No. 205 (March 31, 2022)

KREI Agri-policy Focus

Impacts of Ukraine-Russia Conflict on Global Grain Prices

Kim Jong-Jin, Kim Ji-Yeon, Chung Dae-Hee,
Park Seong-Jin, Kim Bheom-Seok, Yun Sung-Ju

Summary

Global grain prices, which rose after the second half of 2020, expedited the speed amid the protracted war in Ukraine, mainly triggered by price surges in wheat, maize, and barley, which are the Black Sea region's major exports.

- The Chicago Board of Trade (CBOT) futures prices of wheat, maize, and soybeans in March 2022 rose by 137.7%, 102.1%, and 72.0% compared with the average March prices. Concerns about grain export decrease in the Black Sea region due to the war and major grain exporters' restriction on outbound shipments caused the rise.

Ukraine and Russia are one of the largest producers and exporters of maize, wheat, and sunflower oil.

- Ukraine's shares in the international grain trade amount to 14% for maize, 9% for wheat, 10% for barley, and 43% for sunflower oil. Russia takes a 20% share for wheat, 14% for barley, and 20% for sunflower oil. The grains from the Black Sea region are mostly shipped to Europe, the Middle East, Southeast Asia, and China.

Russia's war on Ukraine will likely raise wheat and maize prices by 10-20% in 2022/23. If the conflict continues longer than expected, price hikes will keep up.

- The region's wheat and maize exports will likely decrease by 7 million tons and 6 million tons in 2021/22. Meanwhile, Ukraine's spring crop output and cultivation areas for summer crops will shrink by 30% each.

South Korea highly depends on maize for processing (including non-GMO maize) and feed wheat exported from the Black Sea region. Although the nation can find replacements in other countries, upward pressures on domestic prices will be unavoidable.

- Korea relies on imported grains for assorted feed and food manufacturing. As a result, international supply bottlenecks and following price volatilities affect production activities in domestic industries such as feed and food processing, livestock production, and restaurants.
- Russia's invasion of Ukraine drove up consumer prices of processed foods by 3.4-6.8%, dine-out services by 0.6-1.2%, and producer prices of animal feed by 5.3-10.6%.

In the short term, the government must develop replacement sources and extend financial and tax aid to minimize impacts on domestic prices. In the long term, it should expand domestic output bases, including grain stockpiling, and help domestic grain distributors enter the international distribution market to set up the nation's procurement platform.

- As grain prices surged amid the conflict in the Black Sea region after their rise in the second half of 2020, the government activated a response system led by the grain policy committee to tackle challenges from international price surges.

01

Global grain markets

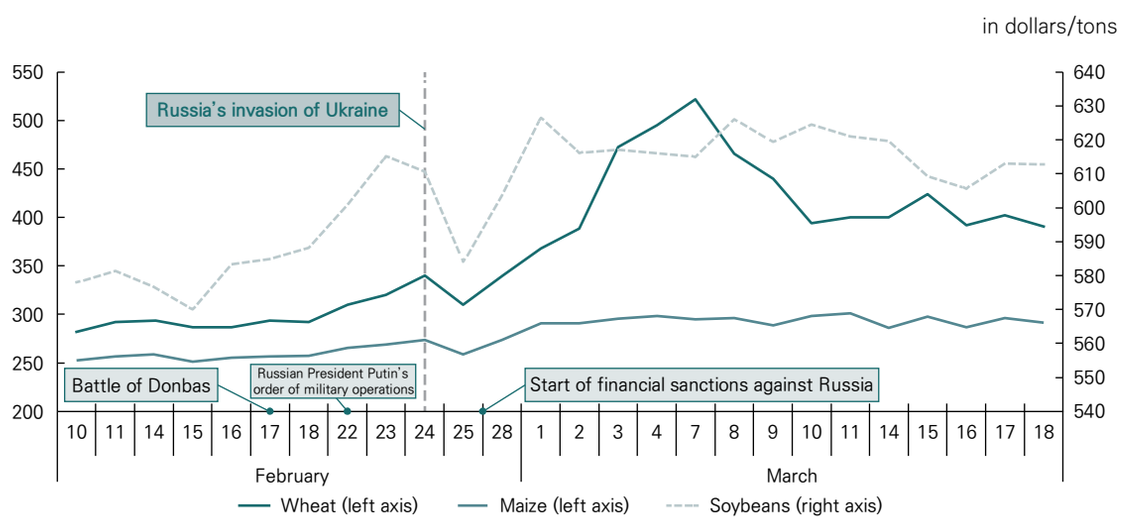
1.1. Price trends

Grain prices have increased since the second half of 2020, and started to surge along with the protracted war in Ukraine, the breadbasket for wheat, maize, and barley.

Grain prices surged shortly after Russia's war on Ukraine. Their surge continued amid concerns about the protracted war and financial sanctions against Russia by the U.S., the EU, and Japan.

- After Russia's invasion in February, global grain prices spiked, and the price hikes continued until March as advanced nations, including the U.S., Japan, and the EU, imposed financial sanctions and removed Russia from the Society for Worldwide Interbank Financial Telecommunication (SWIFT) system amid the prolonged war.
- Grain prices turned to rise in the second half of 2020 due to supply shortages worldwide amid the pandemic and climate changes in global breadbasket areas. The war in Ukraine triggered price hikes, which were already on the rise amid global supply bottlenecks.

