

# FOOD SELF SUFFICIENCY IN SELECTED CROPS IN THE CZECH REPUBLIC AND POLAND

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## Abstract

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Being a member of the EU, today the Czech Republic is not entirely dependent on domestic production of food and farming commodities. Since borders inside the EU are open, particular commodities can flow without any tariff measures. But food self-sufficiency belongs to internal factors of national security and therefore it deserves sufficient attention. The aim of this article is to evaluate, based on an analysis, the self-sufficiency rate of the Czech Republic and Poland in selected commodities of crop production between marketing years 2000/2001–2009/2010, with special attention to the most important and cultivated commodities – basic cereals, oilseeds, corn and potatoes. Based on analyses of self-sufficiency rate it can be concluded, that both countries can be considered as stabilised with respect to rate of self-sufficiency of selected crops – none of the presented groups falls under 80%. For most described commodities the trend of self-sufficiency rate in the Czech Republic and Poland is stabilised or growing. Only production of potatoes is coming close to critical threshold in CZ, therefore national strategies should be put in place to maintain the self-sufficiency rate above the critical limit. After an analysis of international trade it can be concluded that the Czech Republic is specialised exporter of not-processed commodities but country significantly falls behind Poland in competitiveness of processing of commodities.

Keywords: Poland, Czech Republic, food self-sufficiency, trade coverage, crops, cereals, oilseeds, corn, potatoes

## INTRODUCTION

Food self-sufficiency belongs to internal factors of national security and therefore it deserves sufficient attention; the same applies to conditions related to self-sufficiency. Stachowiak (1999) defines 5 main factors that have a crucial impact on the self-sufficiency rate of a given country. The factors are economic, political, social, natural and environmental.

At this point it is necessary to define the word self-sufficiency. Self-sufficiency shall be understood as the ability of a given country or a bloc to satisfy all needs of consumers (namely the basic crops) from the country's (domestic) production rather than by importing food from other countries. (Staat, 1991; Peljor, 2010)

When looking more closely at the Czech Republic we can state that during the socialist era achieving

food self-sufficiency was one of the main targets of the country at any economic and environmental cost (Orsilo, 2008). The same policy was typical for other socialist countries, e.g. Bulgaria, Hungary, GDR or Romania. All the said countries showed gradual increase of self-sufficiency in vegetable and animal production (e.g. 1970–1976) (Tiraspolksy, 1980).

Being a member of the EU, today the Czech Republic is not entirely dependent on domestic production of food and farming commodities that form the basic building element of food self-sufficiency. Since borders inside the EU are open, particular commodities can flow without any tariff measures. The immediate consumption of the population is satisfied from domestic as well as foreign resources. The Common Agricultural Policy of the EU (the Czech Republic is also bound

by CAP by adhering to its rules) aims at maintaining the self-sufficiency rate of the whole EU at 85% even if the self-sufficiency rate in particular member states is reduced (Maštálka, Čuba, Hurta, 2010).

There are several methods of increasing the rate of food self-sufficiency. The policy of food import restrictions by import quotas or tariffs leads to increased food self-sufficiency but to the exclusion of ensuring food for the poorest population for whom the cost of food forms a large part of total available resources (Warr, 2011). Therefore national self-sufficiency should be increased by support and growth of agricultural production. Production efficiency and yields per 1 ha are the decisive factor here. It is essential to ensure permanent production of food, thus ensuring higher self-sufficiency and reducing the number of people suffering from lack of basic food (Azadi *et al.*, 2011).

Based on FAOSTAT data 850 mil. people suffer from lack of basic food globally in spite of the fact that a sufficient global potential for production of food needed for nutrition of global population is available. The key problem is redistribution of food between continents (Grófová, Srnc, 2012). The worst situation is in Sub-Saharan Africa, south Asia and developing countries where 30% of population suffers from lack of food. In Europe it is 3% of population. The total global area of agricultural land is 4,973.4 million hectares (approximately 32% of the Earth's surface – 2008). There is approximately 0.65 ha of agricultural land per person (Lyuri, 2008).

The rate of food self-sufficiency also depends on government policies that directly affect market behaviour. Achieving food self-sufficiency in this manner usually causes major costs in that country's budget, which might be a limiting factor especially for poor and developing countries. (Barker, 1976; Nasko, 1989) Some governments apply a policy supporting consumption of locally produced crops with the aim to support local economy and contribute to sustainability of agriculture and access to food for wide population (Morrison *et al.*, 2012).

The amount of subsidies to agriculture is one of the main factors affecting achievement of self-sufficiency in particular countries. Nearly 50% of farmers' incomes in the EU is from subsidies and direct payments as opposed to Japan, where subsidies form only 20% of incomes of local farmers. Local farmers thus cannot pay the cost of cultivation by production yields (difference of 1,500 Yens per 1 ha in case of rice planting) and there is a low self-sufficiency rate (Kazuo, 2008).

When calculating the self-sufficiency rate there are several aspects that might affect the calculation:

- Gross measurement of a complex and dynamic set of variables.
- Static data mask the rate of goods seemingly produced in the given country depending

on imported inputs (oil, gas, fertilisers, fodders, machinery).

- A misrepresented statistics of the given country may also be a certain restraint (HM Treasury, Defra).

Judging from literary resources, food self-sufficiency becomes an important topic in developing as well as developed countries. Japan has been facing a problem as its food self-sufficiency dropped under 36% and (it is the lowest value among countries with over 100 million people) has been continuously decreasing, like the proportion of local food in total consumption, which leads to a considerable security risk (Kako, 2010). Japan intends to increase its self-sufficiency rate by 10% in 3 years by increasing the agricultural area by 6 million ha and developing new efficient machines for harvest and processing of crops such as rice, wheat and soybeans (Yukumoto, 2011).

