 – Imports of hop extracts from Germany

Hop extracts - IMPORT									
13021300	Year	2000	2001	2002	2003	2004	2005	2006	2007
	Netto (ton)	9.66	9.00	6.95	9.47	85.10	113.46	45.14	110.37
	Stat. Value (CZK)	5 907 000	6 367 000	4 261 000	5 041 000	13 063 000	28 974 000	17 591 000	70 244 000
	Price per ton	611 807	707 366	613 270	532 594	153 496	255 379	389 664	636 464
	Year	2008	2009	2010	2011	2012	2013	2014	2015
	Netto (ton)	61.35	40.25	32.31	58.42	31.44	51.95	45.94	61.72
	Stat. Value (CZK)	200 961 000	29 280 000	26 460 000	39 787 000	17 383 000	34 290 000	21 838 000	26 146 000
	Price per ton	3 275 541	727 417	818 865	681 039	552 930	660 032	475 349	423 616

Source: Foreign trade statistics, own calculation and elaboration.

Imported volume was low at the beginning of the period with a significant increase in 2004. Highest volume was recorded in 2005 and 2007. However the imported volume (62 tons in 2015) may seem to be small, it is important to realize that the volume of hop extracts added to beer is really little. For example, from a 10 milliliters package of ISOHOP 30% can be brewed up to 2,500 liters of beer. In terms of statistical value, there are some extreme values: a price per ton was uncommonly low in 2004 - 2006 and incredibly high in 2008. In 2015 was the price per ton relatively low, amounting to 423 616 CZK.

In period 2005 – 2015, there has been significant overproduction of bitter hops on the market, from which are extracts manufactured (single extraction of bitter hop substances). Data about use of hop products in the brewing industry are very limited. According to the Hop Growers Union, breweries do not provide the data for several years.

Volume of imported hop extracts varies from year to year and does not have clearly growing tendency. By an average price per ton, it is a cheaper option than fresh or dried hop cones or hop pellets. Other advantages of using hop extracts relate to reduced bulkiness, improved storage, standardization, consistency, utilization and reduced wort losses. On the other hand, many experts and beer enthusiasts criticize using hop extracts because the final beer cannot equal to taste of “genuine beer” brewed by the old Czech recipes.

4.6.4 Analysis of influence of exchange rate CZK/EUR on hops exports to Germany

For the analysis of the dependence of exported volume of hops in tons (period 1999 – 2015) on the exchange rate CZK/EUR was used a statistical program “STATISTICA 12”.

Table 17 lists all of the data related to individual observed years, which is a total exported volume of hops, statistical value of the exported hops, price per ton and the exchange rate CZK/EUR in a given year. Total of 17 observations were made for Germany.

Aim of this analysis is to determine whether the volume of exported hops depends on the exchange rate. Data is examined by the use of correlation analysis and simple linear regression analysis, dependent variable is the volume of exported hops and independent variable is the exchange rate CZK/EUR.

Table 17 – Total exports of hops to Germany by Exchange rates

Year	Netto (t)	Stat. value CZK (mil.)	Price (CZK/T)	Exchange rate (EUR/CZK)
1999	1801.53	241 251 000	133 914.88	36.88
2000	1230.92	162 795 000	132 254.95	35.61
2001	1888.62	250 319 000	132 540.69	34.08
2002	1861.06	227 593 000	122 292.20	30.81
2003	1218.43	149 438 000	122 648.10	31.88
2004	1241.50	185 532 000	149 442.17	31.90
2005	1291.78	167 482 000	129 652.51	29.78
2006	324.68	41 170 000	126 802.95	28.34
2007	89.22	14 881 000	166 795.57	27.63
2008	1344.68	298 764 000	222 182.06	24.94
2009	947.77	170 391 000	179 781.72	26.45
2010	1049.73	154 006 000	146 709.83	25.29
2011	940.83	149 992 000	159 425.36	24.59
2012	956.44	130 866 000	136 825.57	25.14
2013	712.97	135 101 000	189 491.50	25.97
2014	939.07	178 809 000	190 411.74	27.53
2015	826.61	157 966 000	191 101.00	27.28

Source: Foreign trade statistics, own calculation and elaboration.

Table 18 presents a statistical summary through the use of correlation coefficient, correlation determination and standard error of the estimate. The correlation coefficient is a measure of correlation. This coefficient ranges from -1 to +1. The value of -1 indicates a complete indirect dependency, whereas the value of +1 means complete direct dependency. If it is equal to zero, there is no linear relationship between the observed variables.

Coefficient of determination R² describes, what proportion of the total variance in the dependent variable is explained by the use of this model. The standard error of the estimate represents a measure of the dispersion of observed values around the regression line.

Table 18 – Table of statistical summary

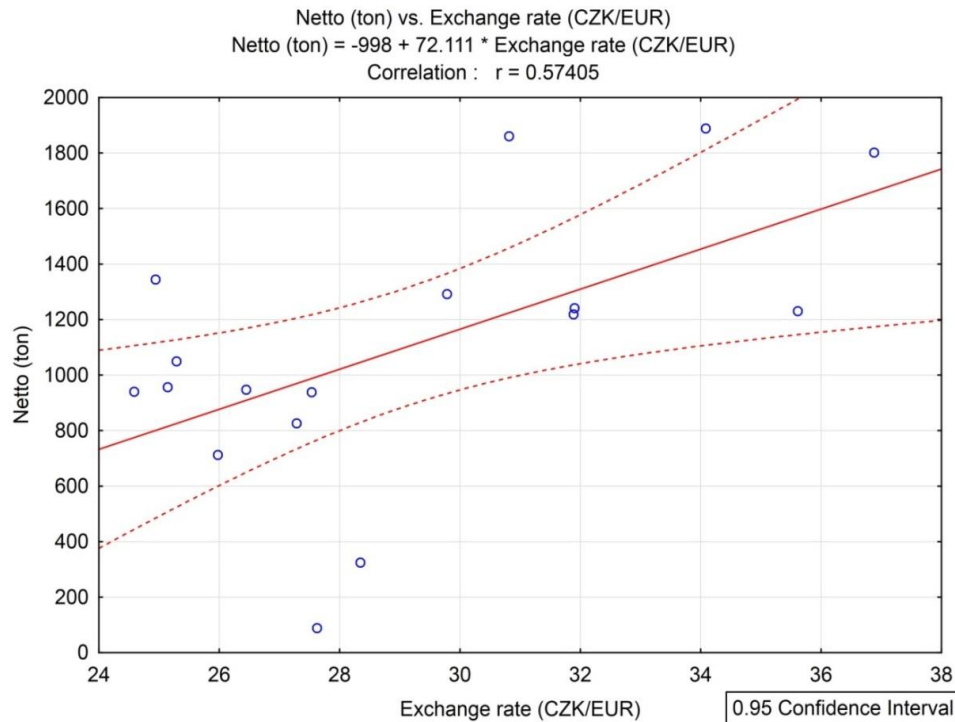
Parameters:
R= 0.574051471976683
R ² = 0.329535092478597
p= 0.0159631315618753
Std.Error= 411.366024714812

Source: Output of STATISTICA 12, Own elaboration.