〈Figure 1〉 Chicago Board of Trade (CBOT) futures price chart

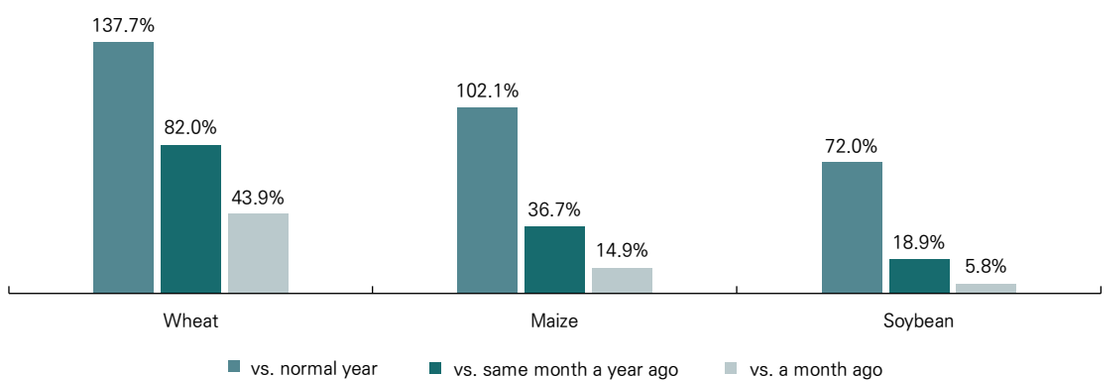


Source: CBOT. "Futures prices." (http://www.krei.re.kr:18181/new_sub01, access date: March 21, 2022).

In March, wheat prices rose 82.0% on year and 43.9% on month, hitting a record high. Maize prices were up 36.7% on year and 14.9% on month, while soybean prices hiked 18.9% on year and 5.8% on month.

- The wheat futures price in March rose 137.7% compared with the average in March, while maize and soybean futures were up 102.1% and 72.0%.[1] Compared with March 2021, their futures rose by 82.0%, 36.7%, and 18.9%, respectively. Compared with a month ago, they increased 43.9%, 14.9%, and 5.8%, respectively.
- With the surges, wheat futures broke the previous record, while maize and soybean futures rose near their highest in 2008.

〈Figure 2〉 Changes in futures prices in March 2022



Note: Prices in March 2022 are the averages as of March 18. The average-year figures are computed based on the five years from 2017 to 2021, except the maximum and minimum.
Source: CBOT. "Futures prices." (http://www.krei.re.kr:18181/new_sub01, access date: March 21, 2022).

Apart from export decreases in the breadbasket in the Black Sea region, major grain exporters' outbound shipment restrictions contributed to hikes in world grain prices.

- As Ukraine added wheat to its export restriction list, permissions were required for outbound shipments of wheat, maize, and sunflower oil.[2]
- Russia, temporarily for domestic price stabilization, prohibited exporting wheat, barley, and maize to the European Economic Union (EEU)[3] from March 15 to June 30.
- Argentina announced on March 13 that it would suspend export sales registration of soybean oil, soybean meal, and other related products until instructed otherwise. Other countries, such as Egypt (wheat and wheat processed foods), Hungary (all grains), and Bulgaria (wheat), followed suit.

1) Wheat, maize, and soybeans, all used for animal feeds, are substitutable for one another, showing similar price changes in global markets.
2) After its export sanctions on March 5, Ukraine added barley, rye, sorghum, sugar, salt, and meat for sanctions until the end of 2022.
3) As its member nations (former Soviet states, such as Kazakhstan, Belarus, Armenia, and Kyrgyzstan) were exempt from tariffs, they were not influenced by export quotas.

1.2. Cases of the Black Sea region's impact on global grain prices

Ukraine and Russia are major producers and exporters of wheat, maize, and barley. Their changes in export policy or regional conflicts have triggered price hikes worldwide.

Ukraine is a key exporter of wheat, maize, and barley and a geopolitical bridge linking Europe with Russia and the Baltic and Black Seas.

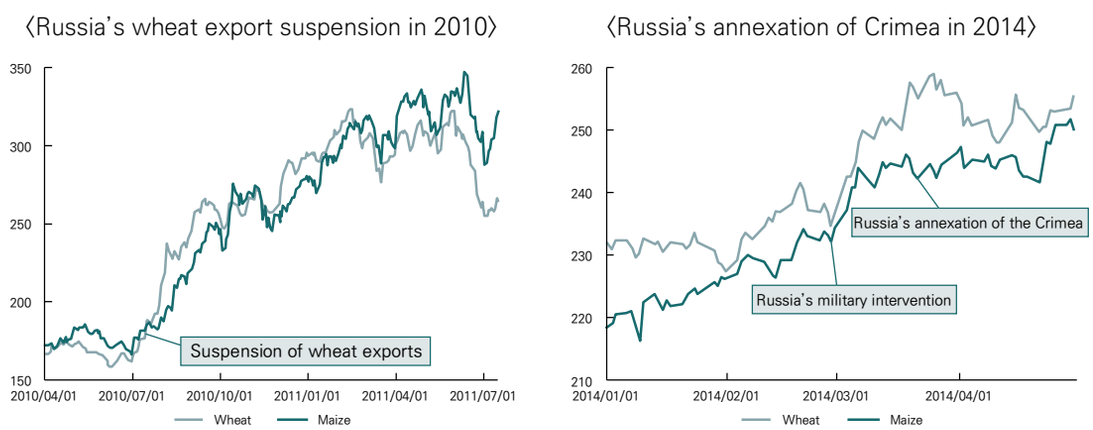
- Ukraine is dubbed the breadbasket of Europe, as it produces grains on its fertile soil and exports a large volume of them. Russia became a net exporter of wheat in the early 2000s with a surge in wheat's outbound shipments.

Since the 2000s, Russia and Ukraine have been major producers and exporters of grains. Changes in their export policy or setbacks in outbound shipments caused price volatility in global grain markets.

