Principles of co-existence

The Czech Republic total agricultural land area is about 4 264 000 ha, which represent about 54 % of the total country area. Arable land covers 3 050 000 ha. Other agricultural area is used as hop-gardens, vineyards, orchards, gardens and grasslands (meadows and pastures).
At present, three basic farming types exist in the CR: **conventional** (classical, traditional) **farming, organic farming, farming using GM crops**. Conventional agriculture prevails, whereas the cultivation of GM crop (GM maize) represents about 0.20 % and organic farming 8.04 % (data of 2008).

The cultivation is regulated through the rules of co-existence, which define principles of cultivation with respect to conventional cultivation, organic farming and cultivation of GM crops. The Czech Republic follows the Commission Recommendation of July 23, 2003 on guidelines for the development of national strategies and best practices to ensure the coexistence of genetically modified crops with conventional and organic farming (notified under document C2003/556/EC).

The prevailing **conventional farming** is regulated by the Act 252/1997, on Agriculture, later amended (2005, 2009). The aims of this Act are:

- To create conditions supporting the Czech agriculture with the aim to ensure the basic nutrition of the population, food safety and necessary non-food raw materials.
- To create conditions supporting the non-production farming functions which contribute to the protection of the environmental components, mainly the soil, water and atmosphere.
- To create conditions for implementation of the EU Common Agricultural Policy.

The principles of **organic farming** are set by the Act 242/2000 on Organic Farming. This Act makes provisions for common principles of the Act on Agriculture and further includes conditions for organic farming and production of organic foodstuffs. The Act excludes any use of GMOs (with the exception of pharmaceuticals and veterinary vaccines), and determines concurrently the sanctions against infringement of the ban. The Act on organic farming includes provisions concerning the co-existence. For example, § 10 par. 1) stipulates: „If the plots where the organic farming methods are used border on the plots cultivated by non-organic methods, the organic entrepreneur must take measures that reduce the risk of the effects on his organically cultivated plots to minimum, and that is mainly by means of the hedge fences, insulating grass strips, wind barriers and roads. “

In the Czech Republic, on the basis of the EU legislation, the threshold of casual and technically unavoidable GMO admixtures in the products of both conventional and organic agriculture is 0,9 %. Products with admixtures exceeding this limit need to be labelled appropriately, in line with corresponding EU Regulation 1829/2003 and Regulation 1830/2003. In organic agriculture this leads to withdrawal of the authorisation for bioproduct. Therefore the rules of co-existence for GM crop cultivation in the neighbourhood with organic farming system are more rigorous, especially as to isolation distance.

Genetically modified (GM) crop has been grown since 2005 - Bt maize, MON810 maize resistant to the corn borer (*Ostrinia nubilalis*). The Bt maize is cultivated on a limited area in the Czech Republic (as well as in the EU) because of the application of the precautionary principle regarding genetically modified organisms (GMOs), specific natural and socio-

economic conditions in the EU. For the year 2005 the set of particular measures was taken through the Government Order 145/2005, laying down conditions for complementary national direct payments. The basic principles were set by the Act 252/1997 on Agriculture, later amended (2005, 2009). Cultivation of GM crops is regulated by the Decree 89/2006 on detailed conditions for growing of genetically modified variety of the Ministry of Agriculture, which specified common legal rules according to particular plant species. The Decree entered into force on March 10, 2006. Due to the current situation in the EU concerning the authorisation of GMOs to be introduced into circulation and subsequently listing particular varieties into the Common Catalogue of Varieties of Agricultural Plant Species, the co-existence guidelines in the Czech Republic have been specified for cultivation of GM maize and GM potatoes. The measures for newly authorised varieties of other GM crops will be included into the guidelines after their approval within the proceedings at the EU level.