Based on the determination coefficient R² = 0.33 can be assumed that variability in the dependent variable, which is the volume of exported hops is by 33 % explained by a model with the exchange rate CZK/EUR. Furthermore, the proportion of the variability suggests that the total exported volume is also influenced by other factors which are not considered in this model. The following equation represents the linear regression model of the dependency of the exported volume on the exchange rate:

$$\text{Netto (ton)} = -998 + 72.111 \times \text{Exchange rate (CZK/EUR)}$$

Graph 19 – Representation of the dependent variable and the independent variable in a bulleted chart, the output of a statistical program STATISTICA 12



Source: Output of STATISTICA 12, Own elaboration.

To determine expected hop exports to Germany (in tons) at different exchange rates, a simulation tool for the predictions of a statistical program “STATISTICA 12” was used. This simulation is based on the previous results of the regression analysis:

Table 19 – Results of the regression

N=17	Results of the regression with dependent variable: Netto (ton) (ger) R= 0.57405147; R ² = 0.32953509; Adjusted R ² = 0.28483743 F(1,15)= 7.3725; p<0.01596; Standard Error: 411.37					
	b*	Std. Error (from b*)	b	Std. Error (from b)	t(15)	p-value
Absolute member			-997.986	778.3506	-1.28218	0.219242
Exchange rate (CZK/EUR)	0.574051	0.211418	72.111	26.5577	2.71524	0.015963

Source: Output of STATISTICA 12, Own elaboration.

For the simulation was selected an exchange rate of 24 CZK/EUR, which may represent a real scenario of the future exchange rate in the case that the Czech National Bank will cease with its interventions and the Czech Crown will appreciate again. Result of this simulation is as follows:

Table 20 – Exchange rate simulation – real scenario

Variables	Predicted values (ger) variables: Netto (ton)		
	b-weight	Tested value	b-weight (of the values)
Exchange rate (CZK/EUR)	72.11060	24.00000	1730.654
Absolute member			-997.986
Prediction			732.668
-95.0%LS			375.649
+95.0%LS			1089.687

Source: Output of STATISTICA 12, Own elaboration.

The table shows that by expected exchange rate of 24 CZK/EUR is the predicted volume of exports to Germany 732.668 tons of hops. Values in lines -95.0% LS and +95.0% LS represent a 95% confidence interval. It means that volume of exports to Germany should be in the range from 375.649 tons to 1,089.687 tons with 95% confidence.

Further, a simulation of extreme value was examined. Exchange rate was set to 50 CZK/EUR. This exchange rate is considered to be unreal in current economic situation and it is not foreseen such a development. Result of this simulation is as follows:

Table 21 – Exchange rate simulation – extreme scenario

Variables	Predicted values (ger) variables: Netto (ton)		
	b-weight	Tested value	b-weight (of the values)
Exchange rate (CZK/EUR)	72.11060	50.00000	3605.530
Absolute member			-997.986
Prediction			2607.544
-95.0%LS			1403.621
+95.0%LS			3811.466

Source: Output of STATISTICA 12, Own elaboration.

From the results of the simulation is evident that volume of expected hop exports to Germany at an exchange rate of 50 CZK/EUR would have been 2,607.544 tons. This extremely high value represents more than 50 % of the last year's (2015) overall hops production in the Czech Republic.

As the regression analysis shows the elasticity of approximately 1.6 %, these forecasts cannot be considered to be realistic. This view is also supported by relatively wide confidence intervals and especially real experiences which in the long-term show that exports of hops are not significantly dependent on the current exchange rate. In most cases, the contractual currencies are determined by the hop exporters, reflecting which exchange rate is convenient for the seller.

5 Hops trade company – TOP HOP, Ltd.

To evaluate trade with Czech hops in practice in a narrower scale was chosen a Czech trade company Top Hop, ltd. which operates in the hops sector.

Basic information

Business name: Top Hop

Established: April 25, 1991

Seat: Prague 1, Jilská 2, 110 00

Identification number: 18382002

Legal form: Limited Liability Company

Scope of business:

- agricultural production
- accounting consulting, bookkeeping
- Production, trade and services not specified in Annexes 1 to 3 of the trade licensing act

Governing body: two managing directors

Confederates: Ing. Josef Ondráček and Ing Josef Maryško (business share 50:50)

Capital stock paid: 204 100 000, - CZK

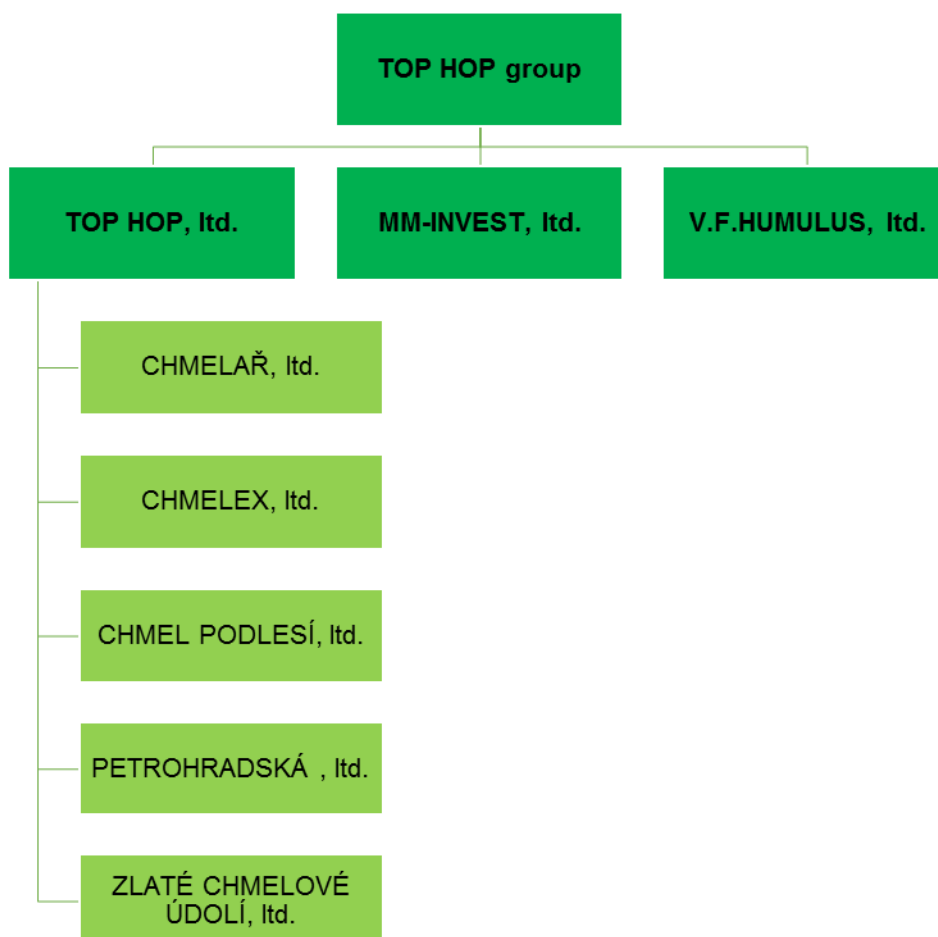
Top Hop. ltd. also owns business shares in six other companies (mainly hops producing companies and also a hop research laboratory V.F. Humulus), namely:

- Chmelař, ltd. – 100 %
- Zlaté chmelové údolí, ltd. – 100 %
- CHMELEX, ltd. – 75 %
- CHMEL PODLESÍ, ltd. – 6 7%
- Petrohradská, ltd. – 66.46 %
- V.F.HUMULUS, ltd. – 50 %

Major activity of the TOP HOP Ltd. and MM-INVEST Ltd. (all trade of TOP HOP is realized through this company) companies was from the very beginning trade in Saaz hops of the highest quality. Thanks to this early specialization, both companies were successful in building a network of prominent business partners. The MM-INVEST Ltd. company is further involved in modernization of hop harvesters and hops drying kilns, all hops related technology and needs.