In China, the issue of food self-sufficiency has been discussed in the context of increasing prices of basic agricultural commodities and food crises experienced by China in 2008 and 2009 (Fan, 1997; Gao, 2010). The self-sufficiency rate is important also for some countries of the Arabian world where the self-sufficiency rate in agriculture is desirable due to possible suspension of food deliveries caused by political reasons (non-performance of resolutions etc.) (El-Sherbini, Sinha, 1978).

Food self-sufficiency is important in connection with national security, economic development and, last but not least, with the national rate of satisfaction and social welfare. According to the Czech ministry of agriculture, decrease of self-sufficiency for some basic commodities under 80% is not hazardous. However, the ministry does not consider it to be optimal. *"In the past years and at present it strives – within local and EU regulations – to find the highest available funds and direct them to sectors affected by considerable decrease of self-sufficiency"*. The Agrarian Chamber of the Czech Republic points out that like energy self-sufficiency, food self-sufficiency will be increasingly important with the growing world population and possible unexpected events (Böhmová, 2012).

## MATERIALS AND METHODS

The aim of this article is to evaluate, based on an analysis, the self-sufficiency rate of the Czech Republic and Poland in selected commodities of crop production. We selected the most important cultivated and consumed commodities. Therefore this report analyses basic cereals, oilseeds, corn and potatoes. Since production of corn has significantly risen in the last 10 years, corn is not included in the general group of cereals (where it logically belongs), but it has been analysed separately. Due to dissimilar agricultural systems and produced commodities the analysed groups may not always include identical groups of commodities. On the other hand, we have always analysed data that account for at least 98%

of national production/sown area. In the Czech Republic group of cereals includes wheat, rye, barley, oat and triticale; in Poland the group includes basic cereals (wheat, rye, barley and oats, triticale). In Poland, oilseeds include anything carrying oil seeds; in the Czech Republic oilseeds are rapeseed, sunflower, poppy seed and mustard seed. In case of corn silage corn is not accounted, but it is strongly represented on fields mainly due to energy use.

Particular selected commodities are evaluated in selected years between marketing years 2000/2001 and 2009/2010. In the Czech Republic information about total production and consumption have been gathered and merged from balance data of particular commodities published in the prospective planning reports (*situační a výhledové zprávy*) of the Ministry of Agriculture. Data about Poland have been extracted from Statistical Yearbooks of Agriculture (*Rocznik Statystyczny Rolnictwa*) for particular years. The self-sufficiency rate index is calculated according to formula 1, where consumption is accounted as the sum of individual national consumptions (human consumption, rearing, industrial consumption etc.).

Formula 1:

$$(\text{Domestic production/consumption}) \times 100$$

(Lohar, 1981).

According to Staatz (1991) there are several options to explain the term of calculation of national self-sufficiency in a certain commodity based on the following criteria:

1. Complete specification of commodity (cultivar, class, place of cultivation, manner of cultivation, use of fertilisers etc.) It is the most accurate method.
2. Use of only a specified commodity with respect to species (e.g. rice). In the 1970s and 1980s South Korea wanted to increase its self-sufficiency in rice by means of subsidies and assigned the same subsidy for all types of rice. The result of this decision was a situation where most farmers started to plant rice of lower quality which consumers refused to buy. There was a lack of high quality rice and high demand resulted in increased prices.
3. Use of a wide category of goods (e.g. cereals) containing several commodities mutually complementing one another (as a possible substitute). Here the self-sufficiency policy strives to achieve equation between domestic supply and efficient demand for a wide class of goods while allowing export or import of particular commodities in the given group.

In this article has been applied approach No. 3 – wide category of goods. Groups of products are also evaluated with respect to coverage of import of agricultural resources by export (TC; Trade Coverage) – see formula 2. TC values exceeding 100% mean positive balance of trade (Szczepaniak,

2012) and may be interpreted as a comparative advantage of the country in production of the given commodity (Lubinski, Michalski, Misala, 1995). TC is evaluated for 2004 and 2010. These years are directly connected to a period evaluated for the self-sufficiency rate, where 2004 is the year of accession of both countries to the EU and 2010 is partially a part of marketing year 2010. Data have been gathered from national databases of foreign trade (CR, PL) in the form of the harmonised system (HS6) / combined nomenclature (CN8). (CZSO, GUS). Particular values of export and import of commodities are recalculated according to the average exchange rate of the national currency to EUR published by the national banks for the given year.

Formula 2:

$$(\text{EXP/IMP}) \times 100 \quad (\text{OECD, 2005}).$$

Basic index and chain index for development of sown areas according to the following formulas are then calculated for particular commodities:

Formula 3:

$$\text{Basic index} = X_t / X_0,$$

$x_0$ ... the starting year,  $t = 1, 2, 3 \dots n$ .

Formula 4:

$$\text{Chain index} = X_t / X_{t-1}, \quad t = 1, 2, 3 \dots n.$$

Since production efficiency and yields are an important factor of the achieved food self-sufficiency (Azadi *et al.*, 2011) yield (t/ha) and total sown area (ths. ha) are compared in the examined countries. Data have been extracted from the Statistical Yearbook of Agriculture (PL) and situation and prospective planning reports of the Ministry of Agriculture of the Czech Republic (the same method like for the purpose of self-sufficiency rate).

## RESULTS

The Czech and Polish agriculture has gone through different development in the past, namely after the period of collectivisation in the 1950s. While in CZ collectivisation was completed with establishment of large blocks of soil, collectivisation in Poland was suspended and a system of individual farmers working in relatively small areas was maintained. Today this fact is one of the main factors of lower yields per hectare, which are important also for the self-sufficiency rate. The text further analyses particular commodities.

