

# SELF-SUFFICIENCY OF SELECTED COMMODITIES IN VISEGRAD COUNTRIES

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## Abstract

*This paper deals with the development of self-sufficiency in selected commodities in the Visegrad countries (Czech Republic, Hungary, Poland, Slovakia) between 2006 and 2016. The data are drawn from the statistical offices of the individual countries in the form of production/consumption balances. This contribution aims to measure self-sufficiency of Visegrad countries in selected (most important) commodities (wheat, eggs, potatoes, beef, poultry and pork), characterise its direction of development and influencing factors. The results show that the Czech Republic is self-sufficient in production of wheat and beef. On the other hand, Czech Republic is unable to cover domestic consumption in potatoes, eggs, pork and poultry. In poultry or pork meat, the situation is very alarming, the degree of self-sufficiency is only 55% and 63% respectively. The situation in Slovakia is very similar to the Czech Republic. In eggs, wheat and beef; the degree of self-sufficiency is above 100%. However, in potatoes, pork and poultry meat, Slovakia does not cover consumption by domestic production. Poland, except for a few years in the case of wheat and pork, is fully self-sufficient in all other commodities evaluated. Also in Hungary, the degree of self-sufficiency is close 100% or above.*

**Keywords:** *Commodities, Czech Republic, Hungary, Poland, Self-sufficiency, Slovakia, Visegrad*

**JEL Classification:** *Q18, R14*

# 1 Introduction

Food self-sufficiency belongs to internal factors of national security and therefore it deserves sufficient attention. Multiple authors (Kapusta & Parvi, 2016; Haji-Rahimi, 2014; Prochazkova, Prasilova & Hlouskova, 2016; Grodea, 2017; Golebiewska & Stefanczyk, 2017; Demirbaş, Niyaz & Daysal, 2017; Kotyza & Slaboch, 2017; Sadowski & Baer-Nawrocka, 2016) paid their attention to the problem of self-sufficiency of various countries and commodities. Rate of self-sufficiency measures the ability of a given country to satisfy all needs of consumers from the country's domestic production. (Staatz, 1991; Minot & Pelijor, 2010) The term self-sufficiency is often confused with the term food security. Whole concept of self-sufficiency, on contrary to food security, take in consideration whether food is imported or produced locally. (Clapp, 2014)

Today self-sufficiency became an important aspect of national policy agenda, mainly after the price volatility shocks of 2007 and 2008. Many countries since than expressed their interests in improving supply of domestic food production. The debate over food self-sufficiency has usually two dimensions. One defend national right to insulated national market from world food markets by increasing domestic food production. The others argue that such measure increase costs to states that prioritize political considerations in their food policy. (Clapp, 2017)

Food self-sufficiency was a serious problem during the Second World War as food convoys were important to prevent hunger and lack of food. Gaining food self-sufficiency today would involve securing home production of fertilizers and other agrichemicals, as well as ensuring home processing and storage. The costs are extraordinary and would eliminate military budget. (Helm, 2017)

But the self-sufficiency is not only connected to national or regional production, but the problem of self-sufficiency is discussed also on the level of households. Countries, regions or even households are better protected from global, regional or local shocks if they have some level degree of self-sufficiency (Fraser et al. 2005; Pradhan et al. 2014).

In general, there are different concepts of food self-sufficiency. They range from an extreme form where a government closes its borders completely, to the situation when country aims to increase its domestic production capacity (Clapp, 2015). In other words, better self-sufficiency could be reached via international or improvements in production. Therefore, within an open market of the EU, ration of self-sufficiency indicate, to a certain extent, whether country has an advantage over other countries.

Based on above stated information, this contribution aims to measure self-sufficiency of Visegrad countries (Czech Republic, Hungary, Poland, Slovakia) in selected (most important) commodities and characterise its direction of development.

## 2 Data and Methods

According to Staatz (1991) there exists several possibilities how to explain national self-sufficiency. First, calculations could be based on complete specification of commodity (cultivar, class, place of cultivation, manner of cultivation), this is regarded as the most accurate method. Second, calculation is done only for a specified commodity with respect to species, (rice). Third, the self-sufficiency could be calculated for a wide category of goods (cereals) containing several commodities mutually complementing one another. In addition to Staatz (1991), fourth approach could be applied. (Sadowski, Baer-Nawrocka, 2016) It uses energetic balance, i.e. domestic production and consumption expressed in calories.

