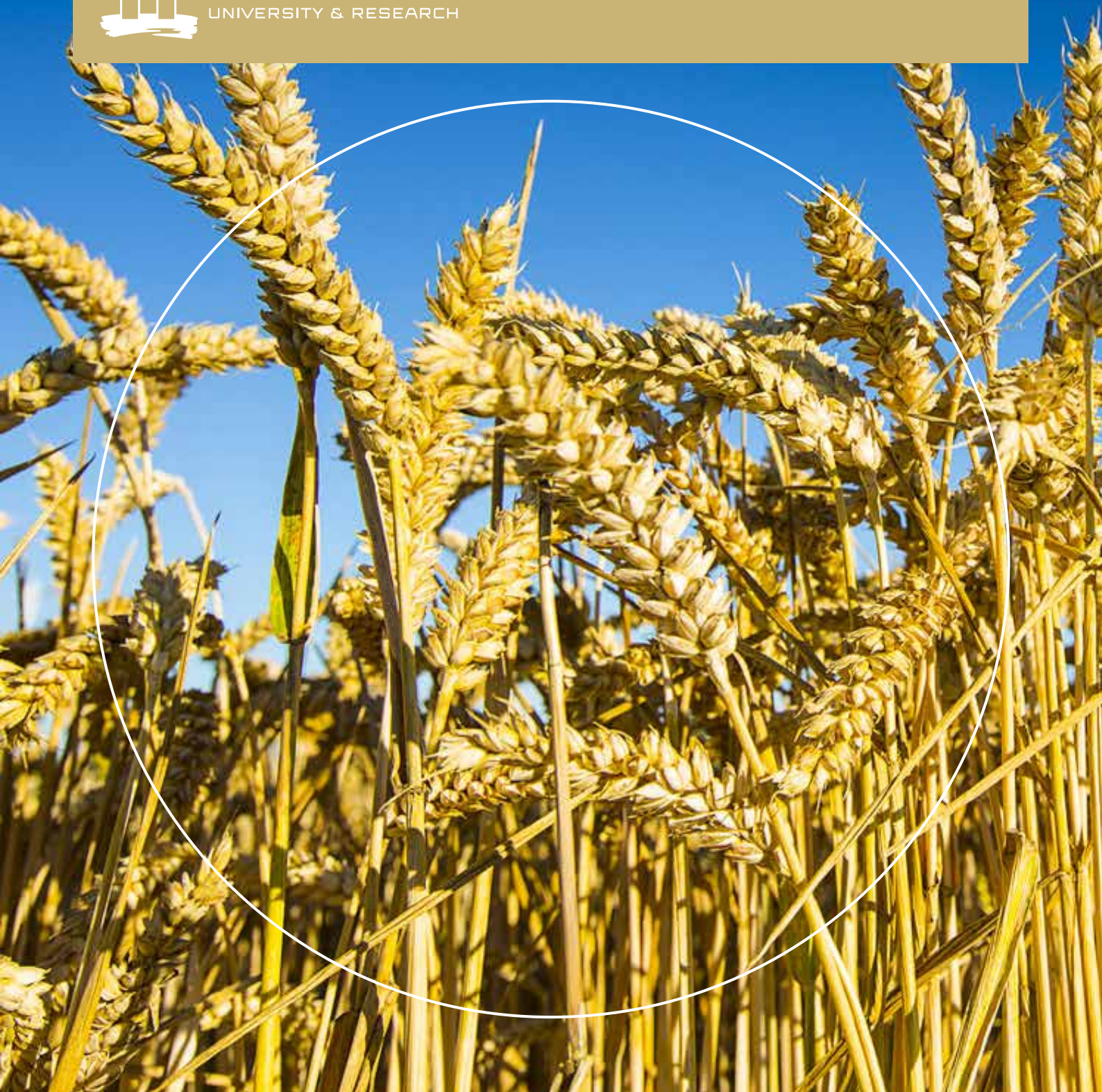


# A brief analysis of the impact of the war in Ukraine on food security

Petra Berkhout, Ron Bergevoet, Siemen van Berkum



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This research was carried out by Wageningen Environmental Research and commissioned and subsidised by the Dutch Ministry of Agriculture, Nature and Food Quality, in the context of the Policy Support research theme 'Economy'

Wageningen Economic Research  
Wageningen, March 2022

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POLICY DOCUMENT  
2022-033

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Berkhout, Petra, Ron Bergevoet, Siemen van Berkum, 2022. *A brief analysis of the impact of the war in Ukraine on food security*. Wageningen, Wageningen Economic Research, Policy Document 2022-033. 22 pp.; 13 fig.; 0 tab.; 16 ref.

This paper gives a first analysis of the possible consequences of the war in Ukraine for food security in the short term. We do this by reviewing the different factors that influence the food situation. At the time of writing (March 2022) the war is still going on and the outcome is still unclear. The analysis should therefore be seen as preliminary.

Key words: food security, Netherlands, war, Ukraine

This policy document can be downloaded for free at <https://doi.org/10.18174/568027> or at [www.wur.eu/economic-research](http://www.wur.eu/economic-research) (under Wageningen Economic Research publications).

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Wageningen Economic Research Policy Document 2022-033 | Project code 2282300554

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# Summary of the initial conclusions

- With the exception of the areas currently affected by the humanitarian crisis in Ukraine, there are no food shortages as of yet: there is enough. This is true globally, both in the EU and in the Netherlands.
- The problems now mainly concern access to food, which is predominantly a consequence of rising food prices. This particularly affects people in poorer countries, some of whom spend more than half their incomes on food.
- For the time being, this first effect – limited access due to increased prices – is the most important. This issue is most pressing in poorer countries, as mentioned, but people may still face difficulties in Europe/the Netherlands because of the increased food prices. These increased food prices are the result of both more expensive raw materials and rising energy costs.
- Energy and food prices were rising, even before Russia invaded Ukraine.
- In addition to the reduced availability and access to grains and oilseeds due to the war in Ukraine, the availability of and access to fertiliser may also be affected by the trade embargoes with Russia and Belarus.
- Some products may become scarce in the Netherlands and/or the EU. However, this does not pose a threat to food security since there are (generally) alternatives to the products in question.
- In the longer term, several factors will determine how food security develops. Further research will provide (some) answers.

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# 1 Introduction

The war in Ukraine is causing a great deal of disquiet and concern about global food security. Wageningen Economic Research was asked by the Dutch Ministry of Agriculture, Nature and Food Quality (LNV) to map the effects of this conflict on agricultural production and food security in several reports. Consideration is given to the short (<6 months), medium (6 months-2 years) and long term (>2 years).