### Cereals

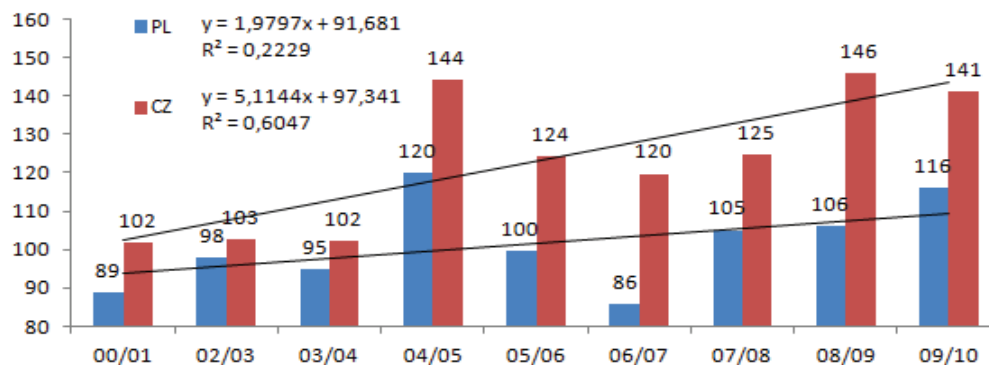
The basic group of cereals includes wheat, rye, barley, oat and triticale. In CZ these commodities were cultivated on 92.6% of agricultural land sown with cereals in marketing years 2009/2010. In Poland the value was lower, i.e. 79.8%. The remaining 20%

of soil in Poland was sown with mixed vegetation for grain, buckwheat, millet and other cereals. The uniform feature of both compared countries is the dominance of planted wheat over other commodities. In a selected group and the last examined year wheat formed 65% (CZ) and 43% (PL) of total production of cereals. The aforementioned figures indicate that in Poland the basic cereals are represented in a more balanced manner and dominance of a single commodity is not so distinct.

Historical comparison of production self-sufficiency of both markets in basic cereals indicated (Fig. 1) that the self-sufficiency rate has been increasing in roughly the same pace. Between marketing years 00/01 and 09/10 the self-sufficiency rate in CZ grew by 37%, while in Poland the growth was rather slower (30%). The fundamental difference is in the final self-sufficiency rate which differed by 31% in 2010. In that year CZ achieved 2 mil. tons over-production of basic cereals and exceeded the balance of trade by 41%. Polish over-production (in relative figures) was significantly lower;

the balance of trade was exceeded only by 3.8 mil. tons, i.e. 16%. The suggested trend function clearly demonstrates the fact that the trend in CZ and PL is increasing of the self-sufficiency index. In PL the increasing self-sufficiency rate is caused by growing production, while in CZ it is caused by decreasing consumption while relatively stable production is maintained. It is also important to look at the development of self-sufficiency rate of particular crops in CZ: the most rapid growth of self-sufficiency rate has been accounted for rye (+89%) and barley (+47%). In the marketing year 2000/2001, consumption of both crops exceeded production. At the end of the examined period the state was different; self-sufficiency rate of both crops exceeded 120%.

If we further compare data of coverage of import of agricultural raw materials by export in 2004 and 2010 (Tab. I) we can conclude that CZ is more competitive than PL in the commodity of unprocessed cereals. While CZ reached 1454% in 2010, in Poland import is covered by export at 216%. Higher yield may be one of the keystones



1: Self-sufficiency rate in cereals in CZ and PL (2000–2010, %)

Source: authors' own chart made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)

I: TC index in CZ and PL (2004 and 2010; Ths. EUR, %)

Basic cereals*	Country	2004			2010		
		IMP	EXP	TC	IMP	EXP	TC
	PL	68 157	29 702	44%	110 872	239 087	216%
	CZ	6 210	39 291	633%	15 868	230 794	1454%

Source: authors' own data based on data of foreign trade – Czech Statistical Office (CZ), GUS (PL)

\*HS codes: 1001, 1002, 1003, 1004, 10089010

II: Index of yields for wheat and sown areas in CZ and PL in 2000–2010 (t/ha, ths. ha)

Wheat		00/01	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10
PL	t/ha	3.23	3.85	3.40	4.28	3.95	3.24	3.94	4.07	4.17
CZ	t/ha	4.21	5.46	4.07	5.84	5.05	4.49	4.86	5.77	5.24
Cereals										
PL	ths. ha	8814	8294	8163	8377	8329	8381	8353	8599	8583
CZ	ths. ha	1601	1486	1363	1513	1506	1532	1457	1434	1428

Source: authors' own table made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)



of better competitiveness of CZ. Tab. II shows the yields of the most important crop of the cereal group, i.e. wheat and also the development of sown areas. Between 2000 and 2010 the yield of wheat was always higher in CZ, the real difference ranged between 19% (2007/2008) and 29% (2008/2009). Tab. III shows the calculation of basic index of sown areas (base year 00/01). There is a clear stability of the size of sown areas documented in Tab. IV – chain index.

An overall view at the segment of basic cereals indicates that CZ has been significantly focusing on cereal production that is largely exported. The total value (EUR) of export of Czech unprocessed wheat was by 16% higher than export of the same commodity from PL in 2010. This fact clearly indicates the higher rate of processing/consumption of cereals in PL and higher added value formed in the Polish agricultural and food industry. The proof may be the difference in trade balance of products of the milling industry (HS11<sup>1</sup>) and preparations of cereals, flour, starch or milk; pastry cooks products (HS19), i.e. products from processed cereals. CZ achieves positive balance for HS11 (thanks to significant export of malt), but for HS19 the situation is different.

In 2010 the negative balance of trade was increased to up to EUR 127 mil, while in PL the balance for HS19 is permanently positive (EUR 357 mil.) and proves competitiveness of Poland (as opposed to CZ) in further processing of cereals.