In this article the second Staatz's (1991) approach was applied. Self-sufficiency was calculated using data about production and consumption of a specified commodities (potatoes, eggs, wheat, beef, pork and poultry meat) in the Czech Republic, Hungary, Slovakia and Poland. Due to the extent of the conference contribution, only self-sufficiency calculations are taken in consideration, no other indicators were calculated.

Aim of this article is to analyse rate of self-sufficiency development in potatoes, eggs, wheat, beef, pork and poultry meat in the Czech Republic, Hungary, Poland and Slovakia. These countries created informal community that is called Visegrad due to its historical, political and geographical proximity. The rate of self-sufficiency is analysed between years 2006 and 2016, based on the data from national statistical offices (CZ – CSU – Czech statistical office; HU – KSH – Hungarian central statistical office; PL – GUS – Statistics Poland; SK - SU SK – Statistical office of the Slovak Republic). Information about production and consumption were gained from national commodity balance sheets. If for a certain commodity and country full data set of all analysed years was not available, only available data were used.

The calculation of the rate of self-sufficiency is carried out according to the following formula (Lohoar, 1981):

$$\text{Rate of self-sufficiency} = (\text{domestic production} / \text{consumption}) \times 100 (\%) \quad (1)$$

### 3 Results and Discussion

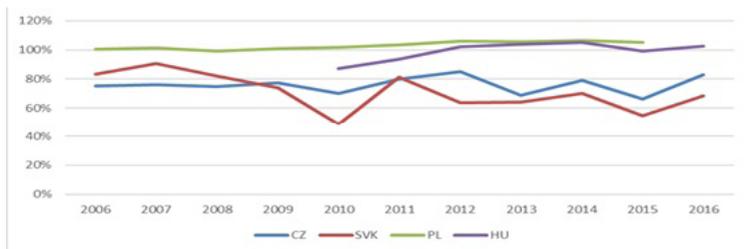
This section presents the results of self-sufficiency for individual selected commodities in Visegrad countries.

#### Potatoes

The degree of self-sufficiency of potatoes is presented in the graph 1. The results show that the Czech Republic and Slovakia are not able to cover domestic consumption from domestic production. In the case of the Czech Republic, the degree of self-sufficiency ranges from 66 to 83%. The fluctuations were caused by change in production, while consumption remained relatively stable (ranging from 950-1100 ths. tons). The production was mainly influenced by fluctuations in yields as well as reduction of harvested area. Total harvested area decreased by 13 ths. hectares (-13%) between 2006 and 2016. As it was already mentioned, the use of potatoes is relatively stable, only utilization is changing. During the analyzed period, consumption is decreasing for human consumption (consumption per capita decreases from 72 kg to 66 kg), but consumption of potatoes for starch production is on the increase (+ 40 ths. tons). Similar development can be observed also in Slovakia. Here it is worth highlighting the significant fall in self-sufficiency in 2010, which was caused by a drop in total production (-45 %) over the previous year due to significant drop in hectare yield (only 12 tons per ha in 2010 caused by unfavorable climatic conditions). At the same time, also total harvested area is on decline, between 2006 and 2016, harvested area was limited by 50% (-10,000 ha). All above mentioned factors caused that the degree of self-sufficiency in 2016 reached only 68%. In Poland, the degree of self-sufficiency is above 100%, the only exception was 2008, when the value falls to 99%. While self-sufficiency is constant, total consumption and production changed. Total consumption falls by 5.477 million tons (-48%, of which -2 million tons for human consumption) and total harvested area falls by 37% (-200 ths. ha). In Hungary the degree of self-sufficiency has a growing trend, it increased from 93% in 2010 to above 102% in 2016. Similarly, to other Visegrad countries, also in Hungary total production and consumption has falling trend. Between 2010 and 2016 total production decreased by 24% (- 120 thousand tons) due to drop in harvested area which is large as in other countries. Over the monitored period, harvested area falls by 3 thousand hectares (-15%). Overall, the trend shows a downward trend in potato consumption. Between 2006 and 2016, consumption was affected by elimination of potatoes in human diet caused by changing consumer preferences. Kotyza & Slaboch (2017) observed average decline of human consumption close to 2kg per capita and year in Slovakia and Poland. Stock feed potatoes were eliminated after

