Self-sufficiency of the Slovak Republic in the Beef Sector in the Context of the Common Market of the European Union

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Abstract
The structured paper deals with the issue of production and food self-sufficiency. The aim was to assess the degree of production and food self-sufficiency of the Slovak Republic in the beef sector in the context of the common market of the European Union. The analysis was performed for the time period year 2015-2020. Emphasis was placed on quantifying and comparing the levels of self-sufficiency of the Slovak Republic and the EU in the beef sector. Two methodological procedures were used to determine self-sufficiency rates, based on balance sheet indicators and manufacturing output. The paper also brings a new perspective on the level of food self-sufficiency by quantifying potential self-sufficiency. Based on the performed analysis, we can state that the results of the examined indicators confirm the low level of self-sufficiency of the Slovak Republic in beef, while the European Union as a whole is in surplus in this sector. At the same time, the results directly reveal the existence of problems and dysfunction of supplier-customer relations between primary production and beef processors in the Slovak Republic.

Keywords: agri-food trade, beef, food self-sufficiency, Slovak Republic, the EU

JEL Classification: Q02, Q11, Q17

1. Introduction
The growing global demand for agricultural and food products as a result of accelerating demographic growth raises concerns about the extent to which humanity will be able to continue to feed on limited resources (Godfray et al 2010, Foley et al 2011, Kummu et al 2017). Many studies have looked at ways in which humanity could meet its growing food needs by either reducing demand or increasing food production (Foley et al 2011). Options for reducing food demand can be found in reducing food waste (Kummu et al 2012), minimizing resource inefficiencies (Springmann et al 2018), using more efficient fertilization and irrigation techniques (Jägermeyr et al 2016), as well as radical dietary changes transition from animal to plant-based diet (Cassidy et al. 2013, Jalava et al. 2014, Davis, D’Odorico & Rulli 2014). Other studies have focused on finding ways to increase food production by sustainably increasing crop yields on existing arable land (Phalan et al 2011, Garnett et al 2013, Pretty 2018).

The need to address the growing demand for food has moved to a higher level on the political agenda in many countries around the world, including the Slovak Republic. The decisive impetus for this turnaround in politics was the extreme volatility of food prices in 2007-2008 and its subsequent shocks. The world has renewed interest in food self-sufficiency. The need to increase the level of food self-sufficiency was gradually adopted by the governments of the Slovak Republic. In the current Program Statement of the Government of the Slovak Republic for the period 2020-2024, one of the strategic goals in agriculture is to increase the level of its own food self-sufficiency (MPRV SR 2020). One of the main arguments for increasing the
level of food self-sufficiency in the Slovak Republic is the constantly deepening deficit of the agri-food trade and its unfavourable commodity structure. In the Slovak Republic, agri-food products with lower added value (especially agricultural raw materials) have long prevailed, in contrast to imports, where products with higher added value (especially final foodstuffs) dominate (MPRV SR 2021).

Food self-sufficiency is a commonly used term. Nevertheless, there is no uniform and universal definition of the term. There are several understandings of food self-sufficiency that can be applied at different levels of analysis (O'Hagen 1975). In its most basic form, the FAO has defined food self-sufficiency as follows: "The concept of food self-sufficiency is generally taken to mean the extent to which a country can satisfy its food needs from its own domestic production" (FAO 1999). This most basic definition can apply at the individual, region, or country level. By applying the basic principle of food self-sufficiency, defined by the FAO, the country would avoid any international food trade and would rely exclusively on domestic food production to meet the food needs of its people (Clapp 2017). Therefore, with this definition it is possible to characterize a country that closes its borders and accepts complete autarchy for its agri-food sector. The extreme political attitude of fully closed borders is very rare in practice. All countries in the world rely on food imports. Even large food exporters, who produce much more food than they consume, usually import at least some food to satisfy part of their domestic consumption (Clapp 2017).