### PLANTING CORN FOR GRAIN

Production of corn has been growing in CZ; between 1994 and 2001 production of corn increased by more than 400%, in the examined period production increased by additional 217%. The growing trend is expected also in periods to come. Corn has become the second most important export commodity for the Czech agriculture. Fig. 2 shows the growth of self-sufficiency in CZ and stagnation in PL. The only diversion of the examined time period was in 2002/2003 when the yield of seed was only 5.58 t/ha and the self-sufficiency rate fell under 100%. The decrease of self-sufficiency between 2007 and 2009 can be explained by steep growth of consumption of corn by 49% and 16% respectively, mainly for industrial purposes (e.g. production of starch, bio ethanol). With respect to the trend in production and continuous reduction

III: Basic index of sown areas of cereals in PL and CZ in 2000–2010 (starting 00/01)

<b>PL</b>	1	0.941	0.926	0.950	0.945	0.951	0.948	0.976	0.974
<b>CZ</b>	1	0.928	0.851	0.945	0.941	0.957	0.910	0.896	0.892

Source: made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)

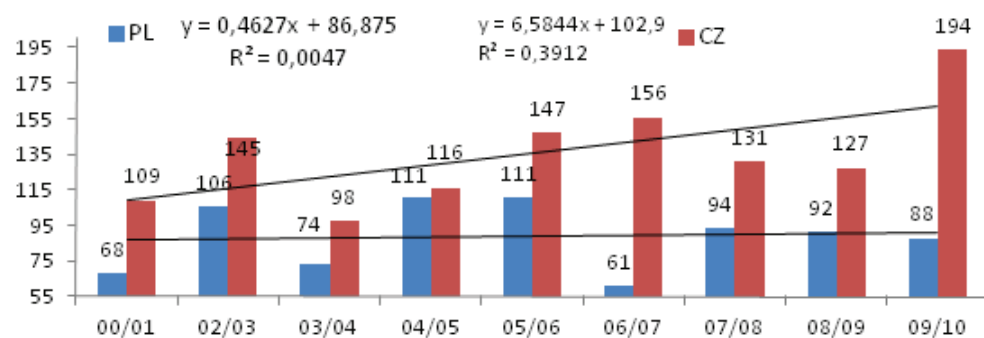
Note: calculation according to formula 3

IV: Chain index of sown areas of cereals in PL and CZ in 2000–2010

<b>PL</b>	0.941	0.984	1.026	0.994	1.006	0.997	1.029	0.998
<b>CZ</b>	0.928	0.917	1.110	0.995	1.017	0.951	0.984	0.996

Source: made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)

Note: calculation according to formula 4



2: Self-sufficiency rate in corn in CZ and PL (2000–2010, %)

Source: authors' own chart made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)

1 Without products made of corn (HS 110220, 110313, 110423, 11041950, 11042310, 110812) and potatoes (HS 110510, 110520, 110813)

of the number of livestock, further growth of self-sufficiency is expected in CZ while maintaining significant proportion of export. In the last examined year production of corn exceeded Czech consumption by 94%.

Growth of production and cultivable areas (Tab. V) has been noted in PL, too, mainly due to increased consumption of corn grain in animal production. In 1994–2001 there is a gradual growth of consumption by 349%. Tab. VI shows extreme growth of sown areas in CZ and PL. In CZ the sown areas of corn planted for grain grew by 260% in years 00–09, in PL by 180%. In PL the area grew by 271% between the marketing years 00/01 and 04/05 but then it was decreasing until 2007. From the record 412 thousand hectares the sown areas dropped to 262 ths. ha, which is explained by several factors: worse weather, vermins or prices of corn seed. Reduction of sown areas together with bad harvest in the marketing year 06/07 (4.16 t/ha) meant a significant drop of self-sufficiency rate in PL to 61%. In the following marketing year the situation improved thanks to above-average harvest (6.57 t/ha) and the self-sufficiency rate grew above 90%. Fig. 2 indicates that production and consumption in PL are unstable. The reason is

fluctuations in yields, decrease and increase of sown areas and change of the consumption structure (reduced consumption of sowing grain, growing consumption of grain for industrial production).

Trade coverage of corn seed has rapidly increased in both examined countries (Tab. VIII). While in 2004 only 2% of import was covered in Poland and 48% in CZ, in 2010 the figures were significantly higher. CZ achieved positive balance of trade with the surplus of over 15 mil. EUR. Corn was traded with the balance of 44 mil. EUR in Poland and import was covered by export only at 38%. The data indicate that CZ has become fully competitive. This fact is also related to higher hectare yield achieved in CZ. The real difference of the average national yield in the examined years ranged between 4% (07/08) and 38% (06/07) in favour of CZ. Lower yield of corn in PL means higher need of sown area to ensure 100% self-sufficiency, which of course bears additional costs connected with the current subsidy system of SZP. If PL achieved the average yield of corn comparable to CZ, PL would do with 85 thousand ha less to achieve 100% self-sufficiency (for marketing year 09/10; saving 26% of agricultural soil sown with corn).