Growers of GM crops need to follow rules done by the above-mentioned legislation. Based on this legislation, the Ministry of Agriculture defines 10 basic principles for cultivation praxis:

- Notify the Ministry of Agriculture before sowing/planting GM crop.
- Notify the neighbouring farmers before sawing/planting GM crop.
- Keep the prescribed isolation distance between GM crop and the fields with the same non-GM species and/or surround the GM plantings with a buffer strip of the same conventional crop.
- Keep the prescribed isolation distance between GM crop and the fields with the same species crop grown in the organic way.
- Notify the Ministry of Agriculture after sawing/planting GM crop.
- Notify the neighbouring farmers after sawing/planting GM crop.
- Inform the Ministry of the Environment about location of GM crop cultivation.
- Mark the locality of GM crop cultivation.
- Label the GM crop product.
- Keep record and store data on growing and on further use of GM crop and its product.

Further it is necessary to follow some provisions of the Act 78/2004, on the use of genetically modified organisms and genetic products, later amended. It is mainly the duty to notify the area of GM fields to the Ministry of the Environment and label GMOs and their products.

The aim of the co-existence guidelines is to determine measures for the minimisation of potential economic losses connected with the increased use of a new technology of genetic crop modification.

The Ministry of Agriculture in cooperation with the Regional Agricultural Agencies and State Phytosanitary Administration monitors the rules of GM cultivation.

Overview of different planting systems in the Czech Republic
The share of existing planting systems in the total agricultural land and arable land is shown in the following tables.

Share of different planting systems in **agricultural land** in the Czech Republic

Agricultural land	2006		2007		2008	
	thous. ha	**%**	thous. ha	**%**	thous. ha	**%**
Total agricultural land	4 254	**100**	4 249	**100**	3 572	**100**
Conventional farming	3 971	**93.4**	3 931	**92.5**	3 222	**90.2**
Organic farming	282	**6.6**	313	**7.4**	342	**9.6**
GM crops (maize)	1	**0.02**	5	**0.1**	8	**0.2**

Source: Czech Statistical Office http://www.czso.cz/csu/

Share of different planting systems in **arable land** in the Czech Republic

Arable land	2006		2007		2008	
	thous. ha	**%**	thous. ha	**%**	thous. ha	**%**
Total arable land	3 040	**100**	3 032	**100**	2 592	**100**
Conventional agriculture	3 016	**99.2**	2 997	**98.8**	2 549	**98.3**
Organic agriculture	23	**0.8**	30	**1.0**	35	**1.3**
GM crops (maize)	1	**0.03**	5	**0.2**	8	**0.3**

Source: Czech Statistical Office http://www.czso.cz/csu/

The following table gives information about cultivation of maize in the Czech Republic, as well as the share in different planting systems.

Share of different planting systems in cultivation of maize in the Czech Republic

Maize	2006		2007		2008	
	ha	%	ha	%	ha	%
Maize in total	273 546	**100**	275 500	**100**	287 676	**100**
Conventional maize	268 133	**98.02**	273 774	**99.37**	278 973	**96.99**
Maize cultivated by organic farmers (EZ)*	413	**0.15**	436	**0.16**	323	**0.11**
GM maize	5 000	**1.83**	1 290	**0.47**	8 380	**2.91**

Source: Czech Statistical Office http://www.czso.cz/csu/2008edicniplan.nsf/p/2104-08

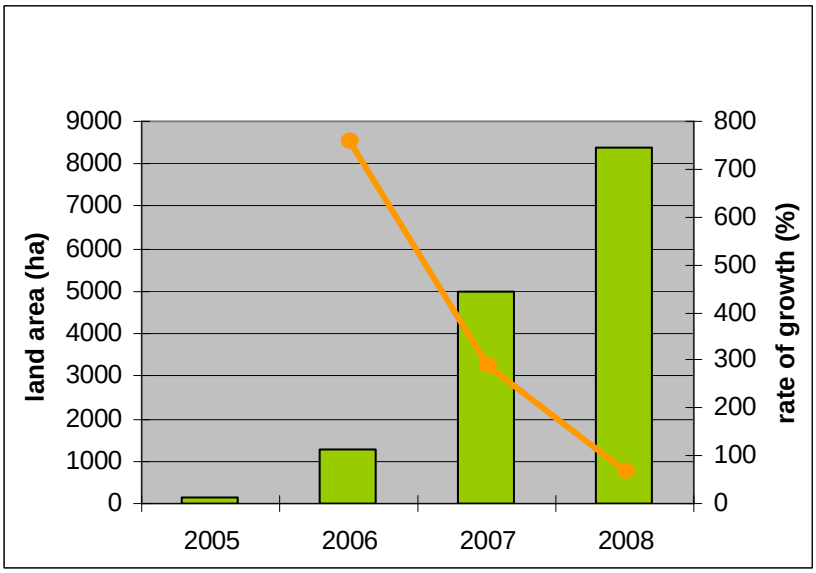
* Ministry of Agriculture (MZe) – data from control organisations in organic farming

