



EFFECTS OF COVID-19 ON INTERNATIONAL TRADE IN FOOD AND AGRO-BASED PRODUCTS

NÓRA GOMBKÖTŐ

Széchenyi István University Faculty of Agricultural and Food Sciences,
Mosonmagyaróvár

ABSTRACT

The COVID-19 pandemic has affected almost every sector of the economy, including international trade in food and agro-based products. The aim of the study is to examine the international trade of food and agro-based products among several countries in the pre- and in-pandemic period, focusing on the first four waves of pandemic. The study concludes that the COVID-19 pandemic has affected international trade in food and agro-based products due to government restrictions (border closures, export-import restrictions). In some countries, there was a shortage of some goods only initially for a transitional period, but as global supply was still satisfactory, an optimal distribution of products among countries was able to eliminate any shortages. The greatest negative impact of the pandemic has been on US trade, but it has spilled over to almost every country, especially its two main trading partners, the European Union and China. In terms of products, the biggest disruptions were in international trade in meat and meat preparation, fish and other aquatic invertebrates, and tobacco products. In addition to government restrictions, consumer habits have also changed to which actors have had to adapt. In addition, some of the habits have remained, which will also have an impact on future trade. International trade cannot be completely demolished but in the future countries must also prepare locally for similar unexpected shocks.

Key words: COVID-19 pandemic, closure, international trade, food, agro-based products

INTRODUCTION

Food is an essential consumer good, so the smooth functioning of the food market is essential. The COVID-19 pandemic has affected almost every sector of the economy, including agriculture and the food sector. The impact of the pandemic was partly due to human diseases and partly due to current government measures. The toolbox of government epidemiological measures was extremely wide (closing borders, restricting travel abroad, quarantining areas, curfews, closing restaurants and hotels, introducing online forms of education, mandatory mask wearing, restricting personal contact), and the tools used or their combination was always dependent on the severity of the current stage of the pandemic. The pandemic in the food market had an impact on both the demand and supply sides, especially in the first period of the pandemic, in the first half of 2020, but later periods were also affected. The supply side is determined partly by crop quantities and partly by the quantities of products imported by each national economy. The amount of yield achieved in a given period depends on many things. One of the influencing factors is a farm management category, which was omitted in the present study, with the exception of the weather, which was extremely adverse in 2020, thus significantly influencing yields. However, the pandemic also had some effect on crop yields, mostly through the labour force. On the one hand, the closure of borders in the initial period restricted the free movement of labour, and on the other hand, the labour force also dropped out of work due to individual illnesses, which led to a decrease in production. The supply side has also been affected by the restrictions or, in extreme cases, the closure of the catering sector, as most alcoholic and other beverages are purchased by them. On the demand side, the pandemic had a significant impact on customer patterns. In early 2020, at the beginning of the pandemic and before government closures, consumers began to panic, buying mainly staple foods and durable foods, as well as flour and yeast for home baking, resulting in a temporary shortage of these products in the world. In addition, people began to look for healthier foods, including vegetables, fruits, and functional foods, for fear of illness. Home delivery and online shopping were preferred to personal shopping, and the number of visits to the grocery store and supermarkets decreased. The pandemic affected trade in almost all food products and in almost every country. Following the first wave of the pandemic, as the pandemic receded, the countries gradually opened, moderating the initial large-scale downturns, and

although new waves of the pandemic subsequently hit, there was no longer as much a decline in trade in agricultural and food products as in the first wave. However, for some products the effect of the first wave is still felt. In addition, it seems that quite a few consumer habits have changed due to the pandemic and will remain with us. These factors also affect current and future trade patterns.

LITERATURE REVIEW

COVID-19 has had a much greater impact on the global supply chain than previous coronavirus pandemics such as SARS or MERS (*Li and Lin 2020*). In addition to the direct effects of COVID-19 (illness and death), Morton (2020) classifies indirect effects into three categories: government decisions, private decisions, and consumer decisions that affect households, the economy, and sustainability in both the short and long term. The pandemic affected trade in goods and services on both the supply and demand sides (*Li and Lin 2020*).

An important regulatory element on the supply side was restrictions in movement. At the beginning of the pandemic, in the first quarter of 2020, governments worldwide introduced significant restrictions on the transportation of goods, as well as labour migration. Restrictions on the supply of products restricted both imports and exports, for different reasons. Import restrictions were primarily for health reasons, as they feared introducing the virus through food. For instance, Indonesia, Korea and Russia imposed a ban on both wild and live animals, and animal products from China in January and February 2020, while Egypt banned imports of garlic, carrots and green ginger from China (*ATPC 2020*). Since March of the same year, Mauritius restricted imports of animal products from China, Iran, Korea, Switzerland and the EU, while Vietnam imposed a total ban on the import of wildlife and related products from around the world. In addition, Iraq and Seychelles increased import duties on agricultural products (*ITC 2020*). In January 2020, the United States increased the number of denials of imports of agricultural products by 52% over the same period last year, by particular by refusing to import agricultural products from China because the pandemic started there. In addition to these import measures, which were notified to the WTO, countries also adopted unilateral border controls by refusing entry to certain imports (*Chen and Mao 2020*). However, it can be seen that the restrictions were mainly on live animals and raw products. The

restrictions on exports of processed food were less common, only Vietnam and Kazakhstan used this tool in the first wave of the pandemic.

Export restrictions are intended to ensure the provision of domestic food supply and maintenance of the quantity of domestic products (*Casey and Cimino-Isaacs 2020*, *Chenarides et al. 2020*). Export restrictions have been applied primarily to staple food products such as cereals. Between 20 March and 10 April 2020, twenty countries banned the export of various foods, including rice, wheat, oil, fruit, vegetables, and eggs. Only half of these restrictions were fixed-term, the other half are still pending (*Chen and Mao 2020*).

The WHO and FAO drew attention to the need for free trade and stressed that there is no evidence that the virus spreads through food (*WHO 2020*), however, the negative effects of export restrictions were much greater. *Espitia et al. (2020)* mentioned that a long-term negative effect is the decrease in domestic prices, thus causing financial damage to farmers and consequently the reduction in production. They mention as a further negative effect the loss of countries' international marketplaces, thereby their competitive advantage, as well as the loss of exporters' reputation, and as a result the loss of confidence in international trade and, ultimately, the loss of future business opportunities for exporters. According to *Glauber et al. (2020)* and *Fyles and Madramootoo (2016)*, the negative effect of an export-restricted policy is the rise in world market prices for staple foods (e.g., wheat, corn, rice) and the reduction in the quantity and quality of food consumed. While *Arianina and Morris (2020)*, *Ndemezo et al. (2018)* and *Reddy et al. (2016)* have also suggested that export restrictions have a number of negative effects. On the one hand, there will be a shortage of products that are not grown or produced nationally. Restrictions also weaken manufacturers because the international market has an infinite number of customers and helps manufacturers choose the best one. When applying export restriction policies, local sellers cannot find buyers and this results in oversupply and waste, as well as economic losses. Foods that are not grown locally but are intended for processing are not available due to constraints and so capacity utilization of food production plants does not meet demand.

The other part of government restrictions was aimed at reducing personal contact and was undertaken by implementing curfews and closing certain community venues (cinemas, theatres, museums), as well as catering establishments and schools. Due to the shutdown of restaurants, hotels and schools, food lost a significant market. And although

food purchases jumped initially due to panic purchases, it was still not enough to use up stocks that would have been sold to the catering sector, thus leaving significant amounts of food wasted due to perishable products. According to *Seleiman (2020)*, the closure of restaurants and food services, logistical constraints on tourism, and transport disruptions are likely to affect the livestock and poultry sectors in terms of supply and distribution chains. For instance, demand for beef in China, which had previously increased due to pork shortages, has also declined. He suggested investing in plant-based meat alternatives and cellular agriculture as a solution.