V: Index of yields of corn for grain (t/ha)

Corn		00/01	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10
PL	ths. ha	152	319	356	412	339	303	262	317	274
CZ	ths. ha	39	71	85	90	98	90	112	114	105
PL	t/ha	6.06	6.16	5.29	5.69	5.73	4.16	6.57	5.81	6.23
CZ	t/ha	6.43	8.73	5.58	6.13	7.17	6.75	6.80	7.54	8.45

Source: authors' own chart made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)

VI: Basic index of sown areas of corn for grain in PL and CZ in 2000–2010 (starting base year 00/01)

PL	1	2.099	2.342	2.711	2.230	1.993	1.724	2.086	1.803
CR	1	1.821	2.179	2.308	2.513	2.308	2.872	2.923	2.692

Source: made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)

Note: calculation according to formula 3

VII: Chain index of sown areas of corn for grain in PL and CZ in 2000–2010

PL	2.099	1.116	1.157	0.823	0.894	0.865	1.210	0.864
CZ	1.821	1.197	1.059	1.089	0.918	1.244	1.018	0.921

Source: made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)

Note: calculation according to formula 4

VIII: TC index of corn for grain in CZ and PL (2004, 2010, Ths. EUR, %)

Corn*	Country	2004			2010		
		IMP	EXP	TC	IMP	EXP	TC
	PL	71 838	1 695	2%	72 102	27 671	38%
	CZ	15 471	7 472	48%	22 683	37 651	166%

Source: authors' table made from data of foreign trade – Czech Statistical office (CZ), GUS (PL)

\* HS code: 1005

In view of high export of raw material from CZ the authors analysed foreign trade of products processed from corn (HS 110220, 110313, 110313, 11041950, 110812<sup>2</sup>) for 2010. The analysis indicates that CZ exported products in the value of only EUR 85 ths., which means negative balance in the amount of EUR 8.9 mil. In PL the situation is similar, foreign trade with corn products (HS11) also reaches negative balance of EUR 15.8 mil. Both countries have potential for development of the processing industry for this commodity.

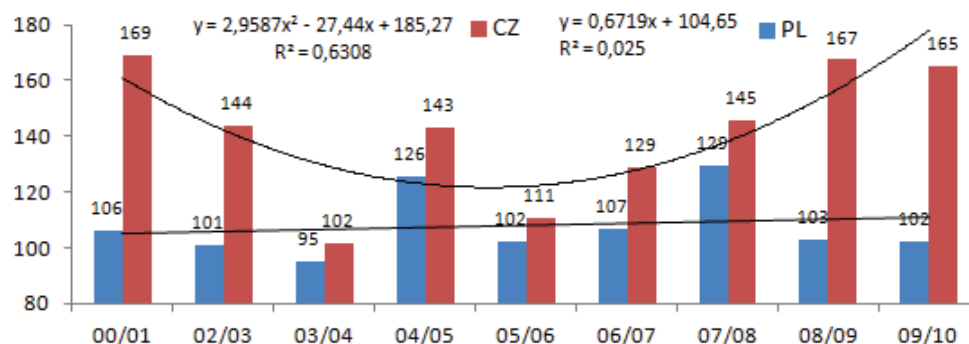
### Oilseed Crops

In Poland the group of oilseed crops is taken as the sum of all planted oilseed plants including minority crops such as soya, linseed for oil, mustard etc. For CZ there are data about four most important crops – rapeseed, sunflower, poppy seed and mustard. However, it needs to be clarified that in PL rapeseed has been achieving a major share in the entire group of oilseed crops in the long term. Its share was comparable for the whole examined period (99% of production; 97% of sown area). In CZ the four examined crops achieve 98% of agricultural land. And due to low significance of other crops a comparison was made. In both countries rapeseed represents the main oilseed commodity and therefore is an important determinant for the total self-sufficiency rate of both countries (Fig. 3).

In the examined period production of oilseed crops grew in both compared countries; in Poland

the growth was more noticeable. Between marketing years 00/01 and 09/10 total production increased by 160% in PL and only by 34% in CZ. The high increase in PL was caused by growing local consumption. In marketing year 2000/2001 consumption ranged around 900 ths. tons, while in marketing year 09/10 this figure was close to 2.5 mil. tons. The main reasons of growth are increasing prices (mainly) of rapeseed. Prices were affected not only by global prices but also by competition in the local market. Food processors started to compete with producers of bio fuel additives. Despite the situation the Polish market has not seen a stable increase of self-sufficiency rate. The exception is marketing year 04/05 and 07/08 when the self-sufficiency rate grew to 126% and 129% respectively. Marketing year 04/05 is characterised by higher yields (+62% y-o-y), while self-sufficiency rate increased mainly as the result of favourable global prices of rapeseed in marketing year 07/08.

In CZ rapeseed also represents a significant share in total production of oilseed crops. In marketing year 09/10 the total share in production of basic oilseed crops was 90%. In CZ the self-sufficiency rate in the examined period increased to 165% for marketing year 09/10, which corresponds with the situation at the turn of the century. Major decrease of self-sufficiency rate to 102% in marketing year 03/04 was caused by poor harvest (see Tab. X below). The yield (1.55 t/ha) decreased by 32% in CZ and 14% in PL year-on-year. After overcoming the poor harvest the mere increase of yield results



3: Self-sufficiency rate in oilseed crops in CZ and PL (2000–2010, %)

Source: authors' own chart made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)

IX: TC index for oilseed crops in CZ and PL (2004, 2010, Ths. EUR, %)

Oilseed crops*	Country	2004			2010		
		IMP	EXP	TC	IMP	EXP	TC
	PL	14 961	58 250	389%	116 726	134 661	115%
	CZ	26 600	60 852	229%	55 442	142 891	258%

Source: authors' table made from data of foreign trade – Czech Statistical Office (CZ), GUS (PL)

\*HS code: 1205, 1206, 120750, 120791.

2 Corn flour, semolina, grand grains or grains in flakes, cornstarch

in growth of total production of rapeseed, which improves the self-sufficiency rate of the whole group and it achieves significant growth. The year 2007 is important in CZ: prices related to new legislation regulating addition of bio ingredients in fuels are increased. As opposed to Poland where most raw materials are consumed in the domestic market, CZ becomes an important exporter of rapeseed and poppy seed, which is reflected in the balance of trade. In general, high self-sufficiency rate is affected by high specialisation of CZ in all the evaluated commodities. The highest self-sufficiency rate in marketing year 09/10 is achieved by poppy seed (680%), mustard (223%) and with its biggest weight of course rapeseed (161%).