Statistics of Bt maize cultivation in the Czech Republic in the period 2005 - 2009

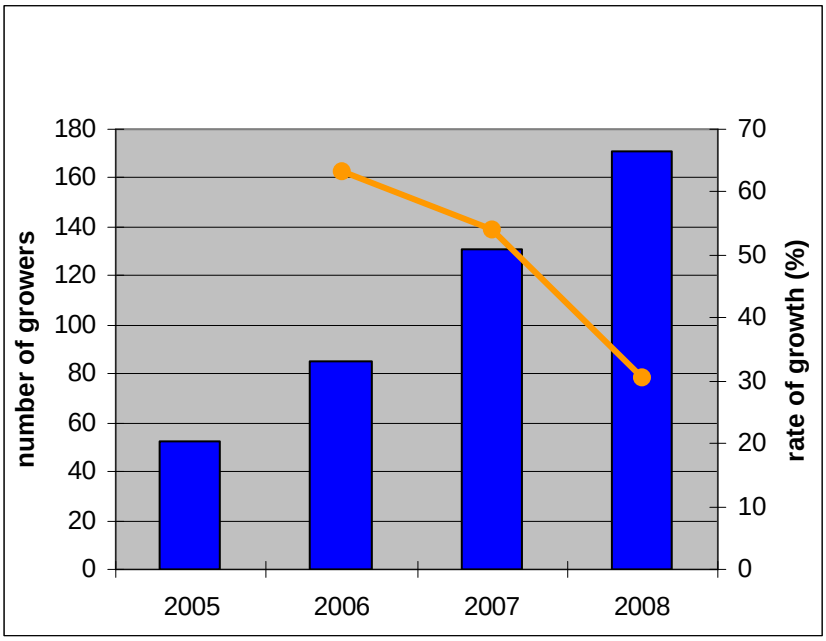
Commercial cultivation of the Bt maize started in the Czech Republic in 2005. The development is shown in the following table and graphs.

Year	Area in ha	Number of farmers
2005	270	52
2006	1 290	85
2007	5 000	131
2008	8 380	171
2009	6 480	125

Development of Bt maize production area in the Czech Republic from 2005 to 2008



Development of number of Bt maize growers in the Czech Republic from 2005 to 2008



When considering the size of an area used for cultivation of Bt maize compared with the total land area of particular enterprise, the most areas of Bt maize in the years 2005 and 2006 were managed by growers with total land area of 20 – 50 ha per one enterprise (40 - 45 %). In 2007 the most of Bt maize was planted in enterprises with the area of 100 – 200 ha (25 %), in 2008 with areas of 50 – 100 ha (almost 25 %). The experimental plots with the area less than 1 ha represented only minimum part of the total Bt maize land area in 2007 and 2008 (0.2 % and 0.1 % respectively).

Experience with cultivation of Bt maize in the Czech Republic

Every year, the Ministry of Agriculture has carried out a survey on experience of the Czech growers with Bt maize through a brief questionnaire. This is focused on technological, economic and ecological aspects. The results can be summarized as follows.