The first report<sup>1</sup> focused on trade between Ukraine, Russia, Belarus and the Netherlands. The current memorandum attempts to provide initial insights into the possible short-term consequences of the war for food security for the world, the EU-27 and the Netherlands. We do this by reviewing the various factors that influence food availability and providing an initial analysis of them. At the time of writing (March 2022), the war is still ongoing, and the outcome is still unclear. The analysis should therefore also be seen as provisional.

Further reports will address key problems and consequences for chains and sectors that the war in Ukraine presents in the short term, and subsequent disruptions in and of chains. Scenario analyses will also be conducted in April to examine the possible effects on the food supply, production and economic consequences in the medium and long term. Attention will be paid to:

- key problems for the EU and the Netherlands in the different agricultural value chains;
- the possible impact of the war in Ukraine on Ukraine's production and export of agricultural goods;
- the possible consequences of the boycotts against Russia and Belarus;
- the possible changes of international markets and trade flows.

## 1.1 Food security – definition

The Food and Agricultural Organisation (FAO) defines food security as the situation where people have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and preferences for an active and healthy life at all times; in other words, people are free from hunger and malnutrition (FAO, 2000).

Food security has a number of pillars: it is about availability of, access to, use and stability of the food supply. In the 1970s, the focus of definitions of food security was mainly on food availability. Over time, the definition has been expanded to include aspects such as quality, nutritional value and access.

When analysing food security, it is important to distinguish between the availability of food and access to it. After all, a great deal of food insecurity comes not as the result of food shortages, but as a consequence of lack of access. Poverty is the main cause of limited access to food: people simply do not have the money to buy it. The quality of food can also be a major obstacle to achieving food security; people may have access to sufficient calories, but the nutritional value – in terms of micro and macronutrients – is lacking.

## 1.2 Resilience of the EU food system

One of the EU's objectives is to guarantee the food security of its citizens. The policy for this is contained in the Common Agricultural Policy (CAP). One of the CAP's aims is to secure Member States' food supplies. A key tool for this is the common market for agricultural products, with there being no trade barriers at internal borders. Over time, the CAP's policy objectives have widened and deepened.

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<sup>1</sup> Bergevoet, R., Jukema, G., en Verhoog, D. (2022). *Impactanalyse oorlog in Oekraïne: eerste rapportage van 10 maart 2022* (Impact analysis of the war in Ukraine: first report dated 10 March 2022). (Policy document / Wageningen Economic Research; No. 2022-031). Wageningen Economic Research. <https://doi.org/10.18174/566232>



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Based on a review of a number of scenario studies, Bindraban et al. (2008) concluded that the EU's food system is robust in term of food supply: in addition to there being a high level of domestic agricultural production, there is enough purchasing power to buy food on the international market. This also applies in the event of crises, such as the drought in 2003, the Chernobyl disaster in 1986 and the outbreak of animal diseases. Consumers can adjust their diets if needs be, and any shortages can be made up for by purchases on the international market. There would only be a significant impact on the meat industry and meat consumption if soya imports for the animal feed industry were to disappear completely, according to the report. The food supply is not in danger, but dietary adjustments would be necessary.

A study by Van der Weijden et al. (2011) reached similar conclusions: the various crises would lead to substantial economic damage, but the food supply would not be endangered.

Cockx et al. (2015) confirmed that food availability in the EU is not a problem currently, but there are vulnerable groups within the EU that do not always have enough money for a healthy and varied diet.

There are no more available recent studies, but there is no reason to assume that the situation in 2022 is very different (also see section on EU Situation). Similarly, the COVID-19 pandemic, while considered a shock to the food system, did not result in food insecurity in the EU.

#### *Food safety*

In addition to guaranteeing food security, the EU plays an important role in ensuring food safety, within the EU and globally. For example, there are strict standards on residues of pesticides or antibiotics, mycotoxins and requirements for production (e.g. organic production and GMO free). Products produced within and imported into the EU have to comply with these requirements. The safety of these products is guaranteed by checks and certificates. This system ensures food safety, but can limit market flexibility. In some cases, this can limit the choice and availability of alternatives, in both the short and medium term.

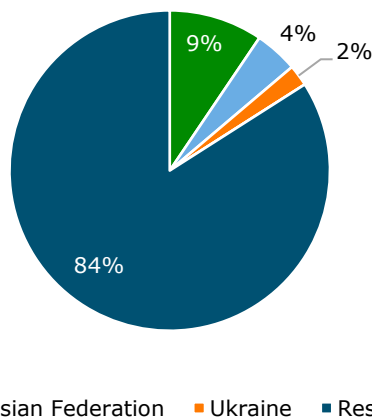
## 1.3 Share of Ukraine and Russia in the production of various products

Ukraine and Russia are major producers and exporters of grains and oilseeds, so the analysis focuses on these two product categories.

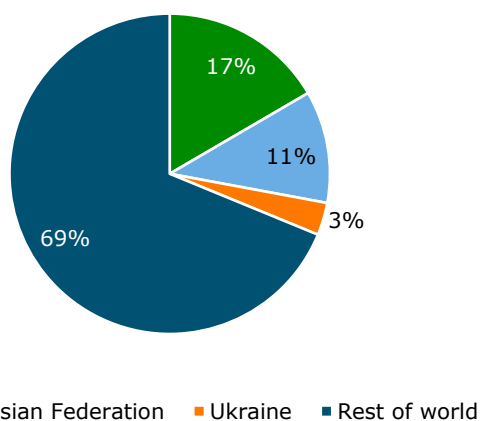
#### *Grains*

In 2020, 2,996 million tonnes of grain (including rice) were produced worldwide. Of this, 4% was produced in Russia and 2% in Ukraine (Figure 1). Annual fluctuation due to climatic conditions (drought and the like) in grain production can vary from 0.5 to 5%.

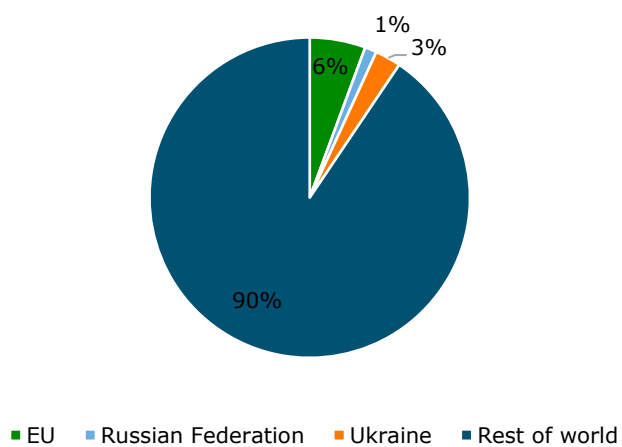
The pie charts below show the share of different countries in global grain and oilseed production (Appendix 1 contains the figures).