The TOP HOP GROUP counts a total of five agricultural companies whose business is hop growing. All of them operate in the Saaz hop growing region and its hop gardens are situated in the best hop locations of the Podlesi (Underwood) and Udoli Zlateho potoka (Golden Creek Valley) sub regions. A good location and quality care for hops guarantee high quality of the hops grown there.

Picture 3 – Organization structure of the TOP HOP group



Source: Annual report of TOP HOP group, 2015, own elaboration.

In 2012, TOP HOP, Ltd. put into operation a new hop processing and stocking plant in Hořesedly (Saaz hop region, Rakovnik district). Air-conditioned storage consists of 6 independent cooled halls equipped by TOYOTA storage technology. The storage is used to stock-keeping of both raw hops from farmers after the harvest and finished product. Storage temperature is from +2 °C to +4 °C. TOP HOP Ltd. is the holder of quality certificate ISO 9001 and HACCP for the purchase, processing, stocking and sale of hops.

5.1 Analysis of the company's position on the Czech hop market

In the following part will be examined current situation on the Czech hop market, especially from the point of view of TOP HOP, Ltd. Competitive environment will be mapped through Porter's Five Forces analysis. With a help of SWOT analysis will be evaluated internal weaknesses and strengths as well as external opportunities and threats of the company.

5.1.1 Porter's five forces analysis

Porter's five forces analysis is a framework that attempts to analyze the level of competition within an industry and business strategy development. It draws upon industrial organization economics to derive five forces that determine the competitive intensity and therefore attractiveness of an Industry. Porter's five forces analysis will be applied on the Czech hop industry.

1) Rivalry among existing competitors

Michael Porter comes from two basic types of competitive advantages in the analysis of existing competition. The first competitive advantage is referred to as cost advantage. Cost competitive advantage means that the company is able to deliver a product or service in the same quality, but at a lower cost than its competition. The second type is called differential competitive advantage. Company is therefore able to offer a product or service in higher quality than its competitors. Companies who deal with trade in hops in the Czech market are able to gain these advantages primarily through technological innovation, improving logistics and providing better customer service.

Company TOP HOP Ltd. launched in 2012 its own processing and storage plant in Hořesedly. The factory is equipped with modern technology for the production of hop pellets of all kinds - type 45, type 90 and isomerized pellets. Packaging line of the plant not only allows processing in small-volume bags (3-20 kg), as well as bulk quantities in weight of 90, 130 and 150 kilograms. This processing line is followed by air-conditioned warehouse with a total of 6 independent refrigerated halls. The storage temperature in these warehouses allows storage of hops at temperatures ranging from +2 to + 4 ° C. These stores also serve as storage of unprocessed hops brought from the hop gardens after the harvest before it goes to its final processing. Part of this factory is also a research laboratory – a company's subsidiary V.F.HUMULUS Ltd.

This investment in modern technology enabled the company TOP HOP Ltd. to strengthen its position against the competition and fulfills all the procedures to gain a competitive advantage. Unification of procedures of hop processing into one comprehensive factory represents advantages in speed of the hop processing, while achieving the best possible quality. Storage capacity located near the main road (road no. 6 - E48) simplifies the logistics processes.

The main existing competitors of TOP HOP Ltd. are Chmelařství, cooperative Zatec, Emil Bureš HOPSERVIS Ltd. and ARIX Inc.

Chmelařství, cooperative Žatec is an organization of 100 Czech and Moravian hop growers. Thanks to it, Chmelařství manages about 4265 hectares of hop gardens, which represents about 94 % of the total hop area cultivated in the Czech Republic. Chmelařství is mainly engaged in the purchase, storage, processing and trade in hops. The cooperative also offers services associated with the supply of hops production machinery, construction of hop gardens, sale of the hop necessities. Chmelařství is the majority owner of companies Bohemia Hop, Inc. and MORAVIA - HOP Ltd.

Emil Bureš HOPSERVIS Ltd. also has its own storage capacities; the company owns combing and drying equipment for primary processing of raw hops. Emil Bureš HOPSERVIS develops a long-term cooperation with a German company Joh Barth & Sohn GmbH & Co. KG. This connection provides guaranteed sales of hops and as well as some capital for securing of contracts with Czech and Slovak hop growers. Furthermore, this company focuses its activity on primary agricultural production.

ARIX, stock company is engaged in trade with Czech hops. Thanks to companies PP Service Inc. and TUFA Ltd. with those is tied on the capital basis - also manufactures hops. Hops from this company come mainly from the areas of the Golden Stream and Podlesí. The company has its own warehouse with a capacity of 750 tons of raw hops and 320 tons of processed hops.

The side competitors of TOP HOP Ltd. are companies: Žatec hop company a.s. and Svoboda – Fraňková s.r.o. Both of the companies are somehow connected to hop growers. Žatec Hop Company is connected with an international group Simon H. Steiner Hopfen, GmbH on a capital basis. Svoboda - Fraňková Ltd. has its own air-conditioned warehouse.

2) Threat of new competitors entering the market

These days is not expected the entry of new competitors on the market with Czech hops. To this fact contributes especially the overall financial demandingness on building technology associated with processing, storage and logistics of hops. Another reason is the high degree of loyalty of existing customers (especially foreign ones) to the companies operating on the Czech market. All the major companies operating on the Czech market have built a name associated with quality.

However, within the new competition, we cannot ignore the possibility of capital investment of the strong (for example foreign) companies in existing companies; the creation of new joint ventures with existing companies and the like. From the perspective of the Czech Republic, the potential competitor can be identified in AGROFERT, stock company, or foreign investors entering the Czech market.

This year have investors from China shown their interest on investing in Czech companies and it is perhaps only a matter of time until these investors focus on the Czech hop market. This fact supports the ever-growing beer market in Asian countries. From a global perspective is the Czech market in hops influenced by competition of foreign hop growers who are able to produce more hops with lower costs. This new competition is currently particularly hampered by the name and the quality of Czech hops, primarily due to the “Saaz” hop variety.

In the future, the Czech hop market should focus on a portfolio of new hop varieties with specific characteristics, especially those with higher yield per hectare while preserving qualitative properties of the Saaz variety. Growing hops on low constructions is an option because it significantly decreases costs. However, it is difficult to cultivate new hop varieties that would fit such cultivation.