Rutten et al. (2013) drew attention as early as 2013 to the fact that if barriers are created to supply and demand within the global food system (either through foreign trade protectionism or efforts to reduce the impact on domestic products or citizens), food surpluses and deficits are likely to be observed simultaneously in different sectors and regions of the world. Protectionism can have devastating consequences, usually for the most vulnerable actors in the global food system. Export restrictions make it more difficult for producers in exporting countries to enter the global market, which could lead to a food security crisis, especially for the least developed countries. Restrictions between cities, provinces, regions, and countries have a negative impact on the distribution of staple products (*Aday and Aday 2020*)

The food and agriculture chain can be broadly classified into two categories regarding capital investment and labour. The first one can be defined as staple products such as wheat, corn, maize, soybeans, and oilseeds. The second one contains high-value products such as fruit, vegetables, and fisheries. Staple products require large amounts of capital investments, while high-value products, particularly fruit and vegetables require large amounts of labour.

On the supply side, one of the reasons for the decline in output was the problem of labour shortages in some sectors. Labour shortages in these sectors had already occurred before COVID-19, but this was exacerbated by the initial period of the pandemic, partly due to restrictions on the flow of foreign labour (travel restrictions) and partly due to illnesses in the labour force. This problem was especially common in animal husbandry, horticulture, fruit and vegetable production (during planting, harvesting and processing; in the case of livestock on farms and packaging) (*Gruère and Brooks 2021, Mahajan and Tomar 2021, Seleiman 2020, Stephens et al. 2020*), and in the dairy and meat sector (*Gruère and Brooks 2021*). According to *Seleiman (2020)*, border restrictions prevented

seasonal workers from Eastern Europe from working on farms and in vegetable processors in Western Europe, thereby reducing vegetable and fruit production, thus leading to higher prices. In France, Spain and the United Kingdom, labour was recruited for these jobs, and in Germany students and the unemployed were recruited (*Gruère and Brooks 2021*).

The demand side has been affected by changed consumer behaviour. Global shocks, such as a pandemic, increased the global demand for food. In the initial period of the pandemic, consumers began to panic buy. They were primarily looking for durable food (dried or canned food, pasta, milk or milk substitutes), as well as flour and yeast, as the main baking ingredients, for convenience, home baking and cooking, which resulted in a temporary shortage of these products (*Bakalis et al. 2020*). Later in the pandemic this problem ceases to occur and did not recur. In addition, people consumed healthier foods (fruits, vegetables, legumes, whole grains, olive oil). At the same time, COVID-19 and the associated anxiety and confinement also had an impact on mental health, so consumers went for a higher volume of mood-enhancing foods (alcohol, sweets) (*Hughes 2020, Muscogiuri et al. 2020*). In Regarding this, *Crisp (2020)* and *DeBroff (2020)* also conducted research from the first period of the pandemic. *Crisp (2020)* found that demand for fresh bread increased by 76% while for frozen vegetables the demand increased by 52%, and although consumption of alcoholic beverages did not initially increase, later it also started to increase significantly. In a *DeBroff (2020)* survey, 43% of consumers reported that they consumed 42% more vegetables and 30% more food that contained protein (meat, chicken, or fish). However, 47% of consumers consumed more sweets, 24% consumed fewer vegetables, 21% consumed less fruit and 19% consumed less protein. Although consumers increased the amount of money spent on food (*Bakalis et al. 2020*), consumer income decreased due to the reduction in labour due to the impact of the pandemic, thus reducing the demand for expensive food in individual consumption (*Amare et al. 2020, Bauer 2020*). In the first wave of the pandemic, the number of visits to grocery stores decreased, with consumers preferring online shopping instead of personal purchases, takeaway, and home delivery. The latter two were also facilitated by the closure of restaurants (*Bakalis et al. 2020, Debroff 2020*).

In most regions of the world, logistical constraints, and labour shortages, due to the COVID-19 pandemic, disrupted some agricultural market chains at the beginning of the pandemic, limiting access to animal feed. Imports of feed ingredients such as soybean

meal and feed additives, as well as veterinary medicines, may have been disrupted due to the COVID-19 pandemic. In addition, livestock farms have faced rising costs for feed and medicines caused by the COVID-19 pandemic, leading to higher costs for all livestock sectors, including those for animal products.

Kerr (2020) examined the first wave of the pandemic and concluded that there was not as large a decline in agricultural production as in other sectors. Supply remained relatively stable, apart from initial panic purchases; however, demand changed. Initially, due to fears of closures, the demand for durable foods increased, but later, with people losing their jobs and their incomes declining, they increasingly demanded staples instead of processed foods. Demand for processed foods decreased significantly, and these are only involved in international trade, so according to *Kerr (2020)*, the globalization of agricultural products decreased. In addition, due to the initial border closures, the countries tried to solve the food supply within their borders, which also had an effect on the domestic food supply, and it went against international food trade. After the pandemic, two possible scenarios are likely to be expected. One is that countries will increasingly strive for food self-sufficiency, thereby reducing their dependence on other countries. The other is that countries will strive for even stronger international cooperation to better prepare the global economy for similar shocks in the future. According to *Kerr (2020)*, this depends on the dynamism of recovery from the crisis. Cooperation is the more likely scenario for a rapid recovery, while protectionism is a more likely scenario for a slow recovery.

According to *Aday and Aday (2020)*, the biggest problem was the disruption of supply chains, as there was no continuity of food flow from manufacturers to end users. While countries struggled with the pandemic, they had to do everything they could to move the gears in food supply chains. The impact of pandemic problems on agricultural systems is highly dependent on the intensity and composition of agricultural inputs and varies depending on the products produced and the country.

The research results of *Li and Lin (2021)* show that the spread of the pandemic in different periods had an asymmetric effect on trade between countries. The main reason is that different stages in the progression of a pandemic lead to differences in the supply and consumption sides of global trade in different countries.

After the outbreak, several researchers began to deal with the impact of the pandemic on international agricultural and food trade. These studies quantified the impact of the

pandemic. Some studies dealt globally with numerical values of trade processes (*Beckman and Countryman 2021, Li and Lin 2021, Maliszewska et al. 2020, Poudel et al. 2020*, while others have examined priority territory (*Kerr 2021, Cao et al. 2020, Grant et al. 2020, Lin and Zhang 2020, Morton 2020, Seleiman 2020*).

Beckman and Countryman (2021) investigated the effect of COVID-19 on agriculture and the food industry using a simulation model. It was found that agricultural production and trade markets in the United States and other countries were very resilient at the time of the pandemic, with production and trade increasing for almost all products in 2020 despite the pandemic (China had a decrease in pork production due to the impact of African Swine Fever [ASF]). Examining the first three months of the pandemic, *Seleiman (2020)* found that the global food supply was sufficient and stable, especially for cereals (wheat, corn, legumes). According to *Beckman and Countryman (2021)*, trade in agricultural products increased globally by 2.3%; *Poudel et al. (2020)* were more pessimistic, as they observed a decrease of 13–22%. According to *Beckman and Countryman (2021)*, trade in processed foods, live animals, alcoholic beverages, tobacco products, and (due to declining demand for clothing) fibre plants decreased, while trade in oilseeds, wheat, other meats, and sugar (due to a significant increase in exports from Brazil and India) increased the most. Trade in pork was not affected by COVID-19 but rather, as written earlier, by ASF, which caused about a 50% loss of pigs in China in 2018. Thus, China's imports of this product increased in 2019 and 2020 compared to previous years. However, it was still unable to make up for the loss, so consumption shifted significantly from pork to beef and, in addition to the increase in beef prices, Chinese beef imports also increased. According to *Poudel et al. (2020)* the products that took the biggest hit in the pandemic were live animals (delivery of poultry breeding stock was disrupted due to the travel bans and fishery products were endangered due to labour shortages, border closures and health measures) and products of animal origin, especially milk. Due to the decrease in the supply of fishery products, people in some regions decreased their animal protein intake or changed the source of their protein intake (*Seleiman 2020*), which led to an increase in demand for other animal products (e.g., poultry meat).