1990 as substituted by other fodder crops (e.g. fodder maize, rapeseed, cereals). (Kotyza, Slaboch, 2014)

Figure 1 Degree of self-sufficiency, potatoes (2006-2016, %)

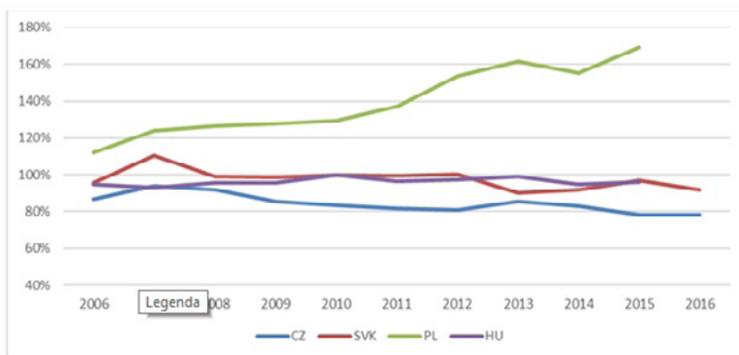


Source: Own processing based on data from CSU, KSH, GUS and SU SK.

## Eggs

In the case of self-sufficiency in eggs, the situation in the Czech Republic, Slovakia and Hungary is relatively balanced. In the Czech Republic, self-sufficiency ranges from 78 to 93%. Figure 2 shows a slightly decreasing tendency of the degree of self-sufficiency, mainly due to slightly increasing consumption (+10% increase over the monitored period) and a constant level of production, which ranges from 2,100 to 2,250 million pcs. A similar situation is also found in Slovakia, where the degree of self-sufficiency ranges from 90-105% and is relatively stable since 2008, with no significant fluctuations. Consumption, as in the case of the Czech Republic, shows a gradual increase until 2014, up to the level of 1,190 million pieces. Production is stable without extreme fluctuations. Hungarian degree of self-sufficiency in eggs is slightly below 100%. Opposite to the Czech Republic and Slovakia, Hungarian consumption has negative trend. Between 2006 and 2015 the consumption fell by 13% (from 3,139 to 2,743 million pcs) which means decrease in annual per capita consumption from 273 to 223 pieces. In Poland, the egg production balance is express tones. In Poland, there is a significant increase in the degree of self-sufficiency from 112 in 2006 to 169% in 2015. This change could be explained by a significant drop in domestic consumption as it went down from 487 ths. tonnes to 349 ths. tonnes. The production is relatively stable and ranges from 550 to 630 ths. tonnes. Excess in production forced producers to export eggs mainly to the EU market. As it is obvious Polish producers succeeds as their trade balance (both in value and volume) constantly increases. (Kapusta, Parvi, 2016)

Figure 1 Degree of self-sufficiency, eggs (2006-2016, %)



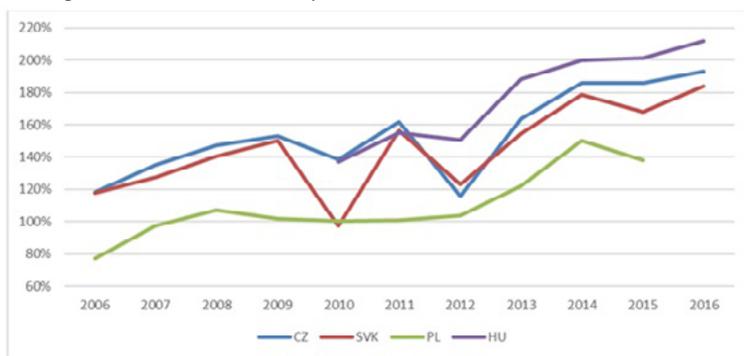
Source: Own processing based on data from CSU, KSH, GUS and SU SK.