- Russia's grain production plummeted due to the worst-ever drought in the summer of 2010. It suspended wheat exports to stabilize domestic food prices, triggering over 50% hikes in international wheat and maize prices.
- In 2014 when Russia annexed Crimea, wheat and maize prices rose more than 10% internationally.

The cases mentioned above show the two nations' impacts on the world grain market, indicating that additional price hikes may happen depending on the situation, and that the rising trend may continue for a considerable period.

〈Figure 3〉 Snapshot on the impacts of Ukraine and Russia on grain markets



Note: Each item's price is the Grains and Oilseeds Index of the International Grains Council, with the January 2000 level as 100.
Source: IGC. "GOI." (https://www.igc.int/en/markets/marketinfo-goi.aspx, access date: March 16, 2022).

02

Grain exports of Ukraine and Russia

2.1. Ukraine's grain exports

Ukraine is a key exporter of maize and wheat, and the largest exporter of sunflower oil.

Maize is Ukraine's No.1 export grain, with 24.9 million tons shipped out yearly (around 14% of the world's export volume). Wheat follows maize and sunflower oil with outbound shipments of 16.1 million tons and 6.0 million tons (9% and 43% of the total).

- Although Ukraine's maize export was small, its production has swollen 10 times over the past two decades, with cultivation areas quadrupled and yields up 2.5 times. As the nation's production has grown much bigger than domestic consumption, it exported 24.9 million tons annually or 73% of the entire production for the latest three years (2018-2020, FAO data), resulting in a share of 14% in the global market.
- Ukraine is the fifth-largest wheat exporter, shipping out 16.1 million tons per year for the recent three years. Its production has doubled in two decades with a surge in exports. The nation is also the largest producer and exporter of sunflower oil, taking 43% (6.0 million tons) of the world market.

〈Table 1〉 Ukraine's grain and oilseed exports

in 10,000 tons

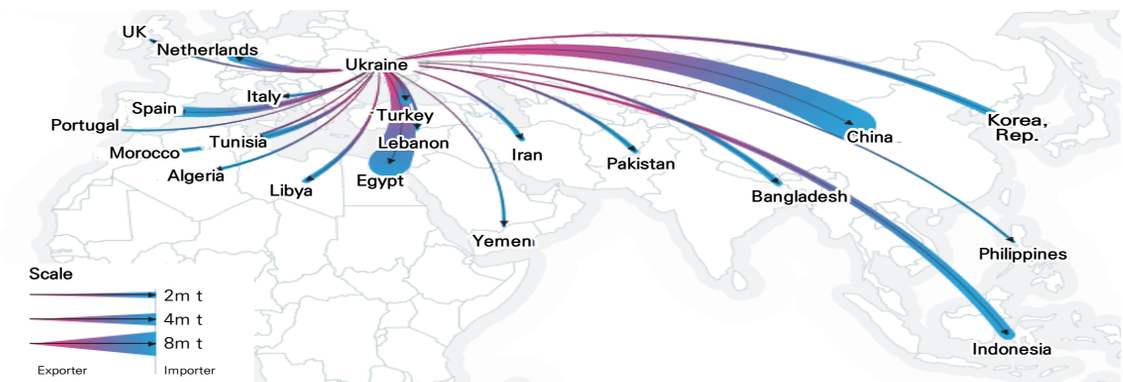
Category	2000	2005	2010	2015	2018	2019	2020	Recent 3-year average		
								Bound for world		Bound for Korea
								Volume	Share	
Maize	16	280	289	1,905	2,144	2,536	2,795	2,492	13.6%	59
Wheat	20	601	430	1,345	1,637	1,390	1,806	1,611	8.5%	62
Sunflower oil	58	85	213	394	559	548	686	597	42.6%	1
Barley	86	350	459	463	360	239	505	368	10.4%	0
Canola	7	18	118	143	244	304	238	262	11.4%	0
Soybeans	1	17	20	220	224	296	179	233	1.5%	0

Note: The share refers to the proportion of Ukraine's exports in the world export volume from 2018 to 2020.
Source: FAO STAT (https://www.fao.org/faostat/en/#home, access date: March 16, 2022).

Major importers of Ukrainian grains include China, the EU, the Middle East, and Southeast Asia. South Korea has imported more than 1 million tons of grains from Ukraine.

- The largest importers of Ukraine maize include China (20%), the Netherlands (14%), Spain (13%), Egypt (8%), and Turkey (6%), while its wheat is bound for Indonesia (17%), Egypt (13%), the Philippines (8%), Morocco (7%), and Tunisia (6%).
- Korea imports 620,000 tons of wheat, 590,000 tons of maize, and 10,000 tons of sunflower oil annually.

〈Figure 4〉 Major importers of Ukrainian grains



Note: Ukraine's grain exports as of 2020, with oilseeds excluded.
Source: Chatham House. "ResourceTrade.Earth." (https://resourcetrade.earth/, access date: March 16, 2022.).

2.2. Russia's grain exports

Russia is the world's No.1 exporter of wheat and takes a large volume of the global market for barley and sunflower oil.

Russia is the largest wheat exporter, with a market share of 20%, shipping out 37.7 million tons yearly. Barley (4.8 million tons, 14%), maize (3.4 million tons, 2%), and sunflower oil (2.8 million tons, 20%) are also major cereals and vegetable oil shipped out to the world.

- Although the nation did not export wheat until the early 2000s, its production doubled over the next two decades. It pushed aside the U.S. in 2015, ranking No.1 in export volume. It has kept its top position, shipping 37.7 million tons annually for the past three years (2018-2020, FAO data).
- Maize production has surged since the mid-2000s, resulting in an export of 3.4 million tons per year for the last three years with a market share of 2%. The nation's outbound shipments of barley amount to 4.8 million tons per year taking a market share of 14% during the same period. Russia is the second-largest producer and exporter of sunflower oil after Ukraine. It exports 2.8 million tons, taking 20% of the world market.