The pandemic did not only affect agricultural and food products. Due to global trade disruptions, farmers had to face a shortage of agricultural raw materials such as seeds, fertilizers and pesticides. According to *Marlow (2020)* and *Poudel et al. (2020)*, China is

one of the largest fertilizer manufacturers and exporters of the world. However, the outbreak of COVID-19 in China affected the Chinese fertilizer industry, disrupting the movement of both fertilizers and raw materials in China. This and the Chinese closure severely affected international fertilizer trade. In addition, the lack of raw materials affected the planting of spring crops such as corn, sunflower, wheat, barley, rapeseed, and field vegetables. Therefore, import-dependent countries appeared to be heavily affected by the pandemic (*Poudel et al. 2020*).

The COVID-19 pandemic has affected trade in all countries of the world mostly negatively. Examining the three largest trading actors in the world, *Li and Lin (2020)* found that the negative impact of the pandemic on trade was the greatest in the United States, followed by China and then the European Union. In their research, *Li and Lin (2020)* found that in the first wave of the pandemic, EU exports fell by 10.5%, imports by 9.5%, and trade by 10%. The COVID-19 pandemic spread rapidly in the EU and many foreign trade companies faced cancellation or delay of orders; trade uncertainty accelerated the commerce crisis. The EU has a huge international market due to its important trade position, so the impact of the pandemic on other developed and developing countries intensified due to this. In the US, trade fell by 23% and imports by 37%, but exports increased by 18% (*Li and Lin 2020*). One possible reason for the increase in exports is that the United States enjoys an export competitive advantage in the international trade market due to its huge competitive market, advanced technology, and high productivity. Both China and the EU, the main trading partners of the United States, were affected by imports and exports. In general, countries with closer trade relations with the United States are more vulnerable than other countries. As for the trade effects in the world, the influence of trade disruptions hit the US more than the real situation of influence. *Li and Lin (2020)* found that China's trade fell by 13%, its exports by 15%, its imports by 12%, and that the pandemic affected most Asian countries (especially the Philippines, Japan, Indonesia, Malaysia, and Thailand). The main problem is that the pandemic disrupted the normal operation of Chinese export companies, as well as foreign trade restrictions and a sharp decline in exports, leading to supply-side disruptions. Importing countries could not find import alternatives in the short term to cope with China's temporary supply shortages, so their related industries were also affected, and their exports limited. *Cao et al. (2020)* examined the impact of COVID-19 on agricultural trade in China in the first wave of the pandemic. Their research found that the first wave

of the pandemic could have had a negative impact on agricultural exports in the short run, mainly due to supply chain disruptions, but could also have a deeper and more lasting negative impact in the long run due to a possible decline in external demand and non-tariff barriers to trade (NTBs). On the other hand, it was stated that despite panic purchases and country restrictions, world food supply and demand for China's food imports remained optimistic. Their simulation results showed that in connection with COVID-19 and China's Sino-US Economic and Trade Agreement (SUETA) signed with the United States in 2020, a large but declining decline in value is likely. The trade agreement declares that China will import \$12.5 billion more in value of agricultural and fishery products from the United States in 2020 compared to 2019 and \$19.5 billion in 2021 compared to 2020. At the beginning of COVID-19, China began granting tariff exemptions to facilitate agricultural import purchases from the United States, but this effect only materialized after the forced entry into the trade agreement (14 February 2020) (*Grant et al. 2020*). *Lin and Zhang (2020)* examined China's agricultural exports in the first wave of the pandemic using firm-level data. It was found that, on average, exports of agricultural enterprises fell, while exports of certain agricultural products, in particular cereals and oil, remained strong and even increased, which coincides with the demand for staples during the pandemic. Not surprisingly, exports of herbs also increased significantly during the pandemic. However, exports of goods such as edible mushrooms and horticultural products fell sharply. Their results also showed that the effect of COVID-19 was generally more severe on smaller firms than on larger firms. *Poudel et al. (2020)* reported that the pandemic in China had the greatest adverse impact on animal husbandry due to limited access to animal feed and labour shortages.

Kerr (2021) examined the impact of the coronavirus on agricultural trade in Canada and concluded that the agricultural sector was severely affected by the pandemic and that pre-COVID characteristics are unlikely to return. Furthermore, the pandemic has highlighted those international reforms are needed in the trading system.

Morton (2020) examined African countries and concluded that the food supply chains of these countries were also vulnerable to COVID19, as they have been adversely affected by other pandemics.

Due to the COVID-19 pandemic, Brazilian and American soybeans and maize were not exported in large quantities, but instead domestic consumption was encouraged and opened up new markets. Therefore, the supply of soybeans and maize may be jeopardized

in many countries. In addition, inadequate fertilizers caused by COVID-19 logistical constraints can cause inadequate yields of soybeans, corn, sugar cane and coffee in Brazil. This means that Brazil and China may be the most affected countries due to border closures and restrictive international trade in fertilizers and crop production. Innovative start-ups in these countries have encouraged the production of their own technologies and reduced the import of inputs (*Seleiman 2020*).

Erokhin and Gao (2020) and *Seleiman (2020)* found that developing countries and the least developed countries were hit hardest by the food crisis due to COVID-19 closures, economic recession, food trade restrictions, and rising food inflation. Some developing countries did not have the capacity to detect viruses on a large scale due to poor infrastructure and inadequate medical resources. In these developing countries, food security risks associated with the health crisis were mainly related to economic access to adequate food supply (food inflation), while in higher income developing economies, food security risks related to accessibility (food trade restrictions and currency depreciation) were more common. As the COVID-19 pandemic continued to spread in developing countries, there was a concern that the reduced global trade would continue. In the trade of goods and flow of capital, there are strong links between the economic sectors of different countries. Due to deepening of globalization, if the COVID-19 crisis continues to deteriorate, then global trade shock will spread further (*Li and Lin 2021*).

Consequently, most of the literature examined the impact of the pandemic only in the year 2020 and within that largely only in the first wave. However, the pandemic is expected to persist even when this paper is published, so an update to examine its impact is needed. The aim of the study is to examine the impact of the COVID-19 pandemic on international agricultural and food trade up to and including the second half of 2021, with special emphasis on the role of each wave. The study highlights from the pre- to the in-pandemic period the good practices that should be continued in the future in order to optimize agricultural trade.

MATERIAL AND METHOD

The study was based on secondary databases. As the study aims to examine the impact of the COVID-19 pandemic on agricultural and food trade, and the pandemic is ongoing, databases that include data from 2021 and at least quarterly, but rather monthly, were

considered. However, out of the largest intergovernmental databases related to international trade (UN Comtrade Database, ITC [International Trade Center] Trade Map, WTO Statistics, FAOSTAT, OECD Statistics, EUROSTAT) only two met these criteria, so the examination was based on these two databases (EUROSTAT, ITC Trade Map). The selection of the examined goods was based on the Standard international trade classification (SITC) grouping, and Section 0 (food, drink, and tobacco) and Section 1 (including live animals) were selected. In addition, as it was demonstrated during the literature review that barriers to trade in fertilizers were encountered, fertilizers from Section 5 were also included in the investigation. The aim of the study was not to examine the long-term characteristics, but to examine the effects of the COVID-19 pandemic and its individual waves, so data for 2020 and the first half of 2021 were included in the research. In addition, for the sake of comparability, the years immediately preceding 2020 were taken into consideration. The methods used in the study are simple statistical methods (absolute deviation, mean, ratios [dynamic, distribution], matrix, graphical representation).