## Wheat

Out of cereals, wheat was selected due to its dominance in total harvested area. The degree of self-sufficiency in the Czech Republic ranges between 115 and 193%; figure 3 shows a growing tendency. The growth of self-sufficiency was pushed by increased production that rose from 3.5 million tons (2006??) up to 5.47 million tonnes (year 2016). In 2012 production felt significantly due to unfavourable climatic conditions, while consumption remains stable. Total consumption ranges from 2.84 to 3.04 million tonnes. Approximately half of the consumed wheat is used for the food industry, while the second half is consumed as feed for livestock (about 1.25 million tons) or for technical use (about 150 ths. tons). In Slovakia, the development of self-sufficiency is very similar to that of the Czech Republic. Degree of self-sufficiency grew from 127% in 2006 to 183% in 2016. Only in 2010 and 2012 extremely low values are observed caused by decline in yields due to unfavourable climatic conditions. Increasing self-sufficiency was pushed by increase in total production that increased from 1.34 million tons (2006) to 2.43 million tonnes (2016). Total wheat consumption remains stable and it is divided into food-processing industry (approximately 35% of production), animal feed (approx. 41%) and technical use (increased from 107 ths. 226 ths. tonnes). Hungary's degree of self-sufficiency in wheat production ranges between 136 and 211% for the 2010-2016 period. It evinces growing tendency, caused similarly to CZ and SK by increased total output. The total production grew from 3.74 up to 5.6 million tonnes. Consumption does not evince significant deflection as it ranges between 2.66 and 2.73 million tonnes. As it is evident, in 2015 about half of the production needed to be exported, while other half was used domestically for food industry and as a feed crop (1,21 and 1,16 million tonnes respectively). Polish degree of self-sufficiency constantly increases (77 -> 150%) without

any annual shocks. Only in 2006 (76.9%) and 2007 (97%) Polish production was not able to cover domestic consumption. After 2012, fast growth in self-sufficiency in wheat is observed. This change was pushed by production increase from 7 to almost 11 million tonnes. On contrary to production, consumption felt from 9.1 (2006) to 7.8 (2016; -15%) million tonnes; mainly because wheat substitution by other fodder crops. As it is obvious, all Visegrad countries produce more wheat than they can consume. Thus raw commodity needs to be exported and in many cases later on the wheat is imported in the form of processed product. Therefore, policy makers should ask, what is more beneficial, to sustain self-sufficiency in production or to invest (politically, financially) in more value-added processing.

Figure 2 Degree of self-sufficiency, wheat (2006-2016, %)



Source: Own processing based on data from CSU, KSH, GUS and SU SK.

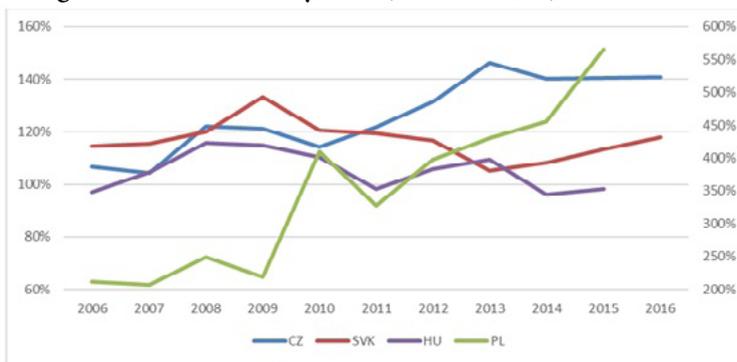
## Beef

For self-sufficiency in meat, three types of meat were selected - beef, pork and poultry; three kinds of meat consumed the most. For beef, it can be concluded, that all analysed countries are self-sufficient (Figure 4), with only some exceptions for Hungary. On contrary Polish degree of self-sufficiency is so high, that its values are indicated on the right vertical axis. In the Czech Republic, the degree of self-sufficiency ranges from 104-146%. But beef has very low share on total meat consumption (10%; approximately 7 kg per capita and year). The production was very stable between 2006 and 2016, it fluctuated between 166 and 180 ths. tonnes. The data used presented a decreasing trend in consumption, which reflected by the growth of the degree of self-sufficiency. Between 2006 and 2016, total consumption felt by 37 ths. tonnes. From 2014, the Czech degree of self-sufficiency was almost constant, 140%. In Slovakia, the degree of self-sufficiency ranges from 105 to 133%. Average per capita consumption of beef was only 4.1 kg. Total production ranges from 20 to 28

ths. tonnes, while consumption fluctuated from 18 to 25 ths. tonnes. In Hungary, we observed the degree of self-sufficiency from 96% (2014) to 115% (2008). The average annual per capita consumption per year is only 3kg, in 2013 it was only 2.2 kgs.