Coverage of import of oilseed crops by export (trade coverage) has rapidly changed mainly in PL (Tab. IX). While in 2004 Poland covered 389% of import by export, in 2010 this figure dropped to 115%. The whole group in PL was affected by reduced specialisation of rapeseed (TC fell from 3274% to 151%), which was caused especially by increase of processed rapeseed and establishment of processing operations for production of rapeseed methylester (RME). In CZ specialisation in rapeseed planting has grown (TC grew from 90% to 201%) and TC for poppy seed has dropped. In view of the similar increase of the value of import and export of oilseed crops

the value of TC has not significantly changed for the entire group of oilseed crops in CZ; it grew from 229% to 258%. CZ specialises in production of rapeseed and poppy seed – these two items are the main reason of positive balance of foreign trade.

Tab. X shows that in both examined countries productivity of planted rapeseed has improved and areas sown with oilseed crops have grown. Tab. XI indicates growth in sown areas in PL by 84% for the examined period. Similarly to other commodities, the yield of rapeseed in CZ as the main crop is higher than in PL. However, when making a more detailed comparison we can see that the real difference of yields in case of rapeseed is the lowest of all other commodities. The biggest difference was achieved in marketing year 00/01 (16%), while in marketing year 09/10 the yields differed only slightly (3%). The cause of smaller differences in yields per 1 ha is the fact that in PL rapeseed is grown prevalently by bigger agricultural producers.

Processing of oilseed crops in both countries is strongly affected by processing of rapeseed for refined and non-refined oil. In 2010 foreign trade (characterised by groups HS 1507-1505, 1517<sup>3</sup>) in CZ achieved positive balance of trade (EUR 6 mil.), mainly thanks to processing of rapeseed and mustard seed. Export of oil made from these commodities created positive balance of EUR 118 mil. In PL, due to high import of soya and palm

X: Yields of rapeseed and sown areas of oilseed crops in CZ and PL (m.r.00/01–09/10)

Rapeseed		00/01	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10
PL	t/ha	2.19	2.17	1.86	3.03	2.63	2.65	2.67	2.73	3.08
CZ		2.61	2.27	1.55	3.6	2.88	3.01	3.06	2.97	3.18
Oilseed crops										
PL	ths. ha	452	452	461	565	569	658	825	791	834
CZ		400	403	405	368	379	418	440	477	475

Source: authors' own chart made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)

\*Rapeseed represents the most important item of the group of oilseed crops

XI: Basic index of sown areas of oilseed crops in PL and CZ in 2000–2010 (starting base year 00/01)

<b>PL</b>	1	1	1.020	1.250	1.259	1.456	1.825	1.750	1.845
<b>CZ</b>	1	1.008	1.013	0.920	0.948	1.045	1.100	1.193	1.188

Source: authors' own chart made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)

Note: calculation according to formula 3

XII: Chain index of sown areas of oilseed crops in PL and CZ in 2000–2010

<b>PL</b>	1	1.020	1.226	1.007	1.156	1.254	0.959	1.054
<b>CZ</b>	1.008	1.005	0.909	1.030	1.103	1.053	1.084	0.996

Source: authors' own chart made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)

Note: calculation according to formula 4

3 Soya-bean, ground-nut, olive, palm, sunflower, cotton-seed, coconut, rape and mustard oil, fixed vegetable fats and oils, margarine



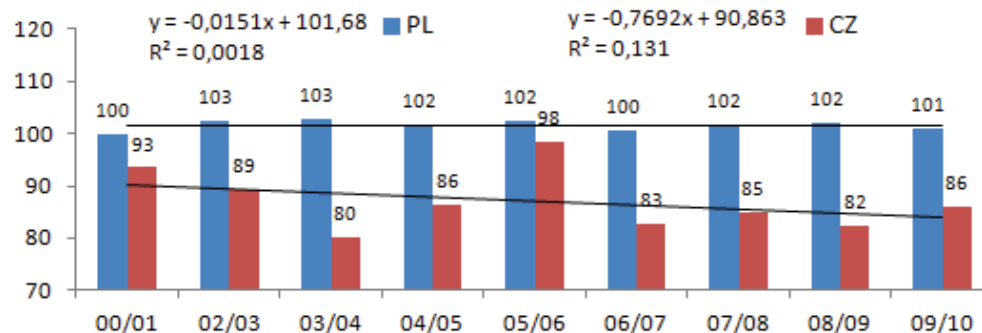
oil the total balance of vegetable fats and oils is negative (EUR 105 mil.); however, we should point out the high value of export of processed oils in the form of margarines (EUR 111 mil.) reflecting the country's high specialisation in this product. Both countries demonstrate positive balance of foreign trade in prepared mustard. The rate of specialisation measured by means of TC index is 357% for PL and 166% for CZ.

### Potatoes

The self-sufficiency rate (Fig. 4) has not significantly changed in PL between marketing years 00/01–09/10; it fluctuated between 100–103% even with noticeable changes of total production. Total production significantly dropped in the examined period. In marketing year 00/01 approximately 24232 ths. tons of potatoes were produced in PL, while in the last compared year the production reached only 9703 ths. tons. Nearly 60% decrease of production in PL corresponded with reduced consumption, which dropped by 61% to 8250 ths. tons. One of the main reasons of decrease in potato production is the noticeable increase of production of fodder maize and import of soya that significantly replaced potatoes. The total

consumption of stockfeed potatoes decreased by 81% for the examined period. The decreasing trend in potato consumption can be identified with all items of consumption. The trend of self-sufficiency rate is relatively stable in PL and no significant change is expected. As shown above, declining consumption goes hand in hand with similar decline in production.