〈Table 2〉 Russia's grain and oilseed exports

in 10,000 tons

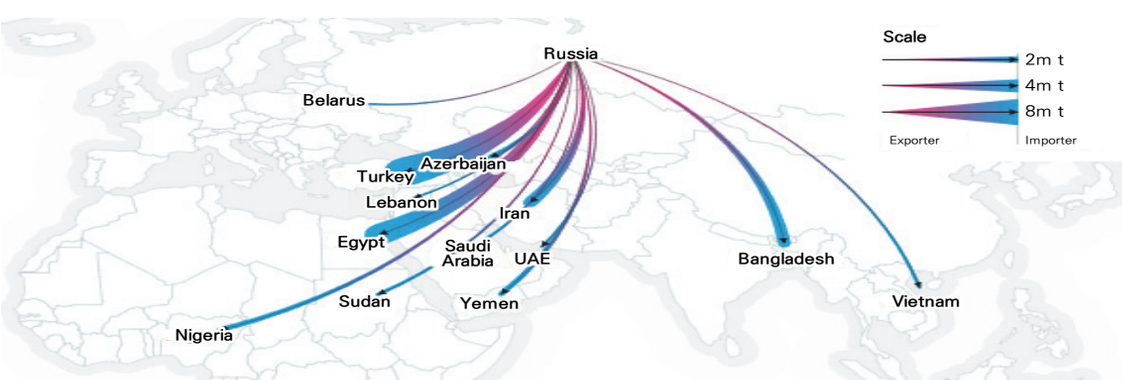
Category	2000	2005	2010	2015	2018	2019	2020	Recent 3-year average		
								Bound for world		Bound for Korea
								Volume	Share	
Wheat	42	1,032	1,185	2,123	4,397	3,187	3,727	3,770	19.9%	11
Barley	54	177	154	529	544	394	496	478	13.6%	0
Maize	0	7	23	370	478	312	229	340	1.9%	34
Sunflower oil	19	31	40	144	210	310	321	280	20.0%	0
Soybeans	5	1	0	38	96	89	120	102	0.6%	1
Canola	6	6	6	5	49	44	65	53	2.3%	-

Note: The share refers to the proportion of Russia's exports in the world export volume from 2018 to 2020.
Source: FAO STAT (https://www.fao.org/faostat/en/#home, access date: March 16, 2022.).

Major importers of Russian cereals include the Middle East, such as Egypt and Turkey, Africa, and Southeast Asia. Korea also imports more than 400,000 tons annually from Russia.

- Egypt and Turkey are the largest importers of Russian wheat, occupying shares of 21% (8.0 million tons) and 18% (6.6 million tons), respectively. Bangladesh and Azerbaijan follow, with 6% (2.1 million tons) and 3% (1.1 million tons).
- Iran and Turkey are the largest importers of Russian maize, with a share of 31% (1.0 million tons) and 24% (0.8 million tons). However, Russia's share in the maize market is merely 2%, resulting in a limited impact on the world market. Russia's barley is mainly bound for Turkey (18%), China (17%), Iran (11%), Egypt (10%), and Indonesia (9%).
- Korea imports 110,000 tons of wheat, 340,000 tons of maize, and 10,000 tons of soybeans from Russia.

〈Figure 5〉 Major importers of Russian grains



Note: Russia's grain exports as of 2020, with oilseeds excluded.
Source: Chatham House. "ResourceTrade.Earth." (https://resourcetrade.earth/, access date: March 16, 2022.).

03

Analysis of impacts on global grain markets

3.1. International grain supply and demand

The global grain supply shortage has worsened since the 2010s due to production decreases from unfavorable weather and China's import increase.

The supply of wheat, maize, and soybeans has improved since the late 2000s, which experienced price surges and fluctuations. However, their supply shortage has aggravated in the latest years.

- The production, consumption, and ending stocks of major grains, such as wheat, maize, and soybeans, are expected to rise 43.4%, 43.4%, and 118.1%, compared with the two years from 2007 to 2008, when prices surged due to agflation.
- However, ending stocks of wheat, maize, and soybeans are estimated to drop by 0.8%, 6.7%, and 11.6% compared with the averages of the recent five years from 2016 to 2021. Wheat and soybeans are forecast to decrease by 3.0% and 11.6% from a year ago.
- The supplies of wheat, maize, and soybeans have smoothed compared with the 2007-2008 period. However, their supplies have worsened, increasing grain prices in the second half of 2020.

〈Table 3〉 World supplies and demands of major grains (wheat, maize, and soybeans)

in million tons

Category	World supply & demand				Change (%)		
	2007/08 (A)	5-yr avg. (B)	2020/21 (estimates) (C)	2021/22 (estimates) (D)	(D-A)/A	(D-B)/B	(D-C)/C
Production	1,630	2,226	2,266	2,338	43.5%	5.1%	3.2%
Export	294	515	549	562	91.0%	9.1%	2.3%
Consumption	1,625	2,204	2,279	2,331	43.4%	5.8%	2.3%

Category		World supply & demand				Change (%)		
		2007/08 (A)	5-yr avg. (B)	2020/21 (estimates) (C)	2021/22 (estimates) (D)	(D-A)/A	(D-B)/B	(D-C)/C
Ending stocks	Wheat	128 (20.9)	284 (38.1)	290 (37.5)	282 (35.8)	119.2%	-0.8%	-3.0%
	Maize	126 (16.1)	323 (29.1)	291 (25.5)	301 (25.5)	139.8%	-6.7%	3.3%
	Soybeans	54 (23.7)	102 (29.4)	102 (28.1)	90 (24.7)	65.5%	-11.6%	-11.6%
	Total	308 (19.0)	708 (32.1)	683 (30.0)	672 (28.8)	118.1%	-5.1%	-1.6%

Note: The world's grain consumption, export, and consumption are calculated by simply adding wheat, maize, and soybean amounts, with their stocks-to-use ratio (= stocks/consumption × 100) in parentheses. The 5-year averages refer to averages of 2016-2021. Rice is part of major grains. However, it is rarely used as animal feed, and not a substitute for wheat or maize. As its prices do not move along with wheat or maize, it is excluded from our analysis.
Source: USDA. "PSD Online." (https://apps.fas.usda.gov/psdonline, access date: March 16, 2022.).