Given the predominance of trade in today's global economy, a more pragmatic understanding of food self-sufficiency is domestic food production, which equals or exceeds 100% of food consumption in a given country. In this context, trade is not excluded, as food self-sufficiency is defined by the ratio of food produced and food consumed at domestic level. The mentioned principle is also applied by the MPRV SR. However, due to the openness of the Slovak economy and the need for imports, the so-called irreplaceable agricultural and food products, MPRV SR defines the full food self-sufficiency of the country so that domestic production equals or exceeds 80% of consumption in the SR (MPRV SR 2021a). Food self-sufficiency understood in this way is not necessarily focused on where specific foods are grown, but rather on the domestic food production capacity in the country. This means that self-sufficient countries can still carry out a certain degree of agricultural specialization in order to trade these foods with other countries. Then a key indicator for measuring food self-sufficiency is the self-sufficiency rate (SSR), which expresses the percentage of consumed food that is produced on the domestic market (FAO 2012). SSR is measured using the following equation with respect to food production and trade:

\[
SSR = \frac{\text{Production} \times 100}{\text{Production} + \text{Imports} - \text{Exports}}.
\]

The SSR can be further refined to include fluctuations in the level of domestic food stocks (Puma et al 2015). SSR can be measured either in calories (Porkka et al 2013, Davis, D’Odorico & Rulli 2014, Puma et al 2015) or in the volume of food produced by the country. SSR is usually calculated for a particular commodity or class of commodities.

2. Data and Methods

The aim of our research is to evaluate the degree of self-sufficiency of the Slovak Republic in the beef sector in the context of the common market of the European Union. MPRV SR in its conceptual materials, prepared in accordance with the Program Statement of the Government of the Slovak Republic for the period 2020-2024 for the field of agriculture, distinguishes two indicators of self-sufficiency: production and food self-sufficiency (MPRV SR 2021a). In our
paper, we will therefore focus on both indicators. Production self-sufficiency is actually simple food self-sufficiency, expressed by a relationship (Matošková, Gálik & Jamborová 2015):

Production self-sufficiency = gross domestic production x 100 / domestic consumption  
(1)

In calculating production self-sufficiency, we based on beef and veal balances, which were compiled and published annually by the Research Institute of Agricultural and Food Economics as part of the situation and outlook report (Gálik 2021). The European Commission also follows the same balance sheet principles and procedures when compiling the medium-term outlook for the market for basic agri-food commodities (EU 2021). We used balance indicators to express the European Union’s productive self-sufficiency.

With a simple adjustment, it is also possible to determine the level of food self-sufficiency from beef balances in the Slovak Republic and the EU. We will replace gross domestic production by net production, which is the result of the difference between gross domestic production and net exports of live cattle.

Food self-sufficiency = net production x 100 / domestic consumption  
(2)

Using data on the production of the food industry (Radela 2021, departmental report of the Ministry of Agriculture of the Slovak Republic Food) it is possible to determine and evaluate the food self-sufficiency of individual branches of the food industry (Matošková et al. 2020) according to the relation:

Food self-sufficiency = production x 100 / (production - export + import)  
(3)

The research used this relationship to calculate food self-sufficiency in the beef sector measured through the production of the processing industry (departmental report Food). From the detailed data, we focused only on the production of beef from the primary processing of animals for slaughter in slaughterhouses. The same data for the EU is also monitored by Eurostat (2022). We used data for foreign trade of the Slovak Republic and the EU from the databases of the Statistical Office of the Slovak Republic and from Eurostat (database Comext 2022) for precisely defined items: HS 0201, HS 0202 and HS 021020.

Detailed data of the Ministry of Regional Development of the Slovak Republic Food allow us to determine the degree of potential food self-sufficiency, which expresses the share of theoretical production of food products corresponding to fully utilized production capacities in their current consumption (Matošková et al. 2020):

Potential self-sufficiency = production capacity x 100/(production - export + import)  
(4)

The period covered by the analyses carried out lasted from 2015 to 2020. All the data used for the European Union were the sum of the 27 Member States without the United Kingdom since the agreement leave the EU was signed.

3. Results and Discussion

The food vertical of beef in Slovakia is one of the problematic. This fact is also documented by the basic balance sheet indicators captured in Table 1. Gross domestic production, after reaching its maximum in 2016, is constantly declining in the following period. In 2020, gross domestic production was only at the level of 80,5% from 2016, which represents a production shortfall of up to 5,5 thousand tonnes c.w.e. At the same time, the average number of cows without market production increased by up to 6,3% during the same period. The increase in the basic herd of mainly meat breeds was not reflected in the growth of production. The reasons
must therefore be found in the deteriorating reproductive indicators of beef cattle. On the other hand, during the period under review, we record a significant increase in total domestic beef consumption, as reported by the Statistical Office of the Slovak Republic. Until 2017, consumption in our country grew sharply, while in the following period its growth slowed down and slowed down. It is astonishing that the volume of our production is declining in a period of growing domestic demand. Nevertheless, the Slovak Republic is a net exporter of live cattle. In the last period almost 12 thousand tonnes c.w.e. is exported from Slovakia in the live state. At the same time, it is a substantial part of domestic production which, instead of processing and placing it on the domestic market, was exported as a low value-added raw material. Consequently, domestic consumption must be largely rehabilitated by imports of beef and beef products. If in 2015 the net export of meat and meat products with high added value reached the level of -11,9 thousand tonnes c.w.e., in 2020 it was already at the level of -15,5 thousand tonnes c.w.e. It follows that the growth in domestic consumption had to be covered by an increase in the volume of meat imports.