Results

Before examining international trade in processed food and agro-based products, it is useful to briefly review what are the general characteristics of trade in these products in the world. The major trading regions in the world are the European Union, the United States and China. The European Union and the United States are major agricultural and food trading partners in the world; they represent more than 30% of global trade. In addition, the European Union has many other trading partners both from developing and from developed countries as well. Comparing the three major trading partners (European Union, the United States, China), the United States exports a higher proportion, while China a lower proportion, of their products than the European Union in the case of all agricultural and food commodities. In the United States a relatively high proportion of meat is provided from import; while in China crops, beef, and veal come from imports; and in the European Union most of crop consumption is supplied by import (*Gombkötő 2017*). World agricultural and food exports are highly concentrated. Russia, the European Union, the United States, Canada and Ukraine together accounted for 75% of total wheat exports in 2019-2020. The rice market is equally concentrated, with 75% of exports

coming from the top five exporters and almost a quarter coming from India alone. Vietnam's global market share alone is 16% (Glauber *et al.* 2020). Brazil and the US supply most soybeans, while China accounts for more than 60% of world soybean imports (Gale *et al.* 2019). In addition, the major global corn exporters are the US and Brazil, while the major corn importers are Mexico and Japan. (Seleiman 2020). The major exporters of cattle are Brazil, India, Australia, while its importers are the US, Russia, Japan and Italy. The major exporters of poultry meat are the US, Brazil and the Netherlands, while importers are China, Hong Kong, Japan and Saudi Arabia. The major exporters of aquaculture are China, Thailand and Indonesia, and importers are Japan, the Netherlands, Italy and the US.

In terms of world trade globally, it is enough to look at only either exports or imports, as the two are in balance. When the trade between countries is examined, it is important to distinguish between exports and imports. Quantitative data are the most appropriate for examining trade, but they are not available in all databases, so value data were used instead. As only a few consecutive years were examined, the purchasing power of money has presumably declined to a negligible extent, so no adjustment is needed to show a change in trade.

First, it is useful to review the change in global exports of processed food and agro-based products over time to get an overall view. For this, quantitative data were examined, but they were only available annually, so the trend between 2010 and 2020 was examined. Regarding the global exports of processed food and agro-based products, the export volume gradually increased from 2010 to 2016 by an average of 3-5% per year. From 2016 to 2017 there was a large increase (47%), then from 2018 it started to decrease. However, in 2019 it still exceeded the level of 2016 but fell back to the level of 2010 in 2020 (Figure 1). This is probably due to the impact of the pandemic for reasons stated earlier.

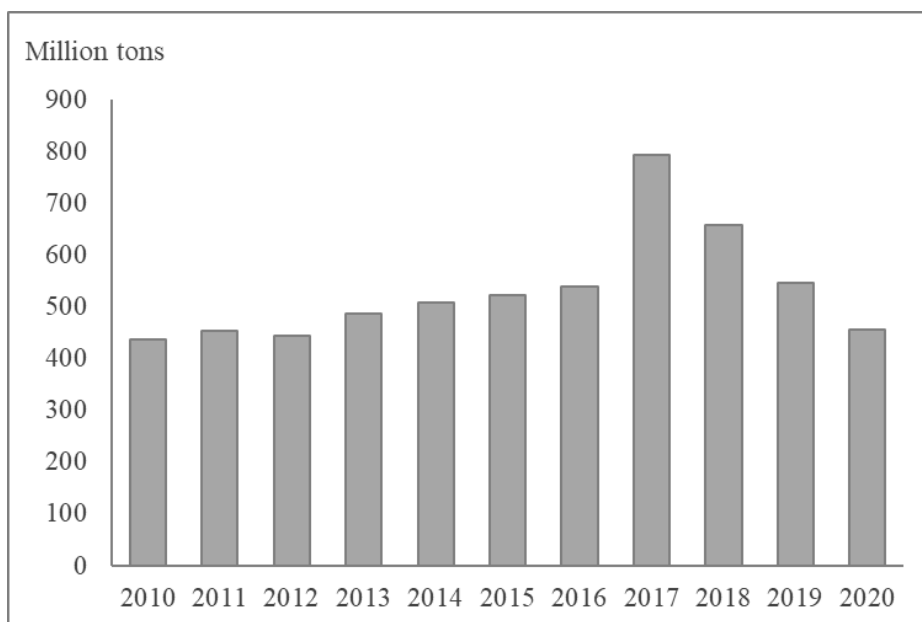


Figure 1: Global export of processed food and agro-based products

Source: Own, based on International Trade Center (ITC) Trade Map

Figure 1 shows world trade in all processed food and agro-based products, but it does not show which products are behind the changes. *Table 1* shows the change in international trade in the same product group compared to the previous year, but it is divided into main product groups. (No data were available for live animals and beverages.)

Table 1: Change in the volume of exports of global processed food and agro-based products compared to the previous year, by main commodity group (%)

Commodity group	2015	2016	2017	2018	2019	2020
Meat and edible meat offal	-0.1	-33.1	+2.0	-1.6	-58.2	-23.6
Fish and crustaceans, molluscs and other aquatic invertebrates	-47.6	-2.0	-2.0	+24.9	-7.8	-27.6
Dairy produce; birds' eggs; natural honey; edible products of animal origin	+1.7	-0.8	-80.1	-0.3	+59.7	+107.8
Vegetables and certain roots and tubers	+145.8	+37.1	-20.8	-4.9	-71.6	+9.7
Fruit	+29.5	+211.5	+26.7	-43.7	-80.3	+74.7
Coffee, tea, maté and spices	+3.5	+5.3	+2.0	-4.8	-0.1	+0.2
Cereals	+29.5	+67.1	+11.3	-27.1	-61.0	+17.0
Tobacco	-4.7	-12.4	+0.2	-0.3	+24.3	-79.9

Source: own, calculation based on International Trade Center (ITC) Trade Map

Table 1 shows that trade in agricultural and food products is highly volatile and largely dependent on yields. The decline in global exports in 2020 is mainly due to meat and meat products, fish and other aquatic invertebrates, and tobacco. The volume of exports of tobacco decreased dramatically compared to the previous year. The decline in exports of meat and fish products began as early as 2019, which was not due to COVID-19, but rather – as written in the literature – African swine fever (ASF). In the case of meat products, exports of beef and pork decreased, while those of poultry remained almost invariable or decreased only slightly. The years 2018 and 2019 brought a decrease in exports for almost all products compared to the previous year. The market for fish and fish products, as described in the literature, is indeed in crisis. They are not only due to pandemic closures, but also labour shortages and health measures, as fewer and fewer quantities have been exported every year since 2015. So it is likely that global decline in fish stocks is in the background. Besides decreases, the volume of export of two commodity groups (dairy products and fruits) increased significantly from 2019-2020. This may be related to COVID-19, but exports of these two product groups have been highly volatile in previous years, so it cannot be necessarily explained by the pandemic.

The supply of fertilizers in agriculture was questionable as well. In this respect there was a tendency that the export of fertilizers in the world was already decreasing dramatically in 2017 (by 64.8%), but since then it has stagnated, and in 2020 there was

no major decline. So, the initial Chinese fertilizer distribution problems at the beginning of the pandemic were resolved during the year.

After reviewing trade of specific product groups, it is expedient to examine the foreign trade data of the countries that trade in these products to the greatest extent. The top 10 agricultural and food exporters are (in descending order) the European Union, the United States, Brazil, China, Canada, Indonesia, India, Thailand, Australia, Argentina, Russia, Malaysia, and Mexico, while the top 10 importers are the European Union, China, the United States, Japan, Russia, Canada, South Korea, Mexico, Hong Kong, India, Saudi Arabia and Indonesia (*Gombkötő 2017*). Based on this, the study examined agricultural and food trade in the European Union, the United States, China, India, Canada, Russia, and Brazil. For each year this study used EU-27 (2020) data, so by removing UK trade data from previous years, the data became more comparable. As the European Union is not a country but an integration of countries and one of the largest traders in agricultural and food products, it will be presented separately in the second part of the study. Data on exports and imports of processed food and agro-based products by country are only available in value, so the impact of the pandemic is illustrated through this. As the main goal is to study the impact of the pandemic and its individual waves, the data were plotted from the first quarter of 2020 to the second quarter of 2021 (*Figure 2*). As the EU-27 has the largest trade in the world and its value is six times that of the second largest, the United States, and while subsequent countries show only a 2-3-fold difference, the EU-27 is left out of the figure so orders of magnitude can be as close as possible to each other. Thus, the trade data for each quarter can be seen as clearly as possible in the figure.