**Figure 1** Share of different countries in global grain production (all grains, including rice)  
Source: FAOSTAT.



**Figure 2** Share of different countries in global wheat production (this includes both wheat for human consumption and wheat for animal feed); the statistics do not distinguish between the two)  
Source: FAOSTAT.



**Figure 3** Share of different countries in global (feed) maize production  
Source: FAOSTAT.

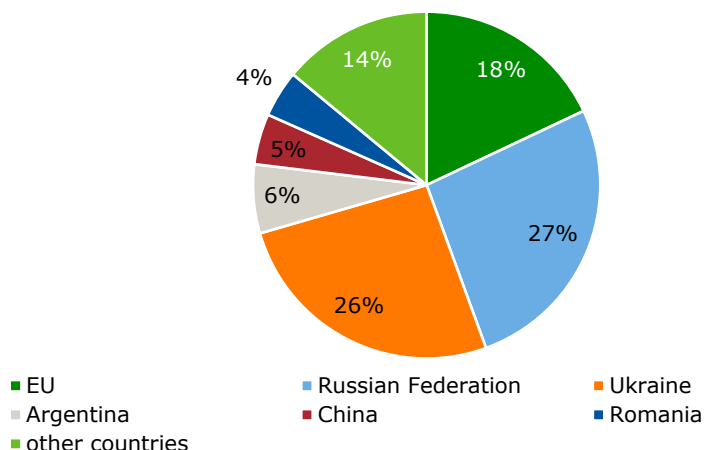
Based on FAOSTAT data, it appears that Ukraine's share of global grain production is relatively limited. A drop or total loss of grain production in Ukraine would be a setback in global terms, but it would not directly lead to any major shortages. However, there are currently significant effects on prices. Factors such as hoarding and market disturbance are playing a role.

Generally speaking, agricultural markets are rarely entirely stable and can become unbalanced easily. This translates into high price volatility. Small shortages and surpluses can lead to significant effects in prices. This imbalance is due to the fact that demand for food is relatively stable, increasing primarily due to population growth and rising incomes, while supply can vary a great deal more; it takes time for supply to adjust to changing demand. Finally, the share of global trade in production is relatively small (Banse et al., 2008). The majority of trade takes place within regions (geographic blocks such as NAFTA and the EU). However, a number of particularly low-income countries with high rates of population growth - such as Nigeria and Bangladesh - are highly dependent on the international market for their grain supplies. Price increases due to shortages - expected or otherwise - therefore have a major impact on these countries' food supply.

The experience of the international market price spikes in 2007 and 2012 (see below) also shows that when prices rise rapidly, exporters tend to announce export restrictions to safeguard their own food security and stable prices on the domestic market. However, as a consequence, international prices continue to rise, and the market remains volatile.

#### *Sunflower seeds*

The total global production of sunflower seeds in 2020 was 50 million tonnes. Russia and Ukraine's combined share in this is more than 50% (Figure 4).



**Figure 4** Shares of different countries in global sunflower seed production

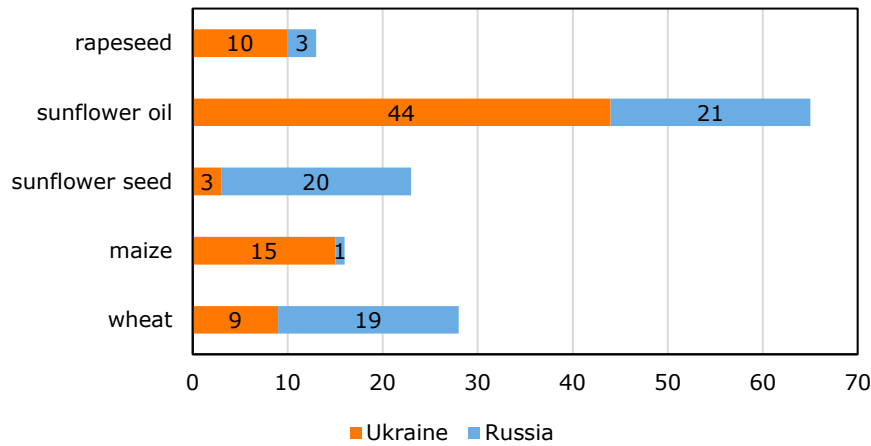
Source: FAOSTAT.

The loss of sunflower seed production from Ukraine and Russia may cause more issues than the loss of grains. Sunflower oil is used in a great many products, both directly and in manufacturing processes. Substitution with other oils - such as palm, rapeseed and soybean oil - is possible, but not for every product that uses sunflower oil.

## 1.4 Russia and Ukraine's share in global trade

Only a limited part of all grain production is traded between countries; about a quarter of wheat and sunflower oil, and 15-20% of maize. While Ukraine's shares in global grain production are limited, those in trade are much more substantial.

Ukraine is a major exporter of wheat (18 million tonnes), maize (27.9 million tonnes), sunflower oil (6.8 million tonnes) and rapeseed (2.4 million tonnes; 2020 UNComtrade), and has a substantial share of international trade for these crops (Figure 5). These shares indicate that Ukraine is a major supplier for these products on the world market and that disruption of that supply could have significant consequences for prices on the international market. Russia is also a major exporter of wheat and sunflower seed and oil. As such, unilateral and bilateral trade embargoes on Russia may affect the availability of these products on the international market.

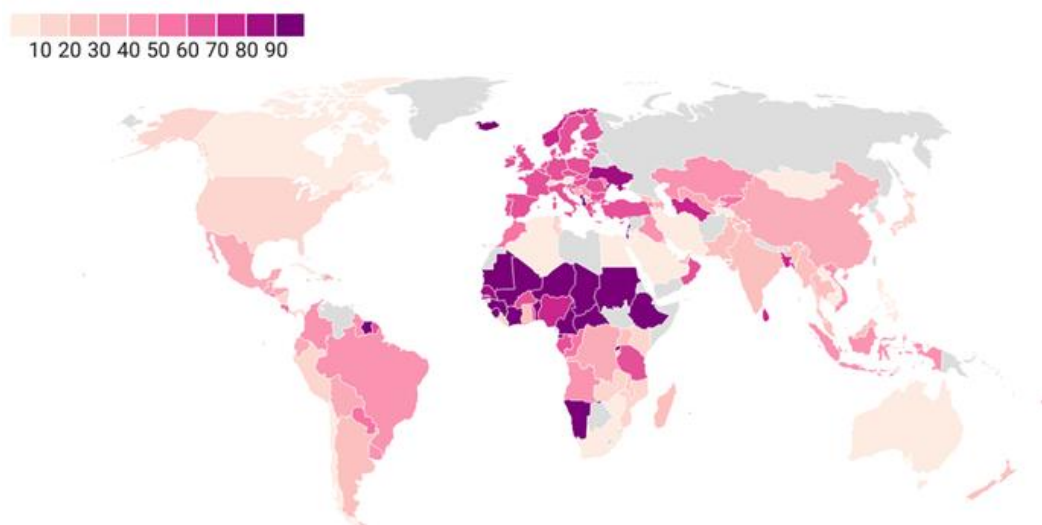


**Figure 5** Russia and Ukraine’s shares in global trade of wheat, maize, sunflower seeds and oil, and rapeseed  
 Source: UN Comtrade, numbers 2020.