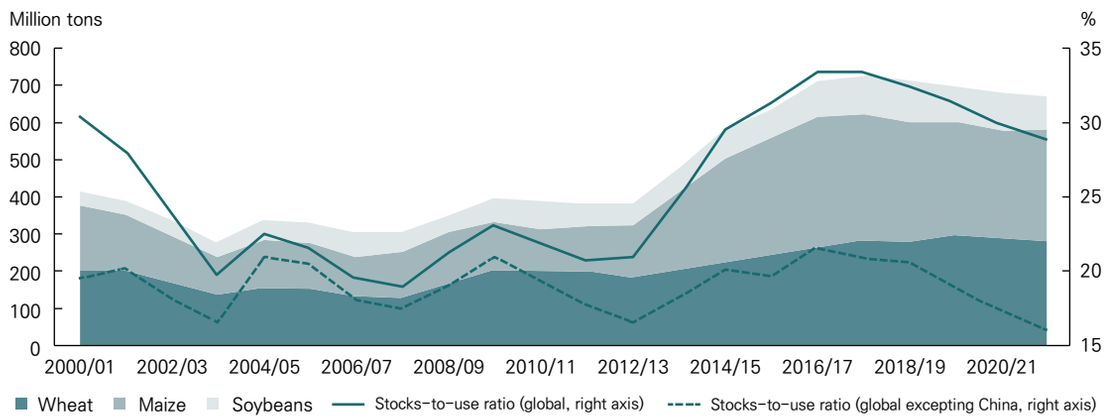
Increased maize stocks led to a surge in grain stocks from 2012/13 to 2017/18. However, the stocks went down for the following three years, and the downward trend will likely continue in 2021/2022.

- Ending stocks of wheat, maize, and soybeans from 2012/13 to 2017/18 grew 57.3%, 135.7%, and 73.2%. Accordingly, their stocks-to-use ratios in 2017/18 rose to 38.5%, 31.2%, and 29.7%, respectively.
- The stocks-to-use ratio of the three grains in 2017/18 stood at 33.4 percent and has continued to decrease. The percentage will likely go down to 28.8% in 2021/22.

Major grain exporters' stocks are not enough to meet the global demand due to the recent years' stocks decreases and the world's dependence on China's grain stocks in the 2010s.

- Although the world's grain stocks-to-use ratio will likely be around 30%, China takes 56.2% of the total as of 2020/21. Thus, despite the high ratio, the world's stocks to meet the demand are insufficient, possibly causing price fluctuations worldwide.

〈Figure 6〉 Global ending stocks of wheat, maize, and soybeans



Note: Stocks-to-use ratios refer to the percentages of ending stocks vs. total amount of consumption.
Source: USDA. "PSD Online."(https://apps.fas.usda.gov/psdonline, access date: March 16, 2022.).

3.2. Impact and outlook

The Black Sea region's wheat and maize exports in 2021/22 are forecast to decrease by 7 million tons and 6 million tons, respectively, amid the Ukraine war. Also, Ukraine's crop production this spring and acreage of summer crops will likely contract by 30%, respectively.

The wheat exports of Ukraine and Russia in March are predicted to decrease from a month ago, while Ukraine's maize export will likely go down during the same period.

- According to the outlook report on wheat and maize,[4] which the U.S. Department of Agriculture issued after the outbreak of the war on March 11, the prospects of wheat exports by Ukraine and Russia contracted by 3 million tons (8.6%) and 4 million tons (16.7%) from a month ago. Meanwhile, the forecast of Ukraine's maize export was down by 6 million tons (17.9%).
- The reduction in grain exports came from damage to the grain stored in Ukraine due to military actions and the blockage of transmission routes caused by destroyed infrastructures, such as railways, roads, and elevators. In addition, the world's financial sanctions against Russia restricted access to banking services for international transactions. The closure of ports for exporting Ukrainian grains is the most significant contributor to reducing exports.

4) Sowell and Swearingen (2022), and McConnell et al. (2022).

〈Table 4〉 Supply and demand estimates for wheat and maize in 2021/22

in million tons

Category		Wheat				Maize			
		Prod.	Consump.	Export	Stocks	Prod.	Consump.	Export	Stocks
World	Feb.	776.4	788.1	206.7	278.2	1,205.4	1,195.2	203.7	302.2
	Mar.	778.5 (0.3)	787.3 (−0.1)	203.1 (−1.7)	281.5 (1.2)	1,206.1 (0.1)	1,196.6 (0.1)	199.9 (−1.9)	301.0 (−0.4)
Russia	Feb.	75.5	41.8	35.0	10.6	15.0	10.9	4.5	0.4
	Mar.	75.2 (−0.4)	41.8 (0.0)	32.0 (−8.6)	13.1 (23.6)	15.2 (1.3)	10.9 (0.0)	4.5 (0.0)	0.6 (50.0)
Ukraine	Feb.	33.0	8.6	24.0	2.0	42.0	7.9	33.5	1.5
	Mar.	33.0 (0.0)	9.6 (11.6)	20.0 (−16.7)	5.0 (150.0)	41.9 (−0.2)	10.9 (38.0)	27.5 (−17.9)	4.4 (193.3)

Note: Figures in parentheses are change rates (%) between February and March.
Source: USDA. "March 2022 WASDE Report." (https://www.usda.gov/oce/commodity/wasde, access date: March 16, 2022.).