Foreign hop growers are slowly gaining properties approaching to the quality and characteristics of the Saaz. This fact can be taken as an important potential threat by evaluation of new competitors, however, is can hardly be directly influenced (and eliminated) by companies on the Czech hops market.

3) Bargaining power of buyers

Effect of buyers is influenced by many aspects in the hops market, especially by the fact that contracts with customers are concluded for several years ahead (typically for 5

years). Position of buyers towards producers of hops is usually balanced. To some bargaining power of buyers contribute aspects of quality and contracted quantity of hops.

In case that in some years of duration of the contract the quality of grown and processed hops remains below the quality requirements of customers; or if seasonal production has not reached sufficient volume with which it is calculated and the producer does not have sufficient stock from previous years to cover contractual obligations, the influence of the buyer increases. During the validity of the contract it is quite difficult for a buyer to switch from one producer to another, especially because of the contractual obligations. These obligations have mostly an international character. On the power of buyers has a great influence the size of the buyer by itself. In the case of strong international buyers is their influence typically higher than have the local small customers, for example - microbreweries.

4) Bargaining power of suppliers

In context of the hop market can be the power of suppliers divided into two types according to the buyer's perspective. First type of suppliers are suppliers for companies that are only focused on trade in hops without having their own production capacity. In this case, the power of suppliers may be significant. Second, there are suppliers that are cooperating with companies which have own cultivation capacities and who are using additional supplies only for coverage of their own shortcomings of hops, to purchase some reserve stocks etc.. In this case, bargaining power of suppliers is declining.

Company TOP HOP owns a few farms, which are source of stable and cheaper hops supplies. Nevertheless, these supplies are not sufficient to cover the company's demand. Each year TOP HOP must buy hops from external farmers at prices established by the farmers (there is not much space for negotiations, especially in case there is lack of hops on the Czech market). In both cases, knowledge of the market and competition plays the key role, as the Czech companies operating in the cultivation and sale of hops know each other quite well. Information or good mutual relationships determine the status, mutual influence and bargaining power in the business relationship. As a rule, the mutual influence changes annually with respect to the crop year and the readiness of buyers.

5) Threat of substitute products

Basic products for the brewing of beer are water, barley malt and of course - hops. Currently, many breweries are trying to the lower their cost by production of beer, which

they achieve for example by various substitutes of the essential products. Price cuts and constantly increasing beer production are the two main factors contributing to the increasing demand for substitutes of Czech hops. Substitute products of Top Hop include several products such as hops from production of other companies, cheaper foreign hops or hop products, hop extracts and hop isoextracts.

To the group of so-called hop products has Top Hop yet responded by investing in its own processing plant. Hop products are pellets or granules that are produced by mechanical treatment of the dried hop cones. Hop cones are then being mixed and compressed into hop pellets. This treatment does not use any chemicals. For companies producing hops and also for breweries are particularly beneficial in terms of maintaining the quality of the raw hops, but with much smaller demands on logistics and storage capacities. Currently, unprocessed hop cones are used in advertising (TV commercials), as additional flavoring of the beer or in microbreweries. These days we cannot observe a large brewery which brews its beer only with unprocessed hop cones. TOP HOP produces hop pellets of type 45 and 90 that are the most commonly used hop pellets.

Another possible substitute is the hops extract. Hops extracts are manufactured through leaching hops in the extraction reagent. Most often, ethanol and liquid carbon dioxide are used for the leaching. Substances of the hop cones are extracted by physical means. Using of hop extracts is quite widespread, especially abroad. Some of the Czech breweries are also using them, but nowadays there is no place in the country where are these products manufactured, they are mostly imported from Germany.

Last substitute of Czech hops are the so-called isoextracts. In this process, only a few substances of the hops are being separated. These are mainly α -bitter acids, which are separated from the hop extract. These substances affect especially the bitterness of the beer and the quality of the foam.

Using of hop extracts and isoextracts is not regulated by the Czech legislation. In recent years, consumption of these substitutes of the Czech hops is growing among Czech as well as foreign breweries.

Results and summary:

To consider all the five forces, it was evaluated:

- Barriers of entry were ranked as high due to the financial demandingness and difficulties in building a good company's name and therefore a base of permanent customers;
- Competitive rivalry inside the hop market is not very strong as there is not a big number of competitors and most of them have established its base of local as well as foreign customers years ago;
- Availability of substitutes is marked as quite many, most significant tend to be foreign supplies of cheaper hops and hop products, particularly hop extracts;
- Bargaining power of hops suppliers (farmers) can be relatively significant, especially in case if the trade company does not possess own production capacities;
- Bargaining power of buyers is middle, contracts for supplies of hops are long-term, buyers cannot change a supplier during the time without a reason, only by serious infringements from the side of the supplier (poor hops quality, low quantity);
- Technological demands are high if we consider that company realizes all the processes connected to the trade with hops – cultivation, processing, storage, hop research and logistics;
- Degree of innovations is rather low in the hop industry.

Table 22 – Summary of the Porter's five forces analysis

Factor	Evaluation					
	0-3	3-6	6-9	9-12		
Existence of barriers to entry	None			x		Almost impossible
Competitive rivalry	Extremely high			x		Almost none
Availability of substitutes	Many		x			None
Bargaining position of suppliers	High		x			Low
Bargaining position of buyers	High			x		Low
Technological demands	Hi-tech		x			Low
Degree of innovation	Often			x		Almost none

Source: Own elaboration.

5.1.2 SWOT Analysis

SWOT, which stands for strengths, weaknesses, opportunities and threats, is an analytical framework that can help a company to face its greatest challenges and to find its most promising new markets. In a business context, the SWOT analysis enables organizations to identify both internal and external influences. In this case, SWOT analysis was created for the company TOP HOP.

Strengths

- **Own research**

Own research is performed by its subsidiary V. F. HUMULUS, core activity of the company is research in the areas of hops with a special focus on reviving of the Saaz variety. The aim is to obtain best quality of Saaz hops, thereby increasing its competitiveness on the World market. Variety Saaz special was first cultivated by V.F. HUMULUS and introduced by TOP HOP.

- **Own storage capacities**

In 2012 began its activity a new plant for processing and storage of hops in Hořesedly (Žatec hop-growing area in the district of Rakovník). Air-conditioned warehouse has six independent refrigerated storage halls fitted with Toyota technology. Warehouse serves for storing of raw hops brought immediately from hop gardens after the harvest and storage of finished products. The storage temperature keeps in the range from +2 to +4 ° C.

- **Good reputation of the company**

TOP HOP was established in 1991 and during 25 years managed to build a good company's name and also a stable base of business partners worldwide.

- **Powerful base of the company**

A group of companies financially and personally linked with TOP HOP include six agricultural companies that deal with hop growing. All of them are in the Saaz hop growing region and its hop gardens are located in the best locations of Podlesí and the Valley of the Golden Stream. Suitable location and quality of care for hops guarantee high quality grown hops. Single companies of the TOP HOP group are marked on the attached map of the Saaz hop region in the Appendix.