## 1.5 Energy and fertiliser

Russia is a major exporter of nitrogen and potassium fertilisers. Figures 6 and 7 below show the share of imports of these fertilisers from Russia and Belarus.

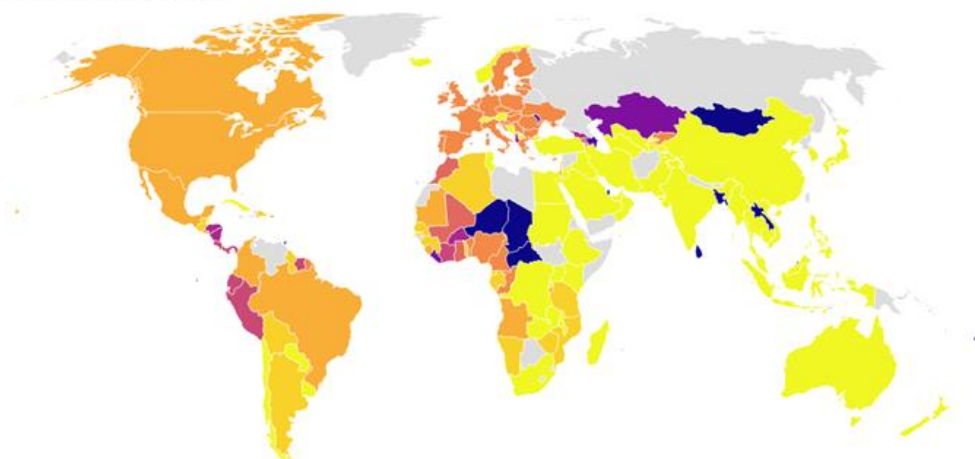
### Percentage of the Russian Federation and Belarus in potassium fertilizer imports by country



Map: David Laborde • Source: COMTRADE • Created with Datawrapper

**Figure 6** Share of Russia and Belarus in countries’ imports of potassium fertiliser  
 Source: IFPRI (2022).

## Percentage of the Russian Federation and Belarus in nitrogenous fertilizer imports by country



Map: David Laborde • Source: COMTRADE • Created with Datawrapper

**Figure 7** Share of Russia and Belarus in countries' imports of nitrogen fertiliser  
Source: IFPRI (2022).

The prices of energy and fertilisers were rising before the outbreak of war in Ukraine and the subsequent sanctions. Prices for crude oil and oil products on the international markets had been rising since April 2020 ([www.iea.org](http://www.iea.org)), and the same is true of gas prices ([businessinsider.com](http://businessinsider.com)). Prices for fertilisers had been rising since January 2021 ([Fertilizers Price Index \(ycharts.com\)](http://Fertilizers Price Index (ycharts.com))). The war is driving these prices even higher.

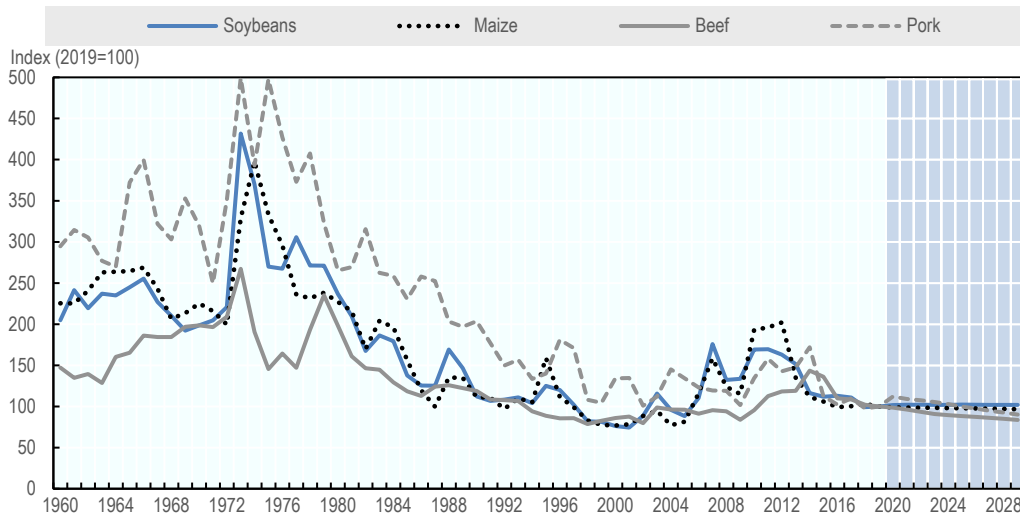
Several fertiliser exporters have already imposed restrictions on their exports (Schmidhuber, 2022). Russia's intention to stop exporting fertilisers will put additional pressure on fertiliser availability. Prices of fertilisers are already high due to increased energy and transport costs, as mentioned, and they will rise further if there is an actual export ban. If fertilisers are more expensive, this could result in lower use and thus lower production, possibly leading to changes in the crop plan. However, this outcome is questionable for this season in the northern hemisphere as crop plans are largely fixed already, and the seed/propagation materials have been ordered. How much the level of use can or will be reduced depends on other factors too, such as the expected yield price of the crops the fertiliser is being applied to and the availability of alternatives, such as animal manure.

Russia is also a major supplier of oil and gas. Around 40% of the gas and 25% of oil used in the EU comes from Russia. Energy prices have been high for a long time and have risen even higher due to the war. Energy is needed in both the primary production of crops and in the processing of raw materials: for example, heating greenhouses, diesel and heavy oil for tractors and fishing boats, and for transport. The production of artificial fertilisers also requires energy, as does the processing of dairy products and the production of food, both at large and small scales.