Although exports through the Black Sea are almost impossible, the routes through the Caspian Sea are open for exports. The export reduction in the region can be compensated through export increases from the U.S., Australia, and India.

- Grains produced in Ukraine and Russia are shipped through the Black Sea. Although the two countries will face setbacks in exports, they can use railroads as alternative logistics routes.
- Russia can ship its wheat, maize, and barley to Iran and Turkey through the Caspian Sea. Although Russia will likely increase its exports by railroad to Belarus and Kazakhstan, which are excluded from the wheat export quota as they are members of the Eurasian Economic Union (EEU). However, the world's financial embargo will set back its exports.
- Although the Black Sea region's exports will likely contract, shortages can be substituted by exports from the U.S., Australia, and India.[5)]

5) However, as major exporters of wheat and maize in other regions do not have sufficient stocks, price hikes seem to be inevitable.

〈Figure 7〉 Ports for two nations' grain exports

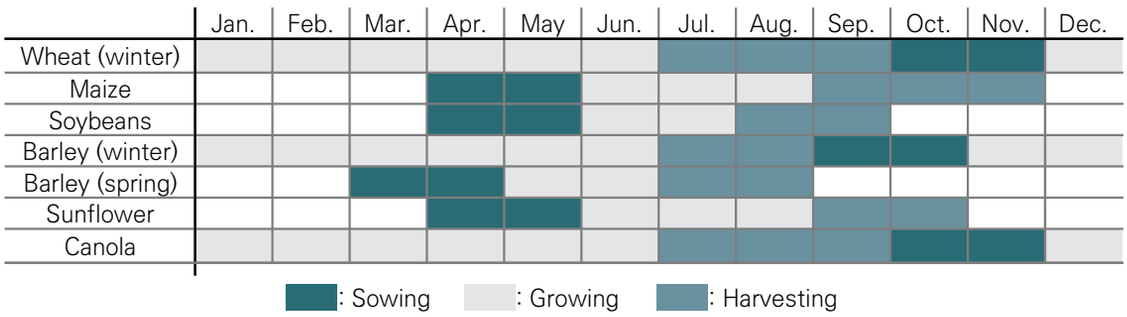
Source: McConnell et al. (2022: 3).

20% of Ukraine's winter crops in 2022/2023 are forecast not to be harvested. Its yields per unit area will also drop by 10% due to insufficient fertilizer application during the growing period.

- The dormancy of the two nations' winter crops (wheat and canola) ends in early April, and the harvest starts in late June. Ukraine starts fertilizing in late March when its dry ground can hold up the weight of farming machines. Fertilizer application follows 2-3 weeks later, and spring sowing begins in April.
- Although the two nations' winter crop situations are optimistic, production will go down due to various setbacks in crop management, fertilization, transportation, and public services for production and distribution.
- The Food and Agriculture Organization (FAO)[6] anticipates Ukraine will see its winter crop yields down 20% as its grain-producing areas have become battlefields, restricting farmers' access to the fields. In addition, delayed or no fertilizer application will reduce grain yields by 10% due to insufficient pest controls, postponed harvests, labor shortage, and inadequate storage sites.
- Farmers start sowing for spring crops, including maize, in April. FAO predicts Ukraine's cultivation areas for maize and sunflower will contract by 30%, with their yields down by 20%. The main reasons for the reduction include fertilizer price hikes and limited access,[7] destroyed oil-processing facilities,[8] and a cultivation shift to potatoes for food security.

6) FAO (2022).
7) Maize needs more fertilizers than other crops, such as wheat and soybeans.
8) Ukraine exports canola, soybeans, and sunflowers after processing them into oil and meal.

〈Figure 8〉 Ukraine's cultivation timeline



Source: Data prepared by the authors.

3.3. Outlook on price impacts

The FAO analysis of scenarios based on the developments in the Ukraine war shows wheat and maize prices in 2022/2023 will go up by 10–20%. If the situation continues, the upward trend will continue for a considerable period.

FAO[9] predicts that the wheat price in 2022/23 will go up by 8.7–21.5%, with the maize price up by 8.2–19.5% due to export reduction in the Black Sea region and crude price rises.

- Rising prices in crude oil and grains will likely increase the demand for farming materials in 2022/23, with fertilizers up 13% compared with the pre-war price levels. As a result, cultivation costs are forecast to rise in 2022/23.
- In a weak-impact scenario, the global trade volumes of wheat and maize will drop by 8 million tons and 7 million tons, while they will plummet by 16 million tons and 12 million tons in a strong-impact scenario.
- The wheat price is likely to increase by 8.7% in a weak-impact scenario and 21.5% in a strong-impact scenario. The maize price is forecast to grow by 8.2% and 19.5%; barley and other grains by 7.0%[10] and 19.9%; and oilseeds by 10.5% and 17.9%, respectively.
- The price hikes will transfer to animal feed and processed grain prices, triggering global inflation in livestock products and foods.