Opportunities

• Investment in new facility

Investment in new equipment or modernizing existing technology is one of the ways to strengthen the company's market position. In 2016, TOP HOP invested in the movement of picking units, which achieved its better availability, cost reduction of operations and reductions of downtimes.

• Opening new markets in Asia

Entering new markets is possible especially due to the ever-increasing demand for high-quality varieties of Czech hops. Foreign competition is great, offering large quantities of cheap - but also less quality hops on the global market. Potential of the company TOP HOP can be in particular seen on Chinese, Russian and Vietnamese markets.

• Increasing number of offered hop varieties

By increasing number of hop varieties, especially the less traditional ones is a potential opportunity for expansion of the company; especially in the area of microbreweries and local customers. Further extension of the portfolio of offered varieties could potentially be varieties qualitatively comparable to Saaz hops, but with greater yields (profitability).

Weaknesses

• Gaps in the coverage of demand

Failure in the full satisfaction of the demand can be the weakest point of the company. Demand for high-quality Czech hops is very high in recent years. Last year's poor harvest caused that the company was not able to provide sufficient volume of hops to satisfy the demand of foreign customers. These situations can occur because contracts are concluded several years ahead.

• Quality of employees

The quality of employees is one of the weaker sides of the company. Especially problematic is educating of new employees on all management positions as well as leaving of the old experienced employees to retirement etc. Currently, majority of companies deals with this issue, not only in the agriculture branch in the Czech Republic. Quality of the staff will be in the future one of the key factors affecting the substantial majority of the processes in the business.

Threats

• Future workforce

The quality of workforce on the labor market is a threat not only in agriculture, but across all sectors. Agriculture seems to be for the new workforce less attractive than other sectors. Agricultural work is physically intensive; there are placed great demands on the staff. Working positions are evaluated rather below average in financial matters.

• Quality of hops

Quality of the hops and the final production depends largely on factors that are not directly impressible by the company. These factors include weather, rainfall and incidence of diseases. Other factors as the quality of storage and transportation, which are also affecting the quality of the hops, can by gradually minimized by the company.

• Quality of the soil

Quality of the cultivation soil is a factor that constitutes potentially a direct threat for hop growing. For the growing of high-quality Saaz hops are required special soils located in Žatec region (in particular the Permian red, but also lighter argillite soils). It is possible to assume the deteriorating quality of these soils in the future, reducing the acreage of the soil areas.

• Diminishing acreage of hop areas

The shrinking acreage of hop gardens and lack of renewal of hop gardens is a factor which could adversely affect all producers of hops in the Czech Republic in the future. The total cultivation area and the acreage of hop gardens decreased by about 16 % between 2008 and 2014.

Result and summary:

The overall result of the SWOT analysis according to the specified importance and ranking of the criteria reached a number of 1.2. This result represents TOP HOP as a strong and stable company. Strengths and opportunities of the company should allow the future gradual elimination of the weaknesses and reduction of the risk of external threats acting against the company.

Table 23 – Summary of the SWOT analysis

		Positive		Negative/harmful				
		STRENGTHS		WEAKNESSES				
		<i>Importance</i>	<i>Score</i>	<i>Importance</i>	<i>Score</i>			
Internal	1	Own research	0.2	4	1	Gaps in the coverage of demand	0.5	3
	2	Own storage capacities	0.4	5	2	Quality of employees	0.5	3
	3	Good reputation	0.2	3	3			
	4	Powerful base of the company	0.2	3	4			
	5				5			
		Total	4		Total	3		
		OPPORTUNITIES		THREATS				
		<i>Importance</i>	<i>Score</i>	<i>Importance</i>	<i>Score</i>			
External	1	Investment in new facilities	0.4	4	1	Future workforce	0.4	3
	2	Opening new markets in Asia	0.4	3	2	Quality of hops	0.3	3
	3	Increasing number of hop varieties	0.2	2	3	Quality of the soil	0.2	3
	4				4	Diminishing acreage of hop areas	0.1	3
	5				5			
		Total	3.2		Total	3		
		SWOT - Result		Total	1.2			
		Strengths	4					
		Weaknesses	3					
		Total - internal	1					
		Opportunities	3.2					
		Threats	3					
		Total - external	0.2					

Source: Own elaboration.

5.2 TOP HOP – trade in hops

Since its establishment, the core activity of TOP HOP was and still is trade with hops. Company sells hops from production of its own farms but also buys hops from outside farms and farmers to cover the demand of its target customers.

Table no. 24 shows the evolution of volume of sold hops in tons recalculated to volume of non-crushed hop cones in order to avoid a biased volume. Hops is sold in two types of hop processing – hop pellets of type 45 or 90 according to the customer’s requirements. From the table is evident that majority of hops is sold abroad (usually around 70 %), the rest is sold to big Czech breweries as well as microbreweries operating on the Czech market.

Volumes of the total sold hops in a significant extend depend on favorableness of the year’s harvest, but also on the company’s ability of buyout of hops from external suppliers. This fact support results of years 2006 and 2007 which belong to the average according to sales, although those crop years were under average, as it is visible from the graph 20.

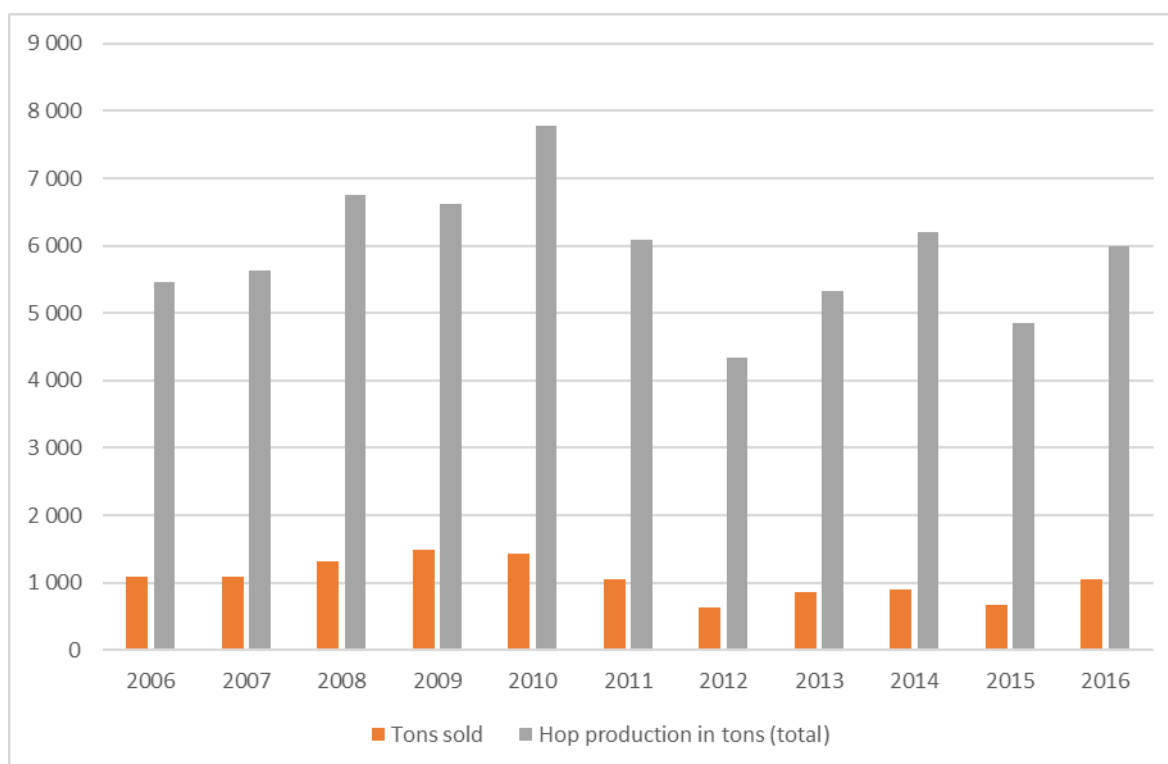
Table 24 – TOP HOP – trade in hops (2006-2016), in tons of non-crushed hop cones