## 1.6 Price developments for agricultural raw materials

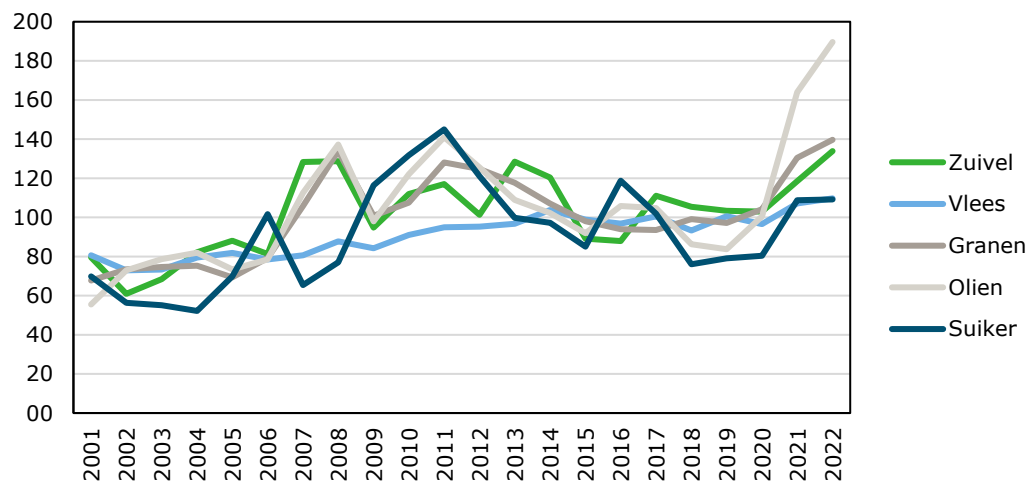
The long-term trend in the development of agricultural prices is that they are falling in real terms. This is mainly due to improvements in productivity, which reduce cost prices. This effect is greater than the price raising effect caused by increased demand for food due to population and income growth. This means the growing demand for agricultural products can be met without huge increases in prices. Figure 8 shows this long-term development for a number of products.

In the 2007-2008 period, prices on the international markets spiked for a variety of products, including grains, oilseeds, sugar and dairy products. This was caused by a combination of unprecedentedly low stocks of grains, severe supply disruptions, very high oil prices and a relatively steep change in demand for grains for biofuel production. In the 2007-2008 period, the development of prices for agricultural products kept pace with the price of oil. The higher energy prices led to increasing costs of food production and thus to rising food prices (Berkhout and van Bruchem, 2009). After a decline in prices in 2009, they peaked again in 2010-2011. Again, the explanation was to be found within a combination of substantially diminished inventories, disappointing harvests (pursuant to which export restrictions were often imposed, raising prices even further) and the growing demand for biofuels (Berkhout en Roza, 2012). At the time, while there was discussion about whether speculation had contributed to the rising prices, no substantial evidence of this could be found (Meijerink et al., 2012).



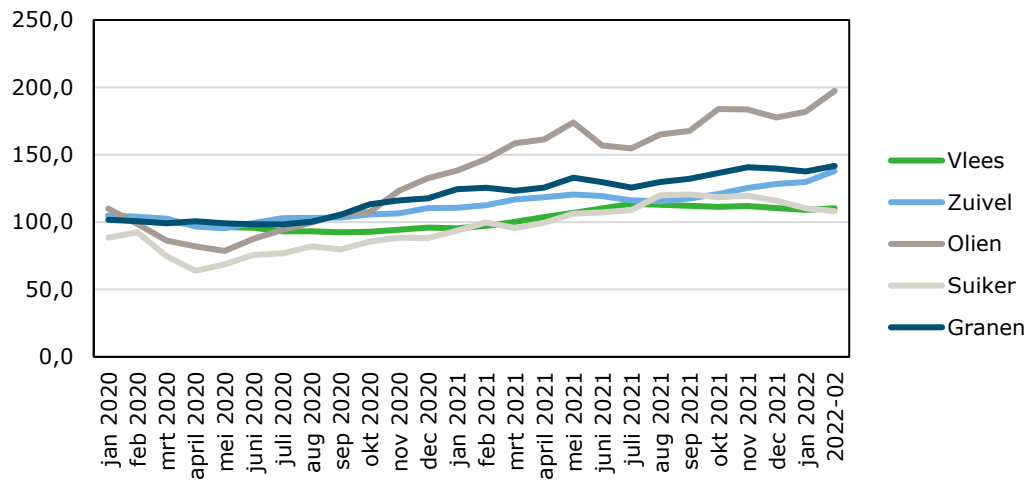
**Figure 8** Long-term development of real prices for a number of products, 1960-2019, and expected price development 2020-2030  
 Source: OECD/FAO, 2020.

Figure 9 shows the real development of some product prices since 2001. The figures are indexed (2014-2016=100).



**Figure 9** Development of the FAO price index, 2014-2016=100, for a number of products on an annual basis, real prices, 2001-2022  
 Source: FAO.

Figure 9 shows that, after the previous high peak in international market prices in 2007-2008 and 2010-2011, food prices have been rising again since the summer of 2020. The price increases are due to disruptions to trade caused by COVID-19 and product specific causes (e.g. the large-scale outbreak of African swine fever in China), among other things. The previously mentioned increased energy costs also played a part. Figure 10 shows the development of prices on a monthly basis for the period from 1 January 2020.



**Figure 10** Development of the FAO price index, 2014-2016=100, for a number of products on a monthly basis, January 2020-January 2022  
Source: FAO.

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## 2 Short-term effects on food supply/food security (<6 months)

### 2.1 General - key problem

The most obvious effect of the war is now increased prices for various goods (wheat, raw materials for animal feed, sunflower oil), energy and fertilisers. This is the consequence of:

- Logistical problems. The war in Ukraine is currently causing problems with the supply of raw materials, as transport supply chains to and from Ukraine have been disrupted or are no longer possible. Companies are therefore looking for alternative suppliers, which puts additional pressure on prices;
- Unrest and panic, which result in sharply increased yet highly volatile prices for grains and vegetable oils. Energy and fertiliser prices are also rising as a result.

For the time being - Ukraine excluded - there are no problems with the availability of food. The spike in grain prices is going to be the biggest issue for countries most dependent on imports from Ukraine (such as Egypt and Turkey, see below); these are predominantly poorer countries where a large part of the household income - as much as 40% or more - is spent on food.

The biggest key problems for the EU and the Netherlands are now:

- the availability of grains, particularly for animal feed;
- the availability of specific import flows, such as GMO free or organic;
- the availability of sunflower oil;
- the sharp increase in the cost of energy and fertilisers.