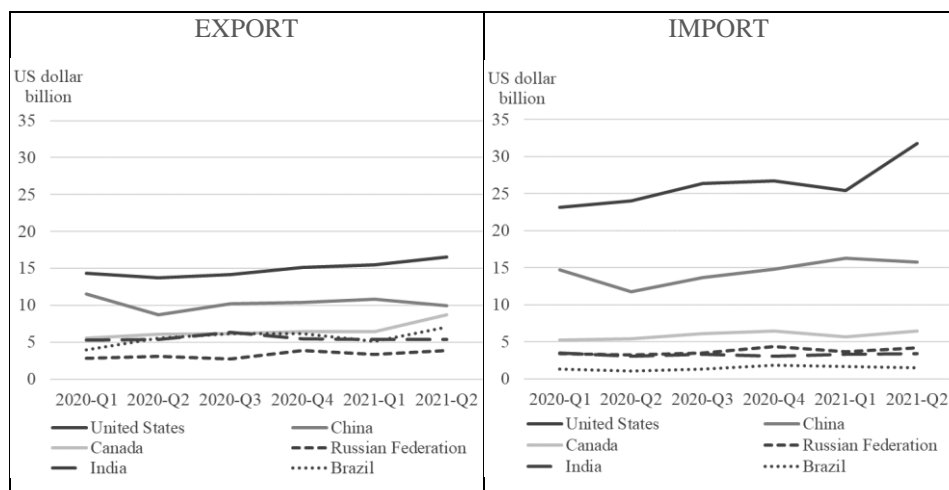


Figure 2: Trade value of processed food and agro-based products in the main foreign trade countries (except the EU) from the first quarter of 2020 to the second quarter of 2021

Source: Own, based on International Trade Center (ITC) Trade Map

Figure 2 shows that the trend in trade in processed food and agro-based products did not follow the same pattern in the countries studied, which is also because each wave of the pandemic reached different countries at different times. In both the United States and China, both exports and imports experienced a decline in the first wave of the pandemic in the first quarter of 2020, due to the temporary closure of borders and other epidemiological measures. The same decline in Russia occurred only in the third quarter of the same year, when the second wave of the pandemic began. In the third wave of the pandemic, a decline was also observed in the United States, Canada, Brazil and Russia, but the extent of this did not reach the decline experienced in the first wave, as the products could flow relatively more freely. Thereafter, growth started in all countries examined except China. Thus, subsequent waves of the pandemic no longer affected trade in processed food and agro-based products, as countries were prepared for this.

The product turnover between the major trading partner countries was examined in the year immediately preceding the pandemic (2019) and in the first year of the pandemic (2020) (*Table 2*). Value data were also available for this, but for two consecutive years it was still only comparable without bias. The highlighted data refer to those trading connections, where product turnovers show the highest change from 2019 to 2020 in a

relative sense. Trade in processed food and agro-based products between countries did not change significantly. Two major changes can be observed, on the one hand, the volume of products exported from Russia to the United States, India, and Brazil, and on the other hand, the volume of products exported from Brazil to China more than doubled. From Russia to the United States mainly foods, frozen products (e.g., frozen crabs, fruits, vegetables, ice cream, etc.), cooking oil, wheat, flour, prepared or preserved fish, convenience food, yeast, dry pasta, potatoes, vegetables, and fruits prepared or preserved, canned goods, and tobacco. However, it can be observed that imports of luxury goods (e.g., caviar, cocoa powder) to the United States decreased. It is also clear from the type of products that the demand for prepared or preserved foods and staple foods increased in line with changes in consumer habits, while there was no demand for luxury goods due to an increase in time spent at home and a decline in GDP, as well as in people's incomes. India mainly imported cooking oil and yeast; while Brazil imported malt, yeast and tobacco from Russia, i.e., staple foods for which most countries have introduced export restrictions, so supply temporarily declined globally. The increase in exports from Brazil to China was clearly due to meat (pork, beef) products caused by the Chinese pig shortage, but the value of yeast and tobacco imports had also increased. However, in addition to these products, there was a decrease in most other products as well.

Table 2: Trade in processed food and agro-based products between major trading partner countries in 2019 and 2020

Million US dollars

2019		Import						
Export	Country/ Region	European Union	United States	China	Canada	Russian Federation	India	Brazil
	European Union	-	25,840	10,375	3,566	5,739	632	1,491
	United States	3,880	-	2,093	15,335	188	229	329
	China	3,745	3,954	-	693	824	207	198
	Canada	751	18,163	2,026	-	53	14	44
	Russian Federation	1,550	43	1,283	10	-	164	9
	India	1,842	3,868	1,570	329	187	-	47
	Brazil	5,383	1,520	768	188	129	521	-
	2020		Import					
Export	Country/ Region	European Union	United States	China	Canada	Russian Federation	India	Brazil
	European Union	-	24,982	10,573	3,711	5,610	640	1,575
	United States	3,664	-	2,536	14,885	184	209	374
	China	3,590	4,106	-	672	756	146	198
	Canada	795	18,561	2,212	-	46	20	35
	Russian Federation	1,732	81	1,815	12	-	365	23
	India	1,790	3,954	1,543	397	189	-	67
	Brazil	4,793	1,546	1,681	322	89	754	-

Source: Own, based on International Trade Center (ITC) Trade Map

As described above, the European Union was examined separately. First, a review of the production data of the main agricultural products is presented. Crop production has an annual yield, so annual data was available. However, data for 2021 has not yet been made available for all EU countries, so considering the EU as a whole, we can only compare data from the first year of the pandemic (2020) with previous years. Cereals had

the lowest total yields in the EU in the last ten years. There was a 10-20% decline compared to previous years, but this is not necessarily due to the pandemic, as the year 2020 was characterized by spring frosts and then a severe drought, so the weather was also extremely unfavourable. The declines were mainly in France, Romania, Bulgaria and Ireland, while in other countries the yield was relatively balanced compared to previous years. In Spain and Lithuania, it even increased, and in Germany and Italy the declining trend started years ago. Regarding sugar beets, a declining trend has been observed since 2017, in almost all countries, so its yield was also not affected by the pandemic. The largest drop in yields (almost 30%) was also in France for sugar beets. Concerning vegetables, despite initial border closures causing a problem for the sector's labour supply, yields in the EU had even increased slightly compared to the previous year. It does not appear to have caused more severe crop losses in any of the countries. In the case of animal products (meat and dairy products) the yield was continuous, so it is more worthwhile to examine the monthly data. Meat production fell even more (20%) than in previous years in April 2020 but returned to its previous level in June and has been stable ever since. The reason for this was the initial closures, during which animal feed and live animal transport were disrupted. In addition, part of the workforce was quarantined, so production fell. Another reason for the decline may be the closing of restaurants, so some of the demand for meat fell, which was also accompanied by a decline in production. In the case of beef, there was another decline in December 2020, which can be attributed to the second wave of the pandemic. However, in the case of pork, in March 2021, a positive jump was observed. In the case of milk production, the recessions relatively followed each wave of the pandemic. Although there was no decline at the beginning of the first wave, a decline began in May 2020 and lasted until November 2020. Subsequently, there was an even larger decline in the third wave (February 2020) and another decline began in August 2021, which was already in the fourth wave of the pandemic. Furthermore, this trend was expected to continue. These waves developed similarly in all countries. It can therefore be concluded that there were larger decreases in yields, mainly in France, which may have had an impact on exports. In the case of milk production, the effects of some of the waves of the pandemic can be clearly observed (a decrease can be seen in the waves), which also affected exports. Examining the European Union's foreign trade, it can be said that trade in food and live animals had extreme fluctuations over the course of a year, both in the years before and during the pandemic (*Figure 3*). Exports in the