Year	In tons			Share of foreign trade (%)
	Sold (total)	Sold within the CR	Exported abroad	
2006	1 087	295	792	72.86
2007	1 085	280	805	74.19
2008	1 307	210	1 097	83.93
2009	1 489	310	1 179	79.18
2010	1 433	390	1 043	72.78
2011	1 039	322	717	69.01
2012	630	189	441	70.00
2013	867	291	576	66.44
2014	888	284	604	68.02
2015	665	244	421	63.31
2016	1 055	325	730	69.19

Source: Data provided by Josef Ondráček, Own elaboration.

Highest sales were recorded in 2009 by an average level of harvest – the peak of the economic crisis did not have a negative impact on the trade in hops of TOP HOP. Year of 2010 was successful in both terms – production of hops and also hops sold by the company.

Graph 20 – Hop production in the Czech Republic vs. Hops sold by TOP HOP (in tons)



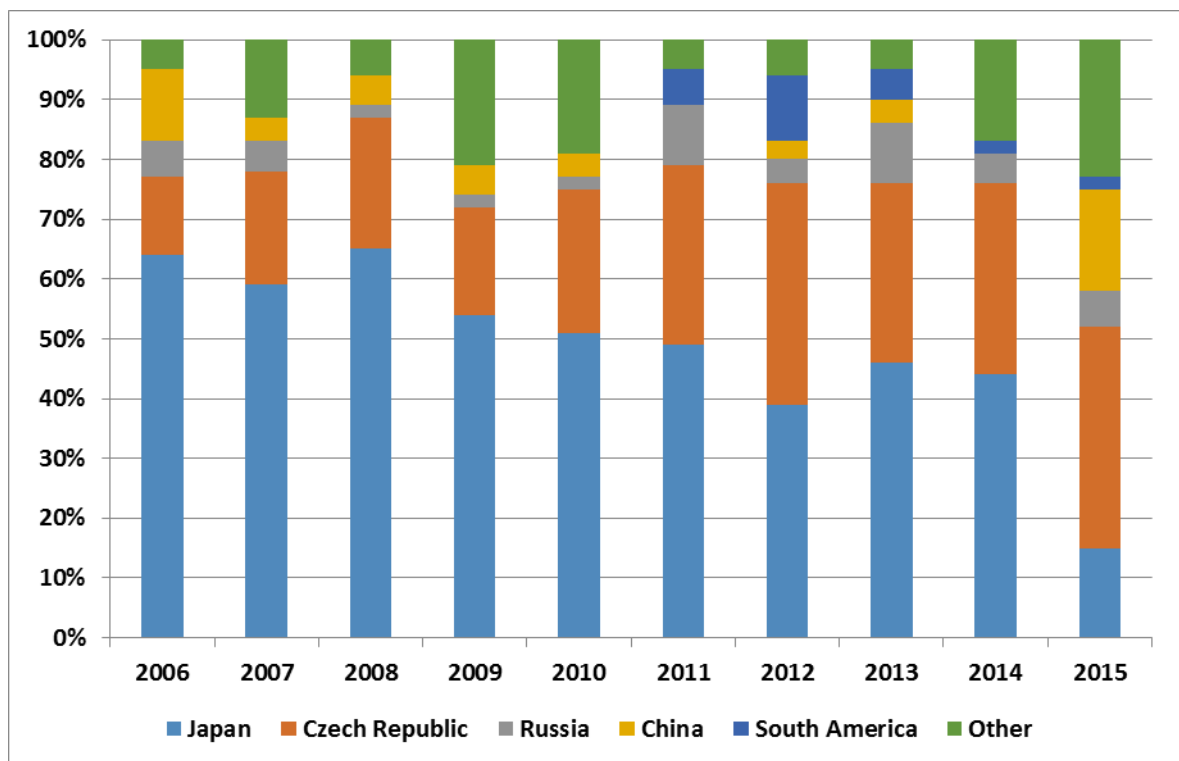
Source: Own elaboration.

In contrast, both – sales and the overall hops production in 2012 was the lowest during the observed time line. Period 2013 – 2015 was a combination of under average to average hop production and smaller volume of hops purchased from external farmers. Year 2016 means a recovery with sales of 1055 tons of hops. Every year TOP HOP sells 15 % – 20 % of the overall Czech hops production.

Regarding the percentage of foreign trade and deliveries to breweries within the Czech Republic, majority of the volume of hops is sold abroad. On the contrary, the company has rules that preferably are supplied breweries on the Czech market and the rest of “free” hop production is exported abroad. Sometimes it is problematic because contracts with foreign breweries are conducted for specified quantities with a threat of financial penalties or losing a customer in case of infringements.

From the beginning of the observed period, most important customers of Top Hop were biggest Japan breweries consuming around 65 % of the total exports.

Graph 21 – Most important export destinations in time



Source: Annual Reports of TOP HOP, Own elaboration.