Companies will look for alternatives, which may lead to the problem that these alternatives do not meet desired product specifications (e.g. being GMO free) or EU legislation on the maximum residue limit (MRL) for crop protection agents. Agents that are not permitted in the EU also may have been used. Replacement is thus not always quick or possible.

#### *Harvest estimates and stockpiling*

There are several sources that provide insights into harvest estimates and stockpiling; two important ones are the FAO and the USDA.

According to USDA figures, current grain stocks (including rice) are similar to or higher than the previous two seasons (situation in spring 2022). For wheat, stocks are estimated to decrease by 4 million tonnes to 263.74 million tonnes in the 2021/2022 season; for feed grains, stocks are similar to previous years (286.93 million tonnes). The USDA's figures already anticipate the drop in production in Russia and Ukraine.

The mobilisation of strategic stocks is an important tool for countries to buffer spikes in commodity prices. Stock-to-use ratios reflect the relative size of strategic stockpiles: they indicate the level of stock for a given commodity as a percentage of the total use of the commodity in a given season. The FAO's latest estimate of these stock-to-use ratios is 37.1% for wheat and 22.6% for feed grains (FAO, 2022). In the study by Meijerink et al. (2011), a stock-to-use ratio of 20% is regarded as a minimum for stocks to play their roles as buffers. During the previous peak in 2007-2008, stock-to-use ratios for grain and maize were around 15-18%, so current stocks are ample.

There is always a margin of uncertainty in estimates of the expected size of strategic stockpiles: harvests may turn out better or worse than expected. Expectations are therefore adjusted regularly. Grain comes to market at different times too (difference between northern and southern hemisphere). For example, in early February, the harvest forecast for Egypt was revised from 9.2 million tonnes of wheat to 10.5 million tonnes of wheat (ahramonline, 2022).



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The current unrest in the markets, with its impact on price formation, is partly due to panic and unrest about potential shortages. In view of the above analysis of the stocks, this concern does not appear to be justified.

#### *Barriers to trade*

Several countries have announced their intention to restrict exports (Hungary: grains; Serbia: grains, vegetable oil; Indonesia: palm oil). Trade-restrictive measures can exacerbate price volatility (the same applies to import subsidies), as shown by an analysis of a number of restrictive measures in 2007-2008, a period when grain prices also rose sharply (Meijerink et al., 2011). This period was ultimately short-lived as the high prices led to additional production through acreage expansion and intensification (Banse et al., 2011). This effect could occur again.

## 2.2 EU situation

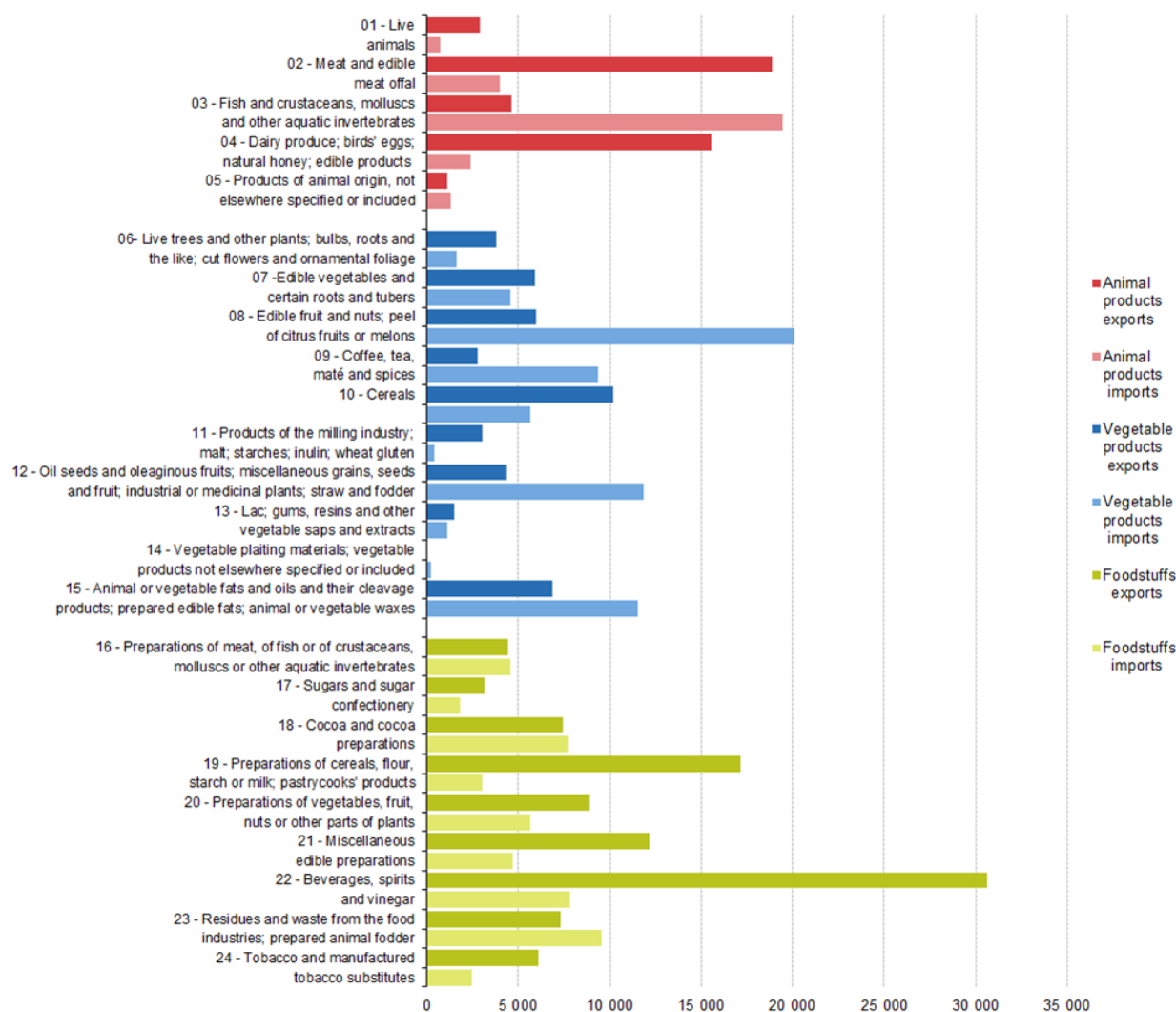
The EU is self-sufficient in most products, with the exception of tropical products (e.g. fruit, coffee and tea), oilseeds (including soya) and natural fats and oils (including palm oil). This is proven by the self-sufficiency rates published by the EU in the forecast (European Union, 2021) and the EU's trade position (Figure 11). The loss of imports from Ukraine puts pressure on certain chains, as mentioned earlier, but there are often alternatives.