Total production ranges from 24 to 33 ths. tonnes, while consumption fluctuated from 24 to 34 ths. tonnes. Because in some years consumption and production almost met, in 2006, 2010, 2014 and 2015 was the degree of self-sufficiency below but close to 100%. In Poland, the degree of self-sufficiency lays far above 100%. Between 2006 and 2009 it reached values above 200%, while after 2010 it increased from 400% to over 550%. Comparing to other countries, average annual per capita consumption was only 1.2 kg in 2015, while in 2005 it was 3.9 kg. The rapid growth self-sufficiency was largely caused by increase in domestic production. It increased from 388 up to 543 ths. tonnes. The second most important factor is the fall in domestic consumption (-96 ths. tonnes). Both factors contribute to a very high degree of self-sufficiency exceeding 500%. In general, it can be concluded, that high self-sufficiency in beef is mostly caused by low share of beef in human diet in the selected countries.

Figure 4 Degree of self-sufficiency, beef (2006-2016, %)



Source: Own processing based on data from CSU, KSH, GUS and SU SK.

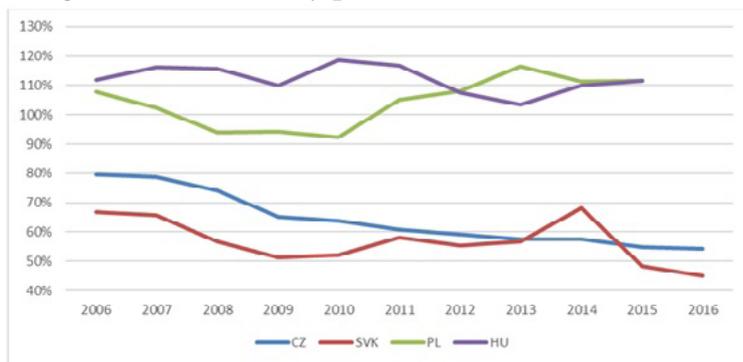
## Pork

The degree of self-sufficiency in pork is very low the Czech Republic, and the downward trend is still evident over the monitored period (see Figure 5). Pork meat has the largest share in total meat consumption, per capita consumption fluctuates about 40 kg, which represents 57% of the total meat consumption. From this point of view, pork is the most important meat type. The fall in self-sufficiency is caused by significant drop in production, while in 2006 total production was 450 ths. tonnes, in 2016 it was only 310 ths. tonnes. Decline in production was mainly caused by the low profitability of pig breeding. The results show that almost 50% of domestic consumption

is covered by imports. Consumption of pork was relatively stable; fluctuated between 560 and 580 thousand tonnes. In Slovakia, the situation is very similar to the Czech Republic. Degree of self-sufficiency ranges between 45 and 68%. Two main factors of poor results were observed. First, we observed significant decline in production between 2006 and 2012; total production decreased from 118 to 77 ths. tonnes. Since than production seems to be relatively stable. On contrary to production, consumption evince an increasing trend since 2013. While in 2013 consumption was 133 ths. tons, in 2016 the total consumption was already 167 ths. tonnes. Two opposite tendencies caused that the degree of self-sufficiency dropped to only 45% in 2016.

In Poland, degree of self-sufficiency fluctuates between 92 and 117% over the reference period. Fluctuations are caused by minor fluctuations in total production (ranging from 1.7 to 2.1 million tons) and total consumption (which ranges from 1.65 to 2.03 million tons). Per capita consumption of pork is rather stable. While in 2005 average Pole consumed about 39 kilograms; in 2016 it was 41.4 kilograms. Only Hungary was self-sufficient over the whole analysed period. Self-sufficiency rates range from 103-118%. Total production is approximately 300 ths. tonnes without significant fluctuations during the analysed period. In Hungary, pork is not as dominant in human diet as for example in the Czech Republic and Poland. Per capita annual consumption of pork is comparable to consumption to poultry (about 27 kg / person / year).