Health status of Bt maize

Significantly improved plant health is one of the major advantages of Bt maize cultivation mentioned by farmers. Farmers regularly announce lower *Fusarium* infestation of maize (assessed visually or via mycotoxins content determination). More than 40 % of farmers cultivating Bt maize observed either significant decrease in fungal infection or completely uninfected yield in 2007, 25 % of farmers observed lower *Fusarium* infestation of maize. Totally 32 % of farmers announced no difference between *Fusarium* infestation of Bt and conventional maize – such observations were made in localities with either no occurrence or a very high occurrence of corn borer (where pesticides against corn borer on conventional maize hybrids needed to be used).

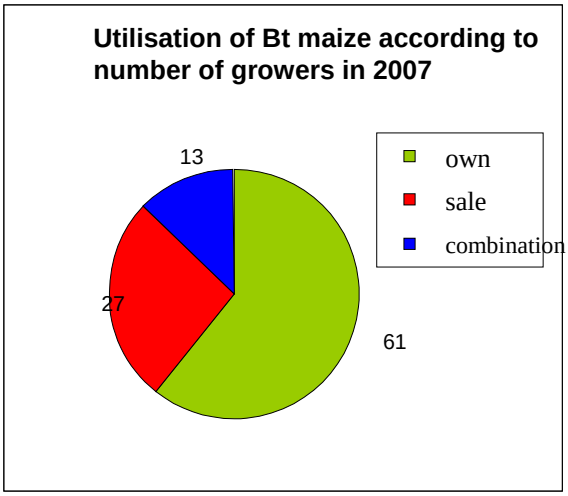
Bt maize yield

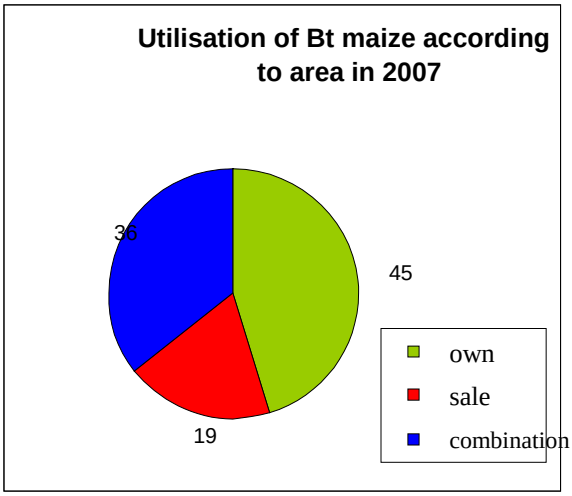
Based on the data from questionnaire, Czech farmers growing Bt maize obtained higher average yields than growing conventional hybrids. Local occurrence of corn borer and alternative method of the protection of conventional maize (chemical/biological or without spraying) play an important role in this respect. In case of a higher level of corn borer infestation the conventional plants are damaged so as maize cobs are invaded and stacks

broken, and therefore the harvesting of the final product is complicated. When the chemical spraying is used for the protection of conventional vegetation that serves at present as the main protective mean when combating corn borer, it is not always achieved the sufficient rate of the effectiveness in contrary to currently 100 % resistant Bt maize. Moreover, the chemical spraying also results in mechanical damage to vegetation due to its application in the field during a later phase of vegetative growth. Data obtained from growers of Bt maize show the increased yield of Bt maize in the period 2005 – 2007.
More than 60 % of Bt maize growers had each year the higher yield in relation to conventional maize varieties. Nevertheless some growers reported the decreased yield of Bt maize in comparison with conventional hybrids, especially in 2007 (12 % of growers).