In CZ the self-sufficiency rate in potatoes has changed more noticeably when compared to PL. In the examined period the pace of reduction of production exceeded the pace of reduction of consumption, thus achieving the final decrease of self-sufficiency rate. The decline of production is related to reduction of sown areas (see Tab. XV below). The reduction of potato areas in the examined period is 60% in PL and 48% in CZ. In CZ the decline in consumption of stockfeed potatoes meant a fundamental determinant of the whole balance. Between marketing years 00/01–09/10 consumption of potatoes decreased by 58% and was affected by replacing stockfeed potatoes with other fodder crops (e.g. fodder maize, rapeseed, cereals). In marketing year 09/10 production reached 929 ths. tons, while consumption was 1082 ths. tons.



4: Self-sufficiency rate in potatoes in CZ and PL (2000–2010, %)

Source: authors' own chart made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and Prospective Reports (CZ)

XIII: TC index for potatoes in CZ and PL (2004, 2010, ths. EUR, %)

Potatoes (0701)	Country	2004			2010		
		IMP	EXP	TC	IMP	EXP	TC
	PL	8 853	5 368	61%	47 502	7 088	15%
	CZ	8 395	1 108	13%	31 332	13 554	43%

Source: authors' table made from data of foreign trade – Czech Statistical Office (CZ), GUS (PL)

XIV: Yield index for potatoes in CZ and PL (t/ha)

Potatoes		00/01	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10
PL	ths. ha	1251	803	766	713	588	597	570	549	508
CZ	ths. ha	69	47	43	42	41	39	40	38	36
PL	t/ha	19.40	19.30	17.90	19.60	17.60	15.00	20.70	19.10	19.10
CZ	t/ha	21.33	23.57	19.35	23.57	28.05	21.70	27.79	25.00	25.29

Source: authors' own chart made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)

XV: *Basic index of development of sown areas in PL and CZ in 2000–2010*

<b>PL</b>	1	0.642	0.612	0.570	0.470	0.477	0.456	0.439	0.406
<b>CZ</b>	1	0.681	0.623	0.609	0.594	0.565	0.580	0.551	0.522

Source: authors' own chart made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)

Note: calculation according to formula 3

XVI: *Chain index of development of sown areas in PL and CZ in 2000–2010*

<b>PL</b>	0.642	0.954	0.931	0.825	1.015	0.955	0.963	0.925
<b>CZ</b>	0.681	0.915	0.977	0.976	0.951	1.026	0.950	0.947

Source: authors' own chart made based on data of the Statistical Yearbook of Agriculture (PL) and Situation and prospective planning reports (CZ)

Note: calculation according to formula 4

Data in Tab. XIII show that the trend of change in the coverage of import of fresh or chilled potatoes by export was inverse in the examined countries. While in Poland the coverage significantly decreased (from 61% to 15%), in CZ there was a major growth (from 13% to 43%). Poland uses production of potatoes mainly for the domestic market; raw and unprocessed potatoes are exported rather exceptionally. The reason of this fact is production of a large amount of potatoes at smaller farms for their own consumption with lower hectare yield (see Tab. XIV) and focus on export of processed potatoes. For comparison, the hectare yield in CZ was 24% higher in marketing year 09/10.

Similarly to other groups we have compared the foreign trade situation for products made from processed potatoes (HS 071010, 110510, 110520, 1108123, 200410, 200520<sup>4</sup>). After analysis of data for 2010 it is clear that the low rate of specialisation in case of export of unprocessed potatoes from PL is given by high specialisation of processed potatoes where there is positive balance of trade with the surplus of nearly EUR 117 mil (TC 340%). In CZ – apart from potato starch – the balance of foreign trade is negative for all other products from potatoes and as a whole there was a deficit of EUR 24 mil (TC 46%).

## CONCLUSIONS

Based on the above data we may evaluate the status of self-sufficiency rate for selected commodities in CZ and PL as stabilised mainly because of the fact that none of the presented groups falls under 80%, which means (according to the Ministry of Agriculture of the Czech Republic; Böhmová, 2012) that the situation is not perceived as hazardous. For most described commodities the trend of self-sufficiency rate in CZ and PL is stabilised or growing. The only exception in CZ is potatoes where the trend of self-sufficiency rate is slightly approaching 80%. In Poland this limit is

only approached by corn, which is caused mainly by the continuously growing consumption and lower hectare yields.

The analysis of self-sufficiency rate indicates that as opposed to the Czech Republic Poland is closer to the optimal self-sufficiency rate in the evaluated commodities (self-sufficiency rate in most commodities ranges around 100% with no major fluctuations). In CZ there are major differences in self-sufficiency rate between particular crops.

Cereals are an intensive crop with national production. In CZ self-sufficiency rate reaches critical level (self-sufficiency rate in 09/10 is 141%) and the approach is unsustainable for the future. Significant overproduction (2 mil. tons) is also caused by reduction of animal production in CZ. The surplus is also connected with TC index, which was at 633% in 2004 and 1454% in 2010. In PL this growth was even more remarkable, but it does not reach such a level. In 2004 TC index was at 44% and in 2010 it grew to 216% (export of cereals grew almost ten times – see Tab. I).

Being a monoculture, corn has a well mastered technological process in CZ. In the examined period there was extreme growth of sown areas in CZ and PL. In 09/10 sown areas grew to 260% compared to 01/00 in CZ; in PL they grew to 180% (see Tab. V). Growth of production and cultivable areas was mainly due to increased consumption of corn seed in animal production. Coverage of import of corn seed by export has significantly increased in both examined countries (Tab. VIII). While in 2004 only 2% of import was covered in Poland and 48% in CZ, in 2010 these figures were noticeably higher.