Figure 5 Degree of self-sufficiency, pork (2006-2016, %)



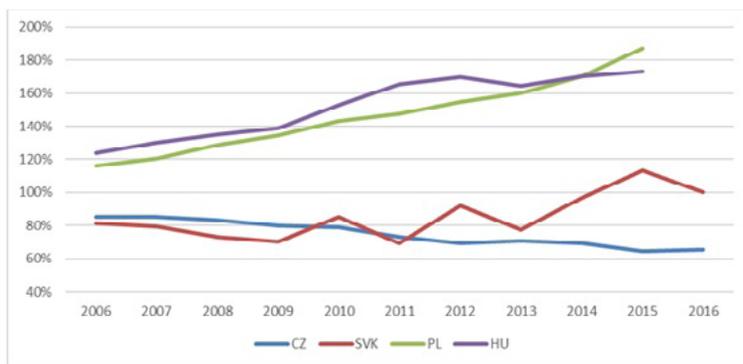
Source: Own processing based on data from CSU, KSH, GUS and SU SK.

## Poultry

For poultry, the degree of self-sufficiency in the Czech Republic was only 65% in 2016. Figure 6 presents the decreasing tendency of this indicator. Poultry meat has

an important share in total meat consumption (about 35%, comparing to 57% of pork). The downward trend is caused by two contradictory factors. First, it is caused by the growth in domestic consumption. Between 2006 and 2016 total consumption increased by 18 ths. tons up to 377 ths. tonnes. Second, fall in poultry meat production was observed. During the analysed period total production decreased by 60 ths. tonnes to 247 ths. tonnes. Between 2006 and 2009, similar situation to the Czech Republic was observed in Slovakia; degree of self-sufficiency fell from 80 to 70%. However, since 2009, self-sufficiency in poultry has risen. In 2015 and 2016 domestic production was equal or larger than consumption. Improvement was pulled by the rise in domestic production, which has been growing significantly since 2011. Between 2011 and 2016, Slovakian poultry industry increased production by 18 ths. tons from 72 to 90 ths. tons. On the other hand, there is a slight drop in domestic consumption; it fell from 117 (2006) to 90 ths. tonnes in 2016. In Average annual per capita consumption was 14 and 28 kg in Slovakia and Hungary respectively. In Hungary, similarly to Poland, degree of self-sufficiency has increasing trend. Even the both countries evince similar growth rate. Hungarian self-sufficiency was improved by increased domestic production. Between 2006 and 2015, total production rose by 116 ths. tonnes to 490 ths. tonnes. Although consumption decreased by 27 ths. tonnes, fall rate was smaller to production growth rate. Total production was 283 ths. tonnes in 2015. In Poland, the degree of self-sufficiency increased from 116% (2006) to 187% (2016). This increase was mainly caused by the growth of domestic production. Between 2006 and 2016 total production doubled as it went up from 1 million tonnes to 2.14 million tonnes. Consumption of poultry meat also has a growing tendency, but it is almost negligible compared to production growth. Consumption increased 895,000 tonnes (2006; 23.7 kg per capita) to 1.14 million tonnes (2016; 27.1 per capita in 2015).

Figure 6 Degree of self-sufficiency, poultry (2006-2016, %)



Source: Own processing based on data from CSU, KSH, GUS and SU SK.

## 4 Conclusion

This contribution aims to measure self-sufficiency of Visegrad countries in selected (most important) commodities (wheat, eggs, potatoes, beef, poultry and pork), characterise its direction of development and influencing factors. The results show that the Czech Republic is self-sufficient in production of wheat and beef. On the other hand, Czech Republic is unable to cover domestic consumption in potatoes, eggs, pork and poultry. In poultry or pork meat, the situation is very alarming, the degree of self-sufficiency is only 55% and 63% respectively. The situation in Slovakia is very similar to the Czech Republic. In eggs, wheat and beef; the degree of self-sufficiency is above 100%. However, in potatoes, pork and poultry meat, Slovakia does not cover consumption by domestic production. Poland, except for a few years in the case of wheat and pork, is fully self-sufficient in all other commodities evaluated. Also in Hungary, the degree of self-sufficiency is close 100% or above.

Based on the reached results, authors aim to further analyse the degree of self-sufficiency also in other commodities in all Visegrad countries. Further, deeper analyses of influencing factors is necessary, unfortunately the scope of this article did not provided enough space for Authors also aims to confirm statistically whether degree of self-sufficiency can inform about competitiveness and certain advantage in production of analysed commodities.

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