years of the pandemic (2020 and 2021) followed a similar trend as in the years before the pandemic. In the first year of the pandemic, in 2020, it was much higher than in previous years, which may indicate a volume of exports that satisfied the sudden surge in world food demand. At the same time, a sharp decline can be seen in the post-February period, which can be attributed to the sudden closure of borders and export restrictions. However, after the August low, it started to rise and reached the level of 2019. Imports had a completely different trend. The trend in the first year of the pandemic was quite like previous years, only at a much lower level, and here, unlike exports, there was a sharp decline in February. This can be explained by the fact that people around the world started to buy and stockpile their food stocks, and countries introduced export restrictions, resulting in a global deficit, so the EU was only able to import less. However, this was settled by April, but the volume of imports lagged the previous years for the rest of the year. This is due to a decrease in human consumption - partly due to closures (e.g., restaurants) and partly due to previously accumulated food stocks. The second year of the pandemic took a different course. Imports increased at the beginning of the year (probably due to an increase in demand in preparation for the third wave) and then fell sharply in mid-March during the third wave. The reason for this was also due to closures.

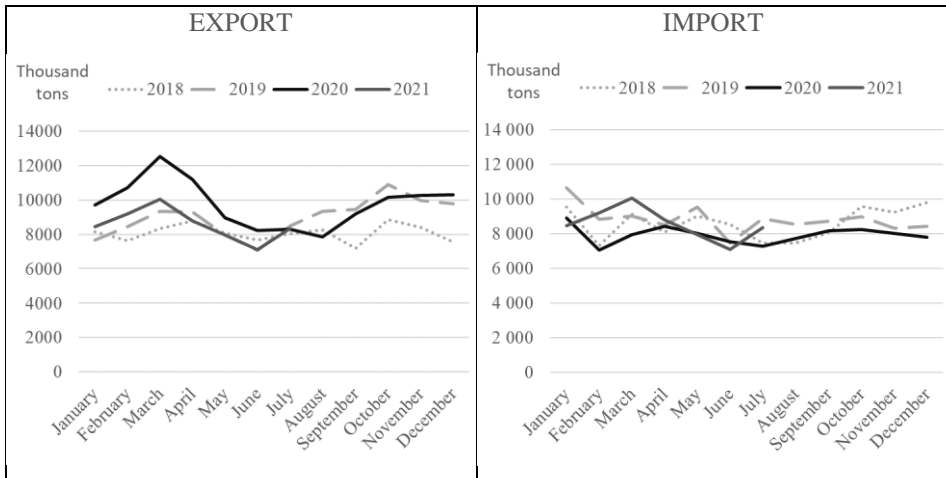


Figure 3: Trade in food and live animals in the European Union

Source: own, based on Eurostat

Most of the European Union's five largest food and live animal importing partners (China, Switzerland, the United States, Norway, Russia) exports follow the same pattern

as the total product group; however, exports to China are highly volatile and no regularity can be observed.

In almost all five of the largest partner countries (Brazil, Argentina, Russia, Canada, the United States) that export food and live animals to the European Union, food and live animal exports to the EU started to rise in February 2020 after a slight decline. However, in Brazil and Argentina, this increase was huge, declining by the end of the year, then starting to rise again in January 2021, and increasing explosively in April of this year. Thus, it can be seen that imports of food and live animals from these countries followed each wave of the pandemic, as it was rising in each wave. This sudden increase is mainly due to cereals and animal feed in Brazil, and meat, animal feed and beverages in Argentina. The volume of fertilizer imports into the EU fell sharply (by 40%) between February and May 2020, right in the peak period of fertilizer use. It then began to increase in June 2020, until March 2021 when it declined by 40%; this decline occurred for just two months and then began to explode from May. Over the same period, fertilizer exports fell by 35% from April to May 2020, probably because domestic production was held back due to a lack of import volumes. After a smaller growth trajectory, it declined again in July but only by 17%, and then it increased until May 2021. It shows that the EU is a net importer of fertilizers, and the course of the pandemic strongly influenced the volume of imports in the first and third waves of the pandemic, with the EU trying to address the shortage of fertilizers by reducing export volumes.

The foreign trade of main foodstuffs of the European Union was examined in the first year of the pandemic (2020) and in the first half of the second year (2021) (*Figure 4*). Examining the European Union's foreign food trade by product group, it can be seen that it exports the largest quantities of cereals while also importing cereals, feed, fruits, and vegetables. Looking at the period of the pandemic, it can be seen that EU beverage exports increased in each wave, while imports decreased, probably due to the closure of the catering sector in the EU, which is the largest purchaser of beverages. Exports of fruit and vegetables have also declined, which may be due to labour shortages during pandemic waves and resulting in a decline in harvested quantities. Cereals exports have fallen dramatically since March 2020, there are not so many epidemiological effects behind this, but rather the cause is the decline in yields due to adverse weather.