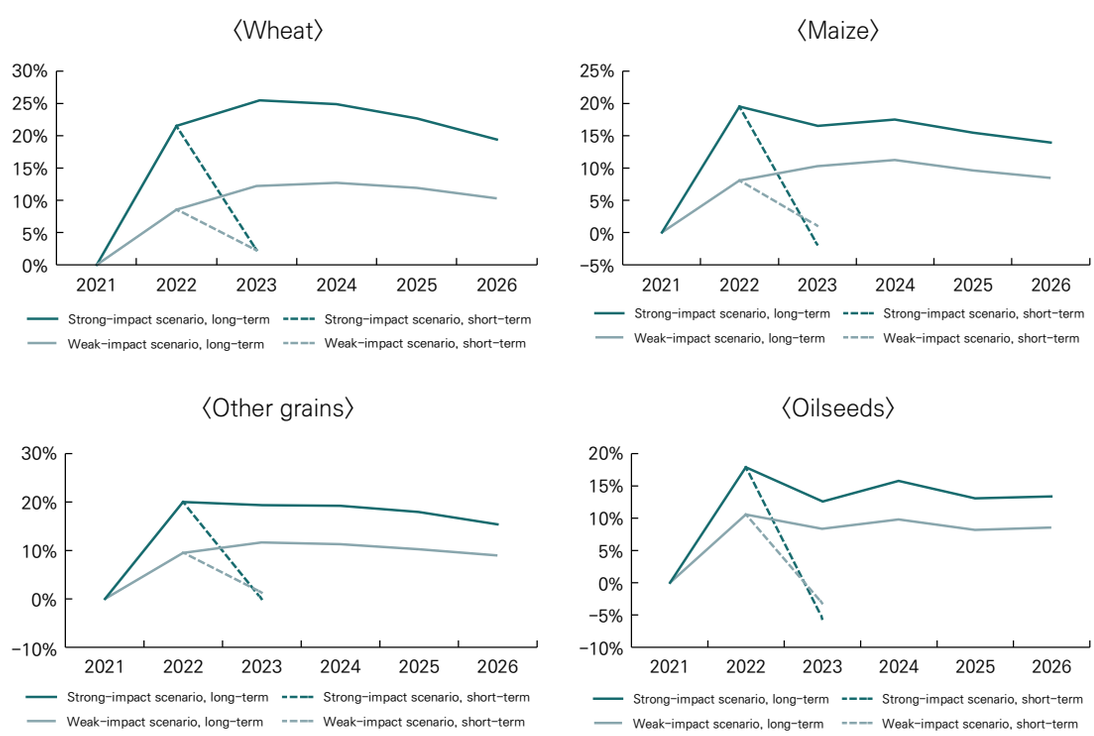
9) FAO (2022) used the Aglink-Cosimo model to examine the possible impacts of grain export declines in the Black Sea region. The basic assumption for the analysis was the normal-year outputs in the region for 2022/23, with crude prices at $75 per barrel (in February before the outbreak of the war). Assuming a turn-back to $75 per barrel for crude and grain exports by 2023/24 in the short term and crude price hikes to $108 and grain export reduction by 2026/27 in the long term, the organization examined the following two scenarios:
a) Weak-impact scenario: Export reduction of 10 million tons of wheat and maize each from Ukraine and Russia, with other grains down by 2.5 million tons and oilseeds down by 1.5 million tons. The crude price is at $100 per barrel.
b) Strong-impact scenario: Export reduction of 25 million tons for wheat and maize from the two nations in 2022/23, with other grains down by 5 million tons and oilseeds down by 3 million tons. The crude price is at $100 per barrel.

10) The percentage on 〈Figure 9〉 is 10%. However, we applied 7.0%, the figure on the source data.

If international crude oil price hikes and a reduction in the region's exports continue, global grain prices will maintain the high level despite output increases in other areas.

- Rising crude oil prices will raise fertilizer prices by 25% in 2026/27 compared with the forecast assuming a situation without Russia's invasion of Ukraine.
- The ratio of substitutes for a reduction in the Black Sea region's exports through other regions' export increase is forecast to be 30-52% for maize and 19-48% for wheat for the next five years in the weak-impact scenario. The shares will be 47-67% and 30-57%, respectively in the strong-impact scenario.[11)]
- In 2026/27, wheat prices will rise by 10% in the weak-impact scenario and by 19% in the strong-impact scenario; and maize prices by 8.5% and 14%, respectively.
- Livestock prices in 2026/27 will grow by 3-6% in the weak-impact scenario and by 5-10% in the strong-impact scenario.

〈Figure 9〉 FAO's analysis of the impact of the Ukraine conflict on grain prices



Note: The order of scenarios for grains and oilseeds are the same as for wheat. The figures show the gap in nominal prices vs. the baseline.
Source: FAO (2022: 19).

11) Increased global grain prices will stimulate other regions' output and exports, resulting in a rise in their replacement ratios.