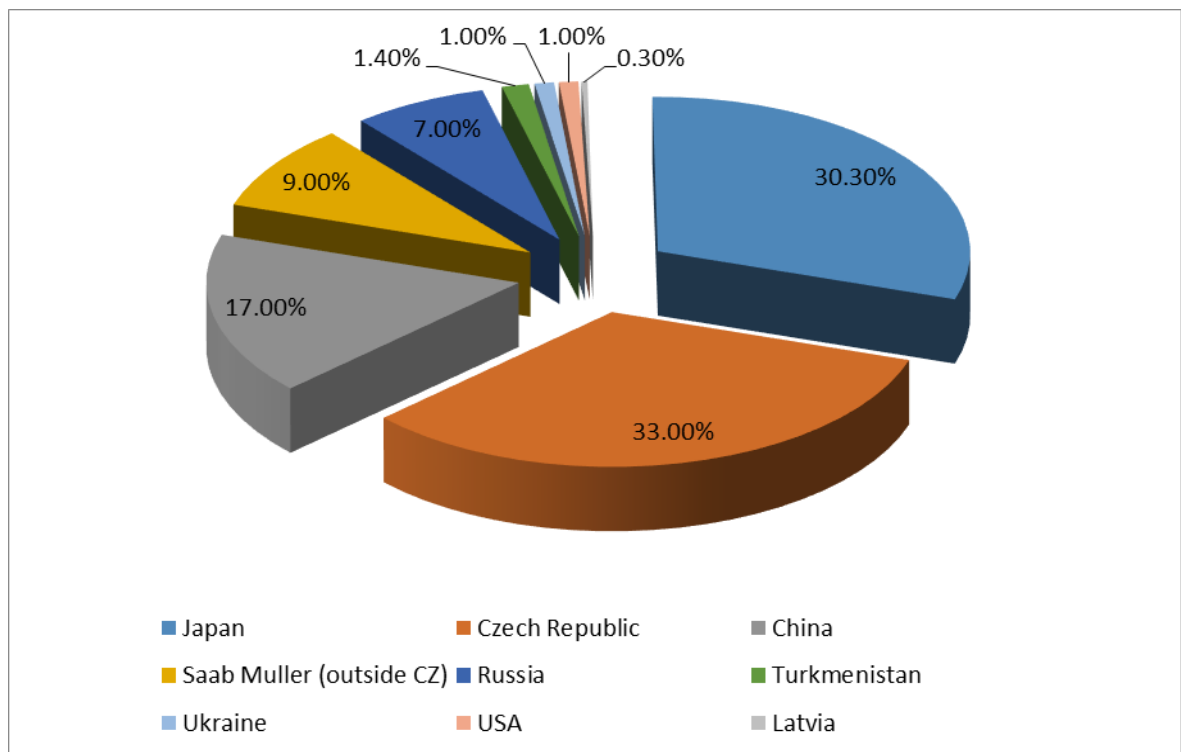
Exports to Japan are constantly decreasing due to the lower consumption tendencies on the Japan beer market. Supplies to Japan experienced a dramatic slump in 2015 falling from 44 % in 2014 to only 15 %. Japan breweries had redundant stocks of hops from previous years and therefore decided to import significantly smaller volume.

Second place (resp. first in 2015) always kept supplies to the Czech breweries. Another three most significant customer countries are China, Russian Federation and South America. After an outage of export to China in 2014, the exported volume has significantly risen in 2015 reaching a share of 17 % of the overall exports which for the first time outweighed exports to Japan. Mutual relations in terms of trade in hops are good and it is expected to keep or slightly increase the volume of hops supplied on the Chinese market.

Further export destinations are quite fragmented, including Vietnam, Peru, South Africa, Uganda, Latvia, Turkmenistan, Ukraine and others.

Latest data was collected for a crop year of 2016. The most significant change was recorded by Japan; supplies to Japan doubled when compared to 2015. Japan breweries consumed its old stocks of hops and decided to revive Czech supplies. China increased volume of imported hops keeping the same share of exports of TOP HOP like in 2015. Czech breweries and microbreweries increased its consumption in absolute numbers, but in relative terms did not change. Exports to Russia also remain stable.

Graph 22 – Export destination in 2016



Source: Own elaboration.

With regard to the hop processing, hop pellets of Type 90 make up 60 % of the exports while 40 % of customers prefer the hop pellets of Type 45. All the most significant customers (Japan, China) import both types of hop pellets. There are not big differences

among contracted prices for breweries from Japan, China or Russia. Contracts are almost in all cases concluded in Euros, only in case if it is more favorable for TOP HOP - they are rarely conducted in Czech Crowns.

Majority of the hops sold in 2016 was the Saaz variety (90.5 %). It was also sold 47 tons of Saaz Special, 44 tons of Sládek, 8 tons of Premiant and 1 ton of Cascade.

Biggest interest in these minor hop varieties showed Russia by importing varieties Sládek, Premiant and also Saaz Special. Premiant was also supplied to a Republic of the Russian Federation – Tatarstan. Saaz special was in small volume exported to the USA. A special variety Cascade was sold to Czech microbreweries for brewing of non-traditional beers of American style.

6 Conclusion

Hop growing in the Czech lands has a long tradition and has always been an important part of agricultural production and the national economy due to the brewing industry, but also through the creation of working positions in rural areas. Czech hops is traditionally prized commodity on the international market thanks to its specific and inimitable qualities. The major advantage of Czech hops is its quality, supported by action of laws and regulations that ensure protected designation of origin, certification and traceability of the hops. Foreign trade in hops of the Czech Republic regularly achieves a positive balance which amounted to 716 million CZK in 2015. Hop growing as an industry therefore annually positively contributes to the gross domestic product of the Czech Republic.

Czech hop industry had been for many years struggling with problems which resulted in a reduction of acreage of hop growing areas. However, since 2014 hop growing areas began to grow again, not only in the Czech Republic, but in most of the major hop producing countries. According to the analysis of the development of Czech hop regions in terms of acreage, average yields and share of individual hop varieties, the most important is the Saaz variety followed by Sládek and Premiant. Region Tirschitz annually exhibits the highest profitability while the largest Saaz region has traditionally the lowest yields at all observed hop varieties. Sládek and Agnus are varieties with a potential of high average yields.

After a long period of 50 years is the USA again the biggest producer of hops in the World. Second biggest hop producer is currently Germany and third rank occupies the Czech Republic because China has significantly shrunk its hop growing acreage. Furthermore, the Czech Republic remains to be the largest producer of fine aroma hops in the World.

More than two thirds of total exports of Czech hops were directed outside the EU. Asian market is currently the dominant one. The top three importers of the Czech hops are stably China, Japan and Germany. Hop exports to China recorded a rise about 100 tons and for the first time received larger volume of Czech hops than Japan. On the contrary exports to Germany dropped by 100 tons in 2015. In 2015, exports to China recorded a peak volume of 963 tons in a statistical value of 192 972 ths.. Japan ranked as a second biggest export destination receiving 879 tons of hops. Exports keep falling due to the situation on

Japan beer market. Germany is the third biggest receiver of Czech hops. Exported volume reached in 2015 827 tons, statistical value was the third highest during the observed period. Considering trade in hops with Germany, for the Czech Republic are important imports of hops extracts, because there is no place of processing within the Czech Republic.

Trade in Czech hops is significantly influenced by developments in global markets, it is therefore necessary to observe the situation abroad, particularly portfolio structure of hop varieties and the amount of foreign costs of production with respect to the realized (selling) prices. Foreign trade is dependent on currency exchange rates - strengthening of the Czech Crown against the Euro can make the Czech hops less competitive, and vice versa.

The influence of exchange rate CZK/EUR was examined on hops exports to Germany with a help of statistical program STATISTICA 12; regression and correlation analysis revealed that volume of exported hops is by 33 % explained by a model with the exchange rate CZK/EUR. Such a proportion of variability suggests that the total exported volume is also influenced by other factors which are not considered in this model. From real experiences, exported volume depends mainly on the volume of hops stocks of German breweries from previous years and demands for the Saaz fine aromatic hops. Through a simulation tool for predictions of the same statistical program was examined, what would be the volume of exported hops to Germany if the exchange rate would be 24 CZK/EUR (realistic scenario) and 50 CZK/EUR (extreme value). Exchange rate of 24 CZK/EUR showed a volume of 733 tons of hops; whereas at exchange rate 50 CZK/EUR would exports to Germany reach 2,608 tons of hops. As the regression analysis shows elasticity of approximately 1.6 %, these forecasts cannot be considered to be realistic. This view is also supported by relatively wide confidence intervals and especially real experiences which in the long term show that exports of hops are not significantly dependent on the current exchange rate.