Table 1: Development of basic balance indicators on the beef market (in tonnes c.w.e.)

|                      | 2015  | 2016  | 2017  | 2018  | 2019  | 2020  |
|----------------------|-------|-------|-------|-------|-------|-------|
| Slovak Republic      |       |       |       |       |       |       |
| Gross domestic production | 24 316 | 28 246 | 25 872 | 24 336 | 22 716 | 22 734 |
| Net exports of live animals | 14 056 | 17 712 | 15 450 | 13 654 | 11 998 | 11 822 |
| Net beef exports     | -11 900 | -13 148 | -15 907 | -16 856 | -15 314 | -15 494 |
| Domestic consumption | 23 285 | 25 884 | 28 011 | 28 179 | 28 334 | 28 990 |
| European Union        |       |       |       |       |       |       |
| Gross domestic production | 6 983 048 | 7 195 436 | 7 220 513 | 7 329 808 | 7 208 875 | 7 150 650 |
| Net exports of live animals | 188 938 | 226 633 | 244 495 | 243 262 | 233 270 | 231 801 |
| Net beef exports     | 176 345 | 234 101 | 265 004 | 223 592 | 190 140 | 285 224 |
| Domestic consumption | 6 617 765 | 6 734 702 | 6 711 013 | 6 862 954 | 6 785 466 | 6 633 625 |

Source: Cattle for slaughter and calves for slaughter. Situation and outlook report. NPPC-VUEPP, MPRV SR: 2021; SO, SR; EU Agricultural Outlook 2021-2031. European Union: 2021; own calculations.

If we look at the development of balance indicators for the entire European Union, in contrast to the Slovak Republic, they show a stable and balanced trend. Gross domestic production oscillates around the level of 7,2 mil. Tonnes c.w.e., while domestic consumption is on average at the level of 6,7 mil tonnes c.w.e. Unlike the Slovak Republic, the European Union is only minimally involved in trade with countries outside the EU common market (so-called third countries). At the same time, it has long maintained its position as a net exporter of not only live cattle, but also beef.

For the correct calculation and interpretation of the degree of self-sufficiency, we must look at the structure of gross domestic production in Slovakia (Figure 1). Gross domestic production consists of 3 parts: slaughterhouses in slaughterhouses, self-supply and net exports of live cattle. Self-sufficiency represents an estimate and calculations of the production of the Statistical Office of the Slovak Republic not only for small farmers, but also for small processors who are not part of national or departmental statistical surveys. The share of self-sufficiency has strengthened by up to 6 pp over the past 6 years (2015-2020). It is the production of beef, which has a regional character and is subsequently consumed in the region.
For the domestic market, the production processed by the domestic processing industry is crucial, i.e. slaughter of animals for slaughter in slaughterhouses. At the same time, the killings make up on average only 1/3 of the total beef production in the Slovak Republic. Net exports of live cattle have a decisive share in domestic production, although their share is declining every year. More than half of our production is slaughtered animals that have been bred in our country, but will be processed by foreign processing capacities. Over the past 6 years, up to 55% of the live animals exported were calves and young cattle weighing up to 300 kg. What is striking is that live animals exported from us are then imported in the form of meat products. This means that all added value will remain abroad.

![Figure 1: Structure of gross domestic beef production in the Slovak Republic (in %)](image)

Source: Cattle for slaughter and calves for slaughter. Situation and outlook report. NPPC-VÚEPP, MPRV SR: 2021; own calculations

Based on the above balance indicators, we can determine the level of production and food self-sufficiency (MPRV SR 2021a) in the Slovak Republic and the EU in the beef sector (Table 2). The level of production self-sufficiency (1) of the Slovak Republic decreased sharply due to the opposite development of production and consumption. If in 2015 we produced 4,4% and in 2016 even as much as 9,1% more meat than we could consume, in the last 2 years the rate of production self-sufficiency is around 80% at the level of full self-sufficiency defined by MPRV SR (MPRV SR 2021a). The European Union has long been able to fully cover domestic consumption with its own production and place its overproduction on third-country markets, whether in the form of live animals for slaughter or processed meat.
Due to the high share of net exports of live animals in total production, the rate of food self-sufficiency (2) in the Slovak Republic is significantly below the level of production self-sufficiency. The rate of food self-sufficiency decreased each year from 44.1% in the base year to 37.6% in 2020. It follows that slaughter animals processed in Slovakia cover only about 38% of domestic beef consumption and the remaining about 62% must be imported from abroad. Exports of live animals from the EU to third countries do not jeopardize the degree of food self-sufficiency of the EU common market. The level of net production of EU member states is able to fully cover the total consumption of the EU population and at the same time generate exportable surpluses of processed beef placed on third country markets.