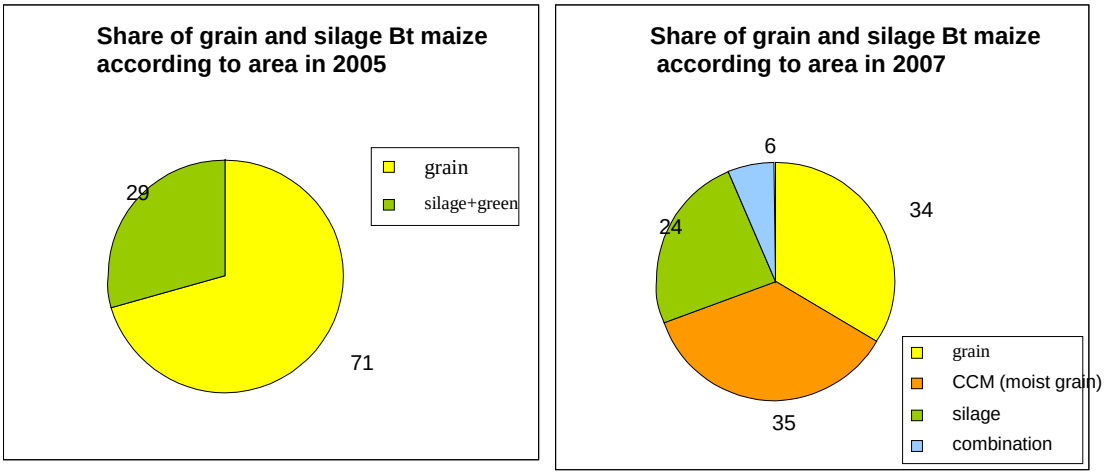
Utilisation of Bt maize
The most of Bt maize final product is utilised as feeding of livestock in the producing enterprise. A certain part of production serves for industrial purposes as the raw material for production of bioethanol or biogas. Bt maize is not used for food purposes in the Czech Republic. With the increasing area of Bt maize, the share of Bt maize for sale (properly labelled), mainly for feeding industry, raises. The situation is illustrated on example of 2007 year (and 2005 as to share of grain and silage) in the following graphs.

Share of utilisation of Bt maize according to number of growers and the area in 2007





Share of the grain and silage Bt maize according to the total area in 2005 and 2007



Advantages and disadvantages of Bt maize cultivation

The first years of Bt maize cultivation confirm certain advantages as well as disadvantages in comparison with conventional maize cultivation. Advantages are more visible in localities with higher occurrence of the corn borer. Growers reported more healthy vegetation (less fungi of the genus *Fusarium*), simplification and increasing efficiency of the protection against corn borer (no chemical or biological treatment of Bt maize which has 100 % resistance to corn borer) and higher yields in consequence of reducing losses caused by corn borer. Apart from these direct advantages, environmental aspect can be mentioned as the cultivation of Bt maize is in many cases an alternative to classical pesticide treatment of the vegetation and thus chemicals and mechanisation use and consequently environmental burden are reduced. From healthy aspect, the advantage represents a high quality feedstuff for livestock.

On the other side the cultivation of Bt maize has some disadvantages for growers, among them mainly need to follow specific rules for cultivation and subsequent marketing of the product, i.e. co-existence rules and system of GMOs labelling, which results in a higher administrative demands. Other disadvantage represents important economic aspect – a relatively high price of Bt maize seeds.

The results of the 2007 questionnaires are summarized in the following 2 tables. Nevertheless, advantages and disadvantages differ according to different vegetation seasons / years as well as localities / regions and could not be therefore generalized.

Advantage of Bt maize cultivation 2007	Number of growers (out of 71 responding the Questionnaire)
Better health status of vegetation, less *Fusarium* and mycotoxines, vital plants	39
Higher yield, certainty of good harvest	22
Lower environmental burden, elimination of chemicals, without any treatment	14
Vegetation clear of corn borer, 100 % effectiveness, protection procedure simplification	13
Personnel, labour and cost savings	8
Health feedstuff clear of fungi, better quality silage and wet grain	7

Disadvantage of Bt maize cultivation 2007	Number of growers (out of 71 responding the Questionnaire)
Increased administration, bureaucracy	27
Higher price of the seeds	13
Production marketing problems	8
Complicated legislation, sanctions	3
More moisture, later maturity of Bt hybrids	3

Source: Marie Křístková, Ph.D., Ministry of Agriculture (abbreviated and updated)