In the Czech Republic oilseed crops are planted nearly on the maximum possible area. It is a demanding crop, which exhausts the soil and should have a longer interval in the crop rotation (3–4 years). In the examined period production of oilseed crops increased in both compared countries; in Poland the growth was more remarkable. Between marketing years 00/01

4 Frozen potatoes, potato flour and meal, potato flakes, potato starch, potatoes prepared or preserved (with or without vinegar or acetic acid)

and 09/10 the total production grew by 160% in PL and only by 34% in CZ. The high growth in PL was caused by growing local consumption. In marketing year 2000/2001 consumption was around 900 ths. tons, while in marketing year 09/10 this value was approaching 2.5 mil. tons. The main reasons of growth are increasing prices (mainly) of rapeseed. Tab. XI indicates growth of sown areas by 84% in PL in the examined period. Similarly to other commodities, in CZ the yield of rapeseed as the main cultivated crop is higher than in PL.

Potato production significantly declines in PL and CZ. In marketing year 00/01 approximately 24 232 ths. tons of potatoes were produced in PL, while in the last compared year production reached only 9 703 ths. tons. Nearly 60% decrease of production in PL corresponded with decline in consumption, which fell by 61% to 8 250 ths. tons. One of the main reasons of decline in potato production is significant increase in production of fodder maize and import of soya, which largely replaced potatoes. In CZ the self-sufficiency rate in potatoes changed more remarkably compared to Poland. In the examined period the pace of reduction of production exceeded the pace of reduction of consumption, which resulted in the final decline of self-sufficiency rate. Reduced production goes hand in hand with reduced sown areas (see Tab. XV). The reduced area of potatoes in the examined period is 60% in PL and 48% in CZ.

Based on the presented trends we may expect further reduction of sown area of potatoes (see Tabs. XIV, XV, XVI) in PL and CZ. In CZ it is expected reduction of the self-sufficiency rate and its coming close to the critical value of 80%. Therefore national strategies should be put in place to maintain the self-sufficiency rate above the critical limit. Despite significant decline in production the situation in PL has been stabilised. For other commodities such as oilseed crops and corn we expect further growth of sown areas, which will not be designed for direct consumption but as an intermediate for further production (see RME, fuel of biogas stations, bio ethanol etc.).

In developing countries the growth of hectare yields is identified as the main aspect for increasing of national crop self-sufficiency. However, this aspect cannot be taken as the main determinant of self-sufficiency rate for the selected countries. Production technology has gone through significant modification in CZ and the trend of yields for the examined period shows growth. In PL we can expect gradual growth in case of crops that are largely cultivated by small farms (e.g. potatoes, wheat, corn) where the differences compared to CZ are more remarkable. The main factor of diverse yields is the lower efficiency of Polish agriculture.

However, the difference in production efficiency of crops planted by large farms is minimal (e.g. rapeseed). The authors point out the need to increase production efficiency in Poland in order to maintain their competitiveness on EU markets with crop commodities; e.g. for potatoes the drop between years 2004–2010 is noticeable.

The issue of self-sufficiency should also include the aspect of the possibility to process commodities for national consumption. Sufficient production (CZ aspect) without ensuring domestic processing capacities is inadequate for ensuring of national security. As proved by the analysis of foreign trade of processed commodities for 2010, CZ significantly falls behind PL in competitiveness of processing of commodities. While in PL positive balance of foreign trade is not achieved especially by the group of oils, cereal and corn milling products, for CZ the positive balance of trade was only for malt, processed rapeseed, poppy seed and mustard seed. The authors recommend to support processing operations and animal production (e.g. within the Rural Development Programme), which would lead to optimisation of TC and reduction of trade balance in case of agricultural commodities (namely cereals and corn).

Food self-sufficiency of CZ has been decreasing especially in commodities such as potatoes, fruit, vegetables, pork meat, poultry meat, eggs etc. We can expect further increase of prices of food and in critical cases insolvency of agricultural enterprises. Historically poor harvests in Europe and in the whole world and production of bio fuels made from cereals cause price increases. Some businesses are facing lack of funds to buy e.f. fodders. High volatility of prices will also force farmers to focus on the most profitable and stable (pricewise) crops where the production and thus the self-sufficiency rate may further rise (e.g. rapeseed).

In case there are national market measures to maintain the minimum limit of self-sufficiency rate (CZ and PL have none so far) the lower hectare yield – with the current EU subsidy policy – might be a major budgetary burden for Poland. In case of corn the balancing of yields in marketing year 2009/2010 would mean reduction of agricultural land by 85 ths. ha to ensure 100% self-sufficiency rate. This conclusion corresponds with the national strategy of Poland, which primarily does not focus on self-sufficiency (there is no problem in self-sufficiency) but on higher quality and efficiency of production. The authors are in full agreement with this approach.

## SUMMARY

Food self-sufficiency becomes an important topic in developing as well as developed countries. The Common Agricultural Policy of the EU aims at maintaining the self-sufficiency rate of the whole EU at 85% even if the self-sufficiency rate in particular member states is reduced. But self-sufficiency belongs to internal factors of national security and therefore it deserves sufficient attention also on national level. Being a member of the EU, today the Czech Republic and Poland are not entirely dependent on domestic production of food and farming commodities, both countries enjoys effect of a common market. Commodities can flow without any tariff measures. Main aim of the article is to evaluate, based on an analysis, the self-sufficiency rate of the Czech Republic and Poland in selected commodities of crop production between marketing years 2000/2001–2009/2010, with special attention to the most important and cultivated commodities – basic cereals, oilseeds, corn and potatoes. Both countries can be considered as stabilised with respect to rate of self-sufficiency of selected crops – none of the presented groups falls under 80%. For most described commodities the trend of self-sufficiency rate is stabilised or growing. The Czech Republic is specialised exporter of not-processed commodities but country significantly falls behind Poland in competitiveness of processing of commodities. While in the CZ self-sufficiency is being discussed, in Poland national strategy does not focus on self-sufficiency but on higher quality and efficiency of production.

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