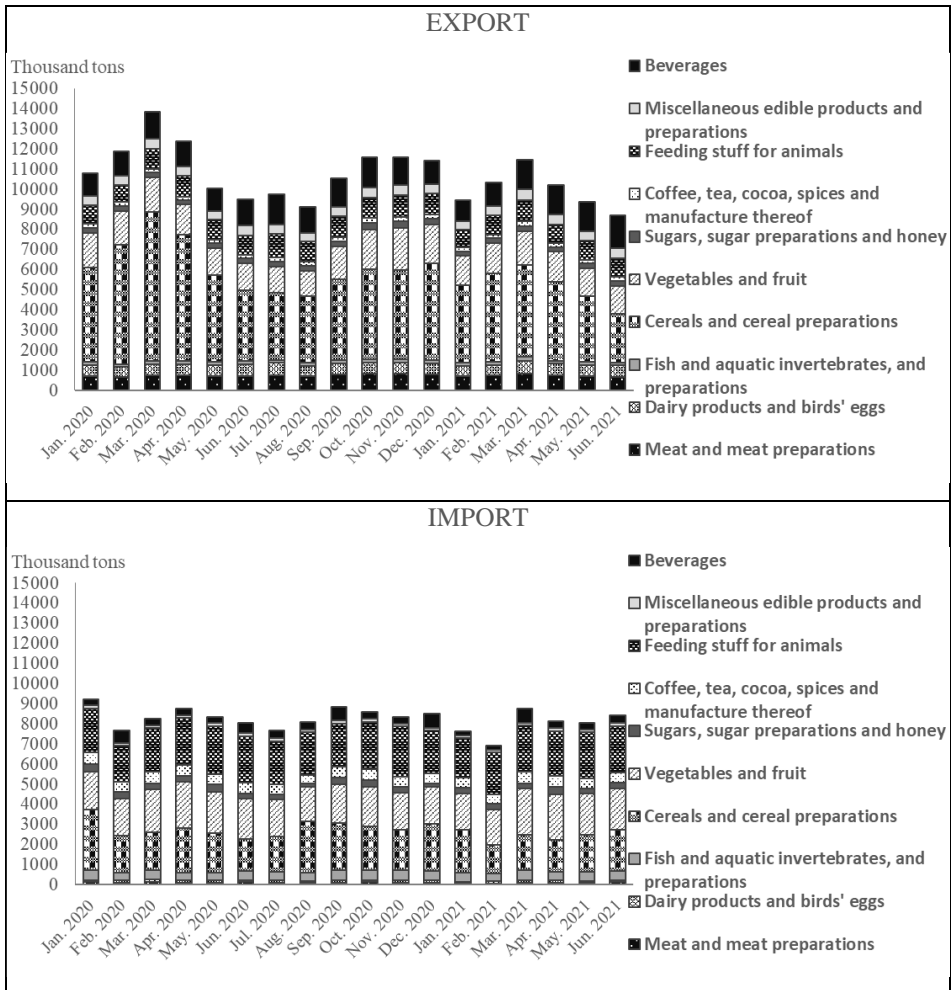


Figure 4: Main foreign trade in food of the European Union by product group

Source: own, based on Eurostat

CONCLUSION

The COVID-19 pandemic has also affected trade in agricultural and food products, mainly due to government restrictions and only to a lesser extent because of its health implications (e.g., illness and absence from work). The worst negative impact of the pandemic has been on US trade, but it has spilled over to almost every country, especially its two main trading partners, the European Union and China. Labour shortages in some agricultural sectors are not a problem caused by COVID-19. Instead, it is a long-standing problem that can be addressed by even stronger digitalisation, especially in those sectors (e.g., horticulture) that are still highly labour-intensive. In terms of agricultural yields, it was not COVID-19 that caused crop losses in crop production, but the unfavourable weather conditions of the pandemic year (spring frosts, drought). However, one of the reasons for the decline in livestock production was the closure due to the pandemic, as transport of feeding stuff was disrupted by the closure of borders. Furthermore, they also fell from losing a significant market due to the closure of catering sector, forcing them to reduce production. Food trade stagnated in the initial period of the pandemic (even then only due to temporary border closures) and later recovered relatively but fluctuated slightly in subsequent waves (but not to the same extent as in the first period). The most affected products are meat and meat products, fish and other aquatic invertebrates, and tobacco. (Meat supply problems were also exacerbated by the swine fever in China and the concomitant increase in demand.) It can therefore be seen that the pandemic has also had a significant impact on meat production and trade. In the future, it would be useful for the sector to prepare for similar unforeseen events, with capacity expansion (production facilities, cold stores), more flexible scheduling of workers and, in extreme cases, the production of meat substitutes. Also in the initial period, there were more serious disruptions with fertilizer imports. In the future, countries importing fertilizers will have to partially increase the use of manure as a supplement to fertilizers. Finally, there have been significant changes not only in the supply system but also on the consumer side, both in terms of products purchased (e.g., demand for healthier food has increased) and shopping habits (e.g., increased demand for online shopping, reduced time spent in stores), some of which appear to remain, to which both producers and distributors must adapt. In terms of world trade, it can be seen that border closures and import restrictions in the initial period of the pandemic caused shortages of goods in some

countries for a short temporary period, but this period was extremely short (2-3 weeks) as world trade reacted quickly and the products were provided by other partners (e.g., Russia). Therefore, global supply was satisfactory, as it was distributed among the countries. Consequently, despite localization efforts, the institution of international trade cannot be completely demolished, as many countries are vulnerable; however, in the future, countries must also prepare locally for similar unexpected events.

A COVID-19 HATÁSA AZ ÉLELMISZER- ÉS AGRÁRTERMÉKEK NEMZETKÖZI KERESKEDELMÉRE

GOMBKÖTŐ NÓRA

Széchenyi István Egyetem, Mezőgazdaság- és Élelmiszertudományi Kar

ÖSSZEFOGLALÁS

A COVID-19 járvány a gazdaság szinte minden területére hatással volt, így az agrár- és élelmiszer-termékek nemzetközi kereskedelmére is. A tanulmány célja, hogy megvizsgálja az agrár- és élelmiszer-termékek nemzetközi kereskedelmét több országon átívelően, a járvány előtti és alatti időszakban, külön figyelmet szentelve az egyes járványhullámoknak. A tanulmány megállapítja, hogy a COVID-19 járvány az agrár- és élelmiszer-termékek nemzetközi kereskedelmére elsősorban a kormányzati korlátozások (határlezárások, export-import korlátozások) hatottak. Az egyes országokban áruhiány csak kezdetben, egy átmeneti időre volt megfigyelhető, mivel a kínálat globálisan kielégítő volt, csak optimálisan kellett elosztani a termékeket az országok között. A járvány legsúlyosabb negatív hatása az Egyesült Államok kereskedelmében jelent meg, de ez tovagyűrűzött szinte minden országra, különösen a két fő kereskedelmi partnerre, az Európai Unióra és Kínára egyaránt. Termékek tekintetében a legnagyobb fennakadások a hús- és húsféleségek, a hal és egyéb halászati termékek, valamint a dohány termékek nemzetközi kereskedelmében jelentkeztek. A kormányzati korlátozások mellett a fogyasztói szokások is megváltoztak, amelyekhez a gazdasági szereplőknek alkalmazkodni kellett. Ráadásul a szokások egy része velünk maradt, amely a jövőbeli kereskedelemre is hatást gyakorol. A nemzetközi kereskedelem intézménye nem bontható

fel teljes egészében, de a jövőben a hasonló nem várt eseményekre az országoknak helyi szinten is fel kell készülniük.

Kulcsszavak: COVID-19 járvány, nemzetközi kereskedelem, élelmiszer, mezőgazdasági eredetű termék

REFERENCES

- Aday, S. – Aday, M.S.* (2020): Impact of COVID-19 on the food supply chain. *Food Quality and Safety*, 4 (2020): 167–180. doi:10.1093/fqsafe/fyaa024
- Agricultural Trade Promotion Center, Ministry of Agriculture and Rural Affairs of the People's Republic of China (ATPC)* (2020): Analysis of technical trade measures in COVID-19 adopted by exporting markets on China's agricultural products. Retrieved from: <https://mp.weixin.qq.com/s/rPZt-4m8gpgKzu3ShG0phA> [Accessed on 2 September 2021]
- Amare, M. – Abay, K. A. - Tiberti, L. – Chamberlin, J.* (2020): Impacts of COVID-19 on food security: Panel data evidence from Nigeria. IFPRI Discussion Paper, Washington DC, International Food Policy Research Institute (IFPRI). <https://doi.org/10.2499/p15738coll2.133866>
- Arianina, K. – Morris, P.* (2020): COVID-19 Export Restrictions Threaten Global Food Supply. Retrieved from: <https://www.squirepattonboggs.com/-/media/files/insights/publications/2020/05/covid-19-export-restrictionsthreaten-global-food-supply/law360covid19exportrestrictionsthreatenglobalfoodsupply.pdf> [Accessed on 4 August 2021]
- Bakalis, S. – Valdramidis, V. P. – Argyropoulos, D. et al.* (2020): Perspectives from CO+RE: How COVID-19 changed our food systems and food security paradigms. *Current Research in Food Science*, 3: 166–172. doi: 10.1016/j.crfs.2020.05.003
- Bauer, L.* (2020): Hungry at Thanksgiving: A Fall 2020 update on food insecurity in the U.S. Retrieved from: <https://www.brookings.edu/blog/up-front/2020/11/23/hungry-at-thanksgiving-a-fall-2020-update-on-food-insecurity-in-the-u-s/> [Accessed on 9 October 2021]
- Beckman, J. – Countryman, A.M.* (2021): The importance of agriculture in the economy: impacts from covid-19. *American Journal of Agricultural Economics*, 103(5): 1595–1611. doi:10.1111/ajae.12212