From the available data, it is possible to determine and assess the level of food self-sufficiency also in terms of manufacturing production (3). The rate of food self-sufficiency of the Slovak Republic, measured by the primary production of the processing industry, is on average up to 10.8 pp. higher than the food self-sufficiency rate based on balance indicators. Nevertheless, the processing industry of the Slovak Republic was able to cover on average only 50% of the estimated domestic consumption of beef (Table 3). If we look at the whole of the European Union, we can conclude that, even from the point of view of the processing industry, the EU has an overall surplus in beef production.

A new view of the level of food self-sufficiency offers us a calculation of potential self-sufficiency (4). It is clear from the construction of the indicator that it allows us to reveal the reserves that exist in the degree of processing of agricultural raw materials. In the case of beef in particular, the level of actual production from the primary processing of bovine animals for slaughter is replaced by the existing processing capacities of domestic slaughterhouses. At the same time, the processing capacities are declared by the reporting units themselves within the Ministry of Agriculture of the Slovak Ministry of Agriculture SR (Radela 2021). It is clear from the recalculated data that the rate of potential food self-sufficiency has fallen sharply over the past 6 years (Table 4). The reason is the rapid decline in declared processing capacity. If in 2015 the processing industry in the Slovak Republic declared that it has the capacity for...
slaughter processing 58.8 thousand t of beef and veal, in 2020 it was only at the level of 15.2 thousand t. Despite this sharp decline, in 2020, with full use of existing processing capacities, we would be able to cover almost 77% of estimated domestic consumption from domestic production. It follows that in 2020 the potential self-sufficiency was up to 30.8 pp. higher than food self-sufficiency measured through actual production by the processing industry. With full use of existing processing capacities, on the one hand, domestic production of beef and beef products would become more efficient and, on the other hand, the processing rate of beef cattle for slaughter would increase. This development would subsequently be reflected in a decrease in net exports of live animals, but also in a decrease in negative net exports of meat.

Table 4: Potential food self-sufficiency rate of the Slovak Republic in the beef sector (in %)

|       | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|-------|------|------|------|------|------|------|
| potential self-sufficiency | 329.3 | 294.2 | 242.9 | 183.8 | 91.6 | 76.9 |

*Source: Departmental Report Food (MPRV SR); SO, SR; own conversions*

4. Conclusion

Increasing self-sufficiency, as a strategic goal in agriculture, has resonated in our society for decades. It has also been adopted by the current Slovak government and is subject to its regulatory and supportive policies. As the contribution showed in the evaluation of the vertical of beef, in the context of the measures taken and the setting of regulatory and support policy, it is necessary to identify sectors in which it is effective to increase the level of self-sufficiency of the Slovak Republic. At the same time, it is necessary to state clearly whether it is important to prefer the growth of production or food self-sufficiency. In the event of increasing production self-sufficiency, the measures should be directed to primary agricultural production through support for the breeding of beef breeds. However, as the data analysed suggest, such support would only lead to an increase in the volume of live bovine exports abroad. However, if measures are to increase food self-sufficiency, regulatory and support policies would need to focus on increasing beef processing rates. However, it is necessary to draw attention to the existing and unused processing capacities, which directly indicate the problems and dysfunction of the supplier-customer relations between primary production and processors. Ultimately, increasing and modernizing processing capacity would not guarantee an increase in the rate of processing of domestic bovine animals for slaughter. Therefore, in the vertical of beef, it is directly necessary to link primary production and the processing industry, e.g. through interbranch producer organizations. As the Slovak Republic has been a part of the EU common market since 2004, it is necessary to assess the self-sufficiency of the Slovak Republic in the context of the EU single market. The results of our analysis confirm the low level of self-sufficiency of the Slovak Republic in beef, while the European Union as a whole is in surplus in this sector. For this reason, we believe that the adoption of measures, based on the growth of the self-sufficiency of the Slovak Republic, is insufficient with regards to the European Commission.

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