This is not to say that individual companies or chains may not experience problems in obtaining sufficient raw materials. These signs are already present at the processors of raw materials for animal feed and sunflower oil. Replacing raw materials from Ukraine and/or Russia with raw materials is not always easy. Products from these countries are not always interchangeable with local raw materials. In the case of detailed products specifications, the use of alternative raw materials may require renegotiations with customers. Companies may therefore encounter uncertainties surrounding deliveries and obligations – administrative and otherwise – such as import certificates and the like.

In the short term, the combined effect of higher costs for energy, raw materials and fertilisers raises the cost of food: the loss of part of Ukraine's production reinforces this effect for raw materials. So far, these higher production costs for primary agriculture have only been reflected in the price consumers pay to a limited extent. This is also true of processing links to a greater or lesser extent. It can be expected that current cost increases will have a greater impact on consumer costs in the near future.

## EU Agricultural exports and imports by product categories, 2020

(EUR million)



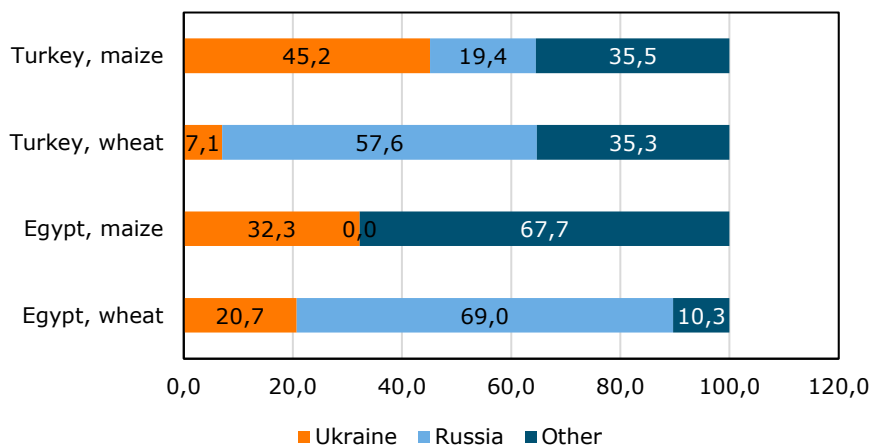
Source: Eurostat (online data code: DS-016894)

eurostat

**Figure 11** EU imports and exports (in millions of euros) by product category, 2020

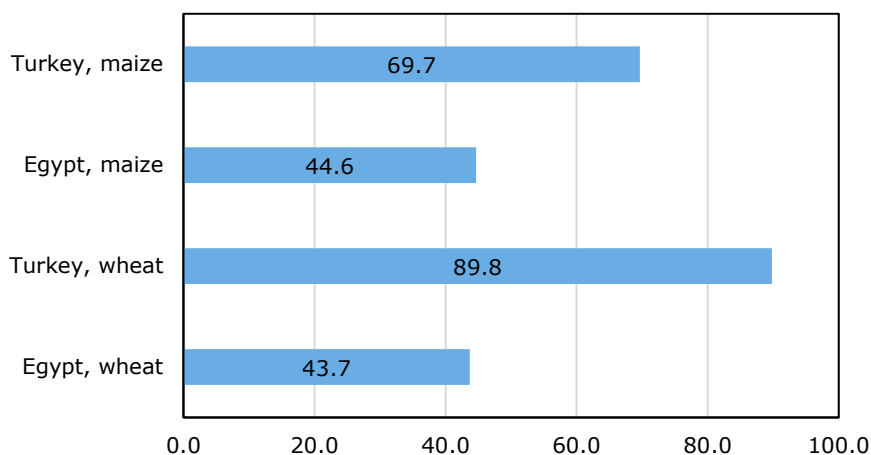
### 2.3 Situation of countries highly dependent on imports from Russia and Ukraine

The largest importers of Ukrainian grain are Egypt, Indonesia, Bangladesh, Turkey and Yemen. Russia exports its wheat mainly to Egypt and Turkey. The latter two countries are therefore heavily dependent on both Ukraine and Russia together for their wheat imports. Egypt and Turkey also rely heavily on Ukraine and Russia for maize and barley feed grains: about 30% of their maize imports come from Ukraine, while Turkey also receives about 45% of its maize imports from Russia (Figure 12).



**Figure 12** Import share of Ukraine and Russia in total imports of wheat and maize in Egypt and Turkey  
Source: UN Comtrade, numbers 2020.

Both countries, Egypt and Turkey, are thus highly dependent on imports of wheat and maize from Ukraine and Russia. An overview of the self-sufficiency rates of both countries shows that Egypt's import dependence is higher than Turkey's (Figure 13). Egypt is less than half self-sufficient, and thus relies heavily on international supplies of these two grains.



**Figure 13** Self-sufficiency levels of wheat and maize in Turkey and Egypt (% of own production in terms of consumption)

The impact that the conflict in Ukraine has on food security in countries that are major grain importers will be determined by a combination of import dependency and self-sufficiency. To clarify this, two examples follow. Pakistan imported around 2.5 million tonnes of wheat in 2020. Half was from Russia; the other half from Ukraine. The country produces enough to cover 90% of its own needs. Comparatively, Nigeria imported 6.5 million tonnes of wheat whilst producing almost none. It did not import wheat from Ukraine, but from Russia (1.1 million tonnes in 2020). Due to its high dependence on imports, the growing consumption of wheat in Nigeria seems to be significantly affected by the disturbances in the international market caused by the conflict in Ukraine. The ultimate effects on food security in countries – such as Pakistan, Nigeria and other countries that are heavily dependent on grain imports – depend on their ability to purchase grains on the international market and at what prices. In the short term, the alternatives to falling exports from Ukraine and Russia seem limited. For example, according to the FAO, wheat and maize harvests in Canada and the US have been disappointing, Argentina is applying export restrictions to combat domestic inflation, and Australia can no longer deliver owing to logistical bottlenecks (FAO, 2022a).

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### 3 Medium to long-term effects on food supply

For the medium (6 months-2 years) to long term (>2 years), there is a great deal of uncertainty about the impact of the war on food security. This involves both the direct consequences of the war and the consequences of sanctions being and yet to be imposed on Russia.

There are five determining and uncertain factors:

- production (decline) in Ukraine and possibly Russia too
- the length of the conflict
- the availability of fertilisers
- the availability of energy
- trade barriers (through protectionism of individual countries or sanctions).