- Cao, L. – Li, T. – Wang, R. – Zhu, J.* (2020): Impact of COVID-19 on China's agricultural trade. *China Agricultural Economic Review*, 13(1): 1-21. DOI 10.1108/CAER-05-2020-0079
- Casey, C. – Cimino-Isaacs, C.* (2020): Export Restrictions in Response to the COVID-19 Pandemic. In Congressional Research Service (CRS): In Focus. Washington DC: Congressional Research Service.
- Chenarides, L. – Manfredi, M. – Richards, T. J.* (2021): COVID-19 and Food Supply Chains. *Applied Economic Perspectives and Policy*, 43(1): 270-279. <https://doi.org/10.1002/aepp.13085>
- Chen, K.Z. – Mao, R.* (2020): Fire lines as fault lines: Increased trade barriers during the COVID-19 pandemic further shatter the global food system. *Food Security* 12: 735–738. <https://doi.org/10.1007/s12571-020-01075-2>
- Crisp* (2020): Get a LIVE view into COVID-19 effects on in-store purchases. Retrieved from: <https://www.gocrisp.com/demandwatch> [Accessed on 29 September 2021]
- DeBroff, S.* (2020): How COVID-19 Has Impacted Consumer Food Habits. Retrieved from: <https://www.foodmanufacturing.com/consumer-trends/blog/21133823/how-covid19-hasimpacted-consumer-food-habits> [Accessed on 14 June 2021]
- Erokhin, V. – Gao, T.* (2020): Impacts of COVID-19 on Trade and Economic Aspects of Food Security: Evidence from 45 Developing Countries. *International Journal of Environmental Research and Public Health*, 17(16): 5775. <https://doi.org/10.3390/ijerph17165775>
- Espitia, A. – Rocha, N. – Ruta, M.* (2020): Covid-19 and food protectionism: the impact of the pandemic and export restrictions on world food markets. Policy Research Working Paper, No.9253, World Bank. 1–30.
- Fyles, H. – Madramootoo, C.* (2016): Key drivers of food insecurity. *Emerging Technologies for Promoting Food Security*. Woodhead Publishing, 1–19. <https://doi.org/10.1016/B978-1-78242-335-5.00001-9>
- Gale, F. – Valdes, C. – Ash, M.* (2019): Interdependence of China, United States, and Brazil in soybean trade. A Report from the economic research service. Retrieved from: <https://www.ers.usda.gov/webdocs/publications/93390/ocs-19f-01.pdf?v=4048.3> [Accessed on 18. September 2021].
- Glauber, J. – Laborde Debucquet, D. – Martin, W. – Vos, R.* (2020): COVID-19: Trade restrictions are worst possible response to safeguard food security. In COVID-19 and

global food security, eds. Johan Swinnen and John McDermott. Part Four: Food trade, Chapter 14, 66-68. Washington, DC: International Food Policy Research Institute (IFPRI). https://doi.org/10.2499/p15738coll2.133762_14

Gombkötő N. (2017): International Trade in Agricultural and Food Products. *International Journal of Commerce, Business and Management*, 6(3): 2319–2828.

Grant, J. – Orden, D. – Marchant, M. (2020): COVID-19 & Agricultural Exports under the U.S.-China Trade Deal, CAT Policy Update No. 2020-05, Center for Agricultural Trade, Virginia Tech

Gruère, G. – Brooks, J. (2021): Viewpoint: Characterising early agricultural and food policy responses to the outbreak of COVID-19. *Food Policy*, 100 (2021) 102017 <https://doi.org/10.1016/j.foodpol.2020.102017>

Hughes, M. (2020): Evolving eating habits as a result of COVID-19. Retrieved from: <https://www.newfoodmagazine.com/article/109890/evolving-eatinghabits-as-a-result-ofcovid-19/> [Accessed on 11 July 2021]

International Trade Centre (ITC) (2020): COVID-19 temporary trade measures. Retrieved from: <https://www.macmap.org/covid19> [Accessed on 24 August 2021]

Kerr, W.A. (2020): The COVID-19 pandemic and agriculture: Short- and long-run implications for international trade relations. *Canadian Journal of Agricultural Economics*, 68:225–229. DOI: 10.1111/cjag.12230

Kerr, W.A. (2021): Agriculture after a year with COVID-19: Any long-term implications for international trade policy? *Canadian Journal of Agricultural Economics*, 69:261-267. <https://doi.org/10.1111/cjag.12274>

Li, C. – Lin, X. (2021): COVID-19 and trade: Simulated asymmetric loss. *Journal of Asian Economics*, 75 (2021) 101327 <http://dx.doi.org/10.1016/j.asieco.2021.101327>

Lin, B. – Zhang, Y.Y. (2020): Impact of the COVID-19 pandemic on agricultural exports. *Journal of Integrative Agriculture*, 19(12): 2937–2945. doi: 10.1016/S2095-3119(20)63430-X

Mahajan, K. – Tomar, S. (2021): Covid-19 and supply chain disruption: evidence from food markets in India. *American Journal of Agricultural Economics*, 103(1):35-52 <https://doi.org/10.1111/ajae.12158>

Marlow, S. (2020): COVID-19: Effects on the Fertilizer Industry. HIS Markit; Agribusiness Research & Analysis. Retrieved from: <https://ihsmarkit.com/research->

analysis/report-covid19-effects-on-the-fertilizerindustry.html [Accessed on 12. October 2021].

Morton, J. (2020): On the susceptibility and vulnerability of agricultural value chains to COVID-19. *World Development*, 136 (2020) 105132 <https://doi.org/10.1016/j.worlddev.2020.105132>

Muscogiuri, G. – Barrea, L. – Savastano, S. – Colao, A. (2020): Nutritional recommendations for CoVID-19 quarantine. *European Journal of Clinical Nutrition*, 74: 850–851. <https://doi.org/10.1038/s41430-020-0635-2>

Ndemezo, E. – Ndikubwimana, J. B. – Dukunde, A. (2018): Determinants of Capacity Utilization of Food and Beverage Manufacturing Firms in Rwanda: Do Tax Incentives Matter? (July 22, 2018). Available at SSRN: <https://ssrn.com/abstract=3217757> or <http://dx.doi.org/10.2139/ssrn.3217757>

Poudel, P.B. – Poudel, M.R. – Gautam, A. – Phuyal, S. – Tiwari, C.K. – Bashyal, N. – Bashyal, S. (2020): COVID-19 and its Global Impact on Food and Agriculture. *Journal on Biology and Today's World*, 9(5): 221.

Reddy, V. R. – Singh, S. K. – Anbumozhi, V. (2016): Food supply chain disruption due to natural disasters: entities, risks, and strategies for resilience. *Economic Research Institute for ASEAN and East Asia*, 1–36.

Rutten, M. – Shutes, L. – Meijerink, G. (2013): Sit down at the ball game: How trade barriers make the world less food secure. *Food Policy*, 38: 1–10. DOI:10.1016/j.foodpol.2012.09.002

Seleiman, M.F. – Selim, S. – Alhammad, B.A. – Alharbi, B.M. – Juliatti, F.C. (2020): Will novel coronavirus (covid-19) pandemic impact agriculture, food security and animal sectors? *Bioscience Journal*, 36(4): 1315-1326. <http://dx.doi.org/10.14393/BJ-v36n4a2020-54560>

Stephens, E. C. – Martin, G. – van Wijk, M. – Timsina, J. – Snow, V. (2020): Editorial: impacts of COVID-19 on agricultural and food systems worldwide and on progress to the sustainable development goals. *Agricultural Systems*, 183: 102873. doi: 10.1016/j.agsy.2020.102873

World Health Organization (WHO) (2020): Updated WHO recommendations for international traffic in relation to COVID-19 outbreak. Retrieved from: <https://www.who.int/news-room/articles-detail/updated-who-recommendations-for-international-traffic-in-relation-to-covid-19-outbreak> [Accessed on 22 September 2021]

A szerző levélcíme – Address of the author:

GOMBKÖTŐ NÓRA

Széchenyi István Egyetem,

Mezőgazdaság- és Élelmiszertudományi Kar

9200 Mosonmagyaróvár Vár tér 2.

gombkoto.nora@sze.hu