To evaluate trade with Czech hops in practice in a narrower scale was chosen a Czech trade company TOP HOP. This company associates five agricultural companies whose business is hop growing and a hop research laboratory. Company annually sells 15 – 20 % of the overall Czech hops production. From a historical perspective, largest volume of exports was consumed by the biggest Japan breweries with a share of 65 % of the total company's exports. However, supplies to Japan experienced a dramatic slump in 2015

falling from 44 % in 2014 to only 15 %. Japan breweries had redundant stocks of hops from previous years and therefore decided to import significantly smaller volume. Exports to Japan doubled in 2016, as Japan breweries consumed its old stocks of hops and decided to revive Czech supplies. Consumption of the Czech breweries constitutes approximately 30 % of total sales. Another two most significant customer countries are China (17 %) and Russian Federation (7 %). While exports to China are still on the rise, trade with the Russian Federation remains stable during last decade.

According to the Porter's Five Forces Analysis concerning the Czech market with hops was concluded that barriers of entry are high due to the financial demandingness and difficulties in building a good company's name and therefore a base of permanent customers. Competitive rivalry inside the hop market is not very strong as there is not a big number of competitors and most of them have established its base of local as well as foreign customers years ago. There are quite many available substitutes of the Czech hops - most significant tend to be foreign supplies of cheaper hops and hop products, particularly hop extracts. Bargaining power of hops suppliers can be relatively significant, especially in case if the trade company does not possess own production capacities. Bargaining power of buyers is middle, contracts for supplies of hops are long-term and buyers cannot change a supplier during the time without a reason, only by serious infringements from the side of the supplier (poor hops quality, low quantity). Technological demands are high if we consider that company realizes all the processes connected to the trade with hops. Degree of innovations is rather low in the hop industry.

SWOT analysis strived for evaluation of strengths, weaknesses, opportunities and threats of Top Hop. Biggest strengths were identified in the existence of own research laboratory V.F. Humulus, own storage capacities in Hořesedly, good name of the company and its powerful base. The weaknesses appear to be in gaps in the coverage of demand and quality of some employees in the company. Opportunities were found in investments in new facility, opening new markets in Asia and increasing number of offered hop varieties. Among identified threats belong the quality of future workforce, possible deterioration in the quality of the soil and hops which is not directly influenced by the company and eventual return of the trend of diminishing acreage of hop areas.

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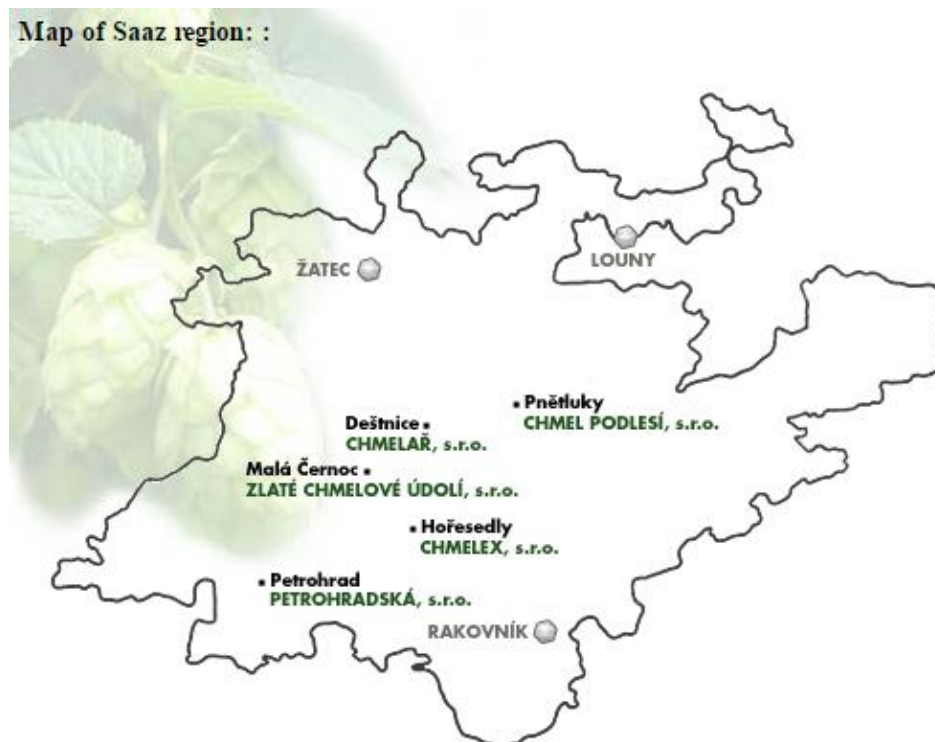
8 Appendix

A) Members of IHCC

1. AUSTRIA	18. Brewers Supply Group
2. AUSTRALIA	19. German Hop Ind. Association
3. BELGIUM	20. Joh.Barth & Sohn
4. CZECH REPUBLIK	21. Xinjiang Sapporo Agric.Sci. &Tech.Devel.Co.
5. FR GERMANY	22. Powiśle
6. FRANCE	23. Hopsteiner
7. NEW ZEALAND	24. CZ Union of Hop Merchants & Processors
8. POLAND	25. Hopsteiner Spain S. A.
9. PR CHINA	26. Charles Faram & Co Ltd
10. ROMANIA	27. Inbarco
11. SLOVAKIA	28. American Dwarf Hop Association
12. SLOVENIA	29. Hmezad Exim d.d.
13. SPAIN	30. Lutega S. Cooperativa Galega
14. SOUTH AFRICA	31. 47 Hops
15. UK - ENGLAND	32. Xinjiang Kinner Agriculture Co. Ltd.
16. UKRAINE	33. YCH HOPS / Yakima Chief - Hopunion LLC.
17. USA	

Source: INTERNATIONAL HOP GROVERS' CONVENTION; 2015; <http://www.hmelj-giz.si/ihgc/mem.htm>

B) Map of the agricultural companies belonging to TOP HOP



Source: Web page TOP HOP, Ltd.; <http://www.hop.cz/home.php?pg=vyroba&lg=en>

C) Hop pellets, type 90



Source: <http://1.bp.blogspot.com/-cKXbO0YCK-c/Uf5tGdjb15I/AAAAAAAAAPcw/bRDB-cmmvmI/s1600/20130803-0026.jpg>

D) Hop cones



Source: <http://www.gastrotrend.cz/files/files/detail-sisek-chmele-720.jpg>

F) CO₂ Hop extract



Source: http://www.beerlog.ru/wp-content/uploads/2014/02/DSC_6785.jpg

F) Designation of origin of hops



Source: http://web2.mendelu.cz/af_291_projekty2/vseo/files/75/7567.jpg