In order to get a better idea of the possible consequences of these uncertainties for production and, consequently, food security, different scenarios will be calculated with different assumptions for these five factors. With regard to food security, both the impact on availability and access to food are calculated. Access to food is heavily dependent on development in purchasing power (development of food prices in relation to income development).

The scenarios start with an exploration of the effects of different assumptions on a macro/global level (e.g. development of Gross Domestic Product, sectoral production, international trade, consumption, world food prices). Subsequently, the results of these macro calculations at an international level are used to explore the consequences at EU and Dutch level, including the impact on (food) chains in the Netherlands.

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# Sources and literature

- Ahram Online, 2022. [Bumper wheat harvest - Egypt - Al-Ahram Weekly - Ahram Online](#)
- Banse, Martin, Peter Nowicki and Hans van Meijl, 2008. Why are current world food prices so high? Report 2008-040, LEI Wageningen UR
- Berkhout, P. en C. van Bruchem (red.), 2009. Landbouw-Economisch Bericht 2009. Rapport 2009-047, LEI, Wageningen UR
- Berkhout, P. en P. Roza (red.), 2012. Landbouw-Economisch Bericht 2012. LEI-rapport 2012, LEI, Wageningen UR
- Bindraban, P.S., C.P.J. Burger, P.M.F. Quist-Wessel en C.R. Werger, 2008. Resilience of the European food system to calamities. Report for the Steering Committee Technology Assessment of the Ministry of Agriculture, Nature and Food Quality, The Netherlands. Wageningen UR, Plant Research International, Report 211
- Businessinsider, 2022. Natural Gas PRICE Today | Natural Gas Spot Price Chart | Live Price of Natural Gas per Ounce | Markets Insider <https://markets.businessinsider.com/commodities/natural-gas-price>
- Cockx, L., N. Francken en H. Pieters, 2015. Food and nutrition security in the European Union: Overview and case studies. FOODSECURE Working paper 31
- European Union, 2021, EU Agricultural Outlook for markets, income and environment. [agricultural-outlook-2021-report\\_en.pdf \(europa.eu\)](#)
- FAO, 2000. *The State of Food Insecurity in the World 2000*. FAO, Rome
- FAO, 2022. [Cereal Supply and Demand Brief | World Food Situation | Food and Agriculture Organization of the United Nations](#);
- FAO, 2022a. The importance of Ukraine and the Russian Federation for global agricultural markets and the risks associated with the current conflict. Information note. March 8. <https://www.fao.org/3/cb9013en/cb9013en.pdf>
- IFPRI, 2022. [How will Russia's invasion of Ukraine affect global food security? | IFPRI: International Food Policy Research Institute](#)
- Jospeh Schmidhuber (2022). [PowerPoint Presentation \(fao.org\)](#)
- Meijerink, G., S. van Berkum, K. Shutes en G. Solano, 2011. Price and prejudice: why are food prices so high?. LEI report 2011-035, LEI Wageningen UR
- OECD/FAO, 2020. OECD/FAO Agricultural Outlook 202-2029. [1112c23b-en.pdf \(oecd-ilibrary.org\)](#)  
[wasde0322.pdf \(usda.gov\)](#)
- Weijden, W.J. van der, C.P.J. Burger, D.M. Jansen, C. Rougoor en E. Hees, 2011. De kwetsbaarheid van het Europese landbouw- en voedselsysteem voor calamiteiten en geopolitiek (2011-2020). Platform Landbouw, Innovatie en Samenleving.

# Appendix 1

**Table B1** Production of all grains (including rice), 2017-2020, in tonnes

	2017	2018	2019	2020
EU	286.460.386	270.945.470	296.040.100	282.610.530
Russian Federation	131.300.767	109.848.095	117.889.170	130.037.708
Ukraine	60.696.191	69.118.012	74.449.698	64.342.357
Belarus	7.529.412	5.813.781	6.991.979	8.403.688
Rest of the world	2.478.719.249	2.454.185.011	2.471.971.009	2.510.748.006
<b>Total</b>	<b>2.964.706.005</b>	<b>2.909.910.369</b>	<b>2.967.341.956</b>	<b>2.996.142.289</b>

**Table B2** Flour, 2017-2020, in tonnes

	2017	2018	2019	2020
EU	136.814.326	123.757.660	138.628.910	125.791.420
Russian Federation	86.002.542	72.136.149	74.452.692	85.896.326
Ukraine	26.208.980	24.652.840	28.370.280	24.912.350
Belarus	2.620.230	1.814.765	2.308.660	2.848.391
Rest of the world	520.644.530	509.778.170	521.220.279	521.477.344
<b>Total</b>	<b>772.290.608</b>	<b>732.139.584</b>	<b>764.980.821</b>	<b>760.925.831</b>

**Table B3** Maize production, 2017-2020, in tonnes

	2017	2018	2019	2020
EU	63.587.342	66.857.530	67.800.980	65.413.450
Russian Federation	13.208.095	11.419.020	14.282.352	13.879.210
Ukraine	24.668.750	35.801.050	35.880.050	30.290.340
Belarus	694.238	1.137.845	1.095.331	1.075.833
Rest of the world	1.036.565.655	1.009.045.811	1.022.301.155	1.051.694.164
<b>Total</b>	<b>1.138.724.080</b>	<b>1.124.261.256</b>	<b>1.141.359.868</b>	<b>1.162.352.997</b>

**Table B4** Sunflower oil production, in tonnes, 2015-2020

	2015	2016	2017	2018	2019	2020
Russian Federation	9.280.296	11.015.109	10.480.958	12.755.725	15.379.287	13.314.418
Ukraine	11.181.120	13.626.890	12.235.520	14.165.170	15.254.120	13.110.430
Argentina	3.158.290	3.000.367	3.546.707	3.537.545	3.825.750	3.232.649
China	2.698.113	2.610.000	3.149.400	2.494.200	2.420.000	2.375.000
Romania	1.785.771	2.032.340	2.912.743	3.062.690	3.569.150	2.198.670
Turkey	1.680.700	1.670.716	1.964.385	1.949.229	2.100.000	2.067.004
Bulgaria	1.699.228	1.873.677	2.056.987	1.943.980	1.937.210	1.733.530
Hungary	1.556.976	1.875.412	2.022.332	1.830.280	1.706.850	1.697.960
France	1.186.913	1.172.411	1.598.972	1.239.080	1.298.140	1.607.080
United States of America	1.326.180	1.202.760	969.670	955.740	887.240	1.352.800
<b>Global total</b>	<b>42.300.016</b>	<b>47.476.776</b>	<b>48.609.350</b>	<b>51,913,748</b>	<b>56.020.665</b>	<b>50.229.567</b>



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