04

Analysis of impacts on Korea

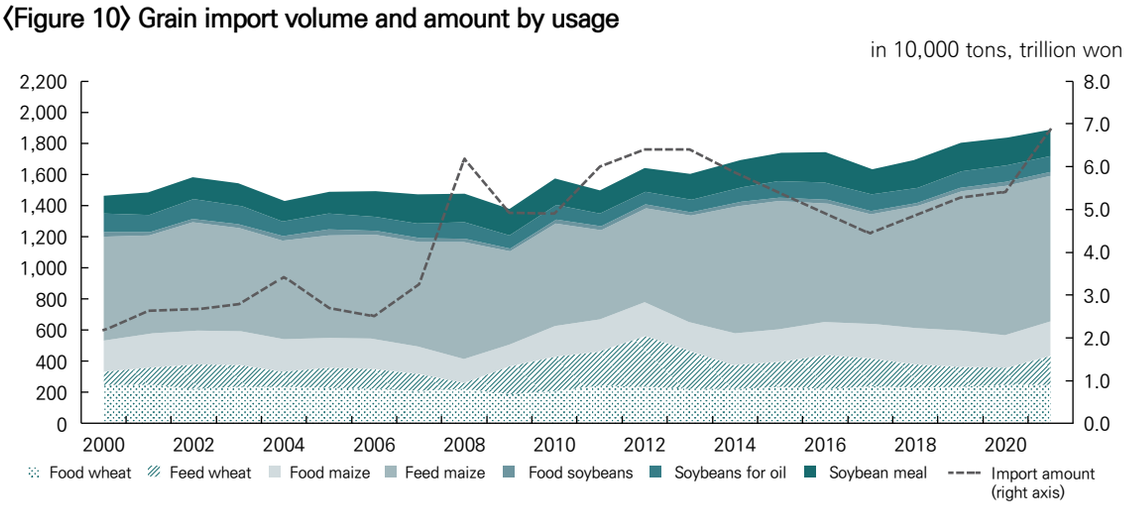
4.1. Major grain imports

South Korea imports maize for processing and wheat for animal feed from Ukraine and Russia. It is possible to seek replacements, but price hikes will be unavoidable.

The nation's annual grain imports, including soybean meal, amount to 18 million tons, fluctuating in 4–7 trillion won depending on changes in world grain prices.

- The increase in maize imports for animal feed has driven up grain trades. Korea's annual average import volume for the recent three years, from 2019 to 2021, stands at 18.49 million tons, with 5.99 million tons for food and 12.50 million tons for feed.
- Maize and wheat for feed are replaceable in assorted feed output. Thus, changes in their import volumes can be significant, but the combined volume of feed grains is not likely to show a difference year-to-year. On the other hand, food grains, including wheat for milling and maize for processing, are imported yearly without a significant change in the volume.
- As the imported volume is constant, but the world prices are volatile, Korea's import cost changes significantly depending on the trend in the global market. When grain prices were high in 2021, the nation's imports amounted to 6.7 trillion won.

〈Figure 10〉 Grain import volume and amount by usage



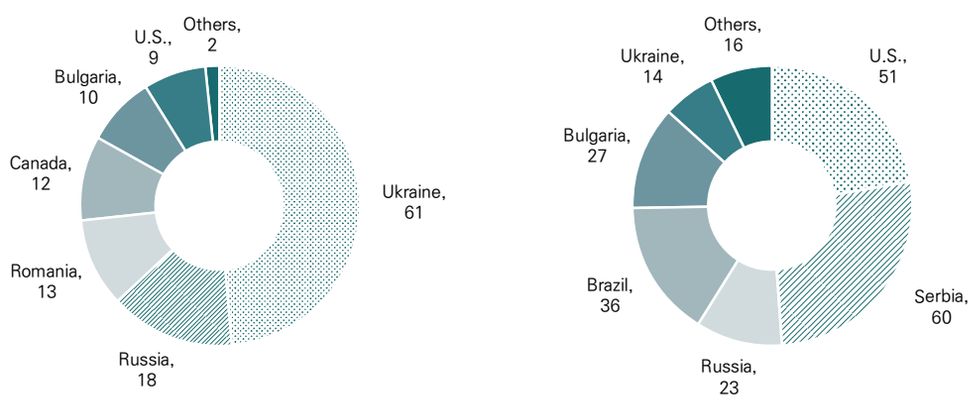
Note: Import amount in Korean won is calculated through annual import amount in dollars timed by the average annual exchange rate.
Source: Trade statistics by the Korea Customs Service (https://unipass.customs.go.kr, access date: March 16, 2022.).

Korea is highly dependent on Ukraine and Russia for wheat for feeding and maize for processing.

- Based on the figures for the recent three years, from 2019 to 2021, Korea's wheat imports for feed amount to 1.25 million tons, of which 610,000 tons (48.9%) are from Ukraine and 180,000 tons (14.3%) from Russia. The nation imports wheat for milling from the U.S., Australia, and Canada. However, as it can substitute feed wheat from other trading sources, the price changes in line with international prices of other feed grains, including maize.
- The total import volume of maize for processing (the recent 3-year average) amounts to 2.26 million tons, with 140,000 tons (6.1%) from Ukraine and 230,000 tons (10.1%) from Russia. Especially, non-GMO maize for processing is not easy to seek replacements from other regions, as East Europe is the only area exporting the product.
- Korea's imports of grains other than feed wheat and maize for processing from the Black Sea region are insignificant and can easily seek replacements from other areas.

〈Figure 11〉 Imports of wheat for feeding and maize for processing

in 10,000 tons



Note: 3-year average imports (2019-2021).
Source: FAO STAT (https://www.fao.org/faostat/en/#home, access date: March 16, 2022.).

As of early March, domestic manufacturers have secured the grains they would need for production in the first half of 2022. They currently seek other sources, considering the contract volumes from Ukraine will not be shipped into the nation.[12)]

12) The following are based on the press release (March 4, 2022) of the Ministry of Agriculture, Food and Rural Affairs (MAFRA).

- As of early March, Korean food manufacturers have secured feed wheat for use until early July (October when including contract volumes) and feed maize for use until early June (mid-July when including contract volumes). As to 260,000 tons of feed grains based on the contract with Ukraine, they will go ahead with additional bids.
- As of early March, Korean manufacturers have secured maize for processing for use until mid-May (June when including contract volumes). Out of 460,000 tons of the contract volumes, 230,000 tons are from Ukraine. The industry seeks bids from other areas, considering shipments from Ukraine will not be possible.

4.2. Analysis of impacts on Korea

As Korea relies on imports for most of the grains used for assorted feed and food processing, international grain supplies and price changes impact the nation's various sectors, including feed, processed food, livestock products, restaurants, causing price volatility.

The significant impacts of a crisis in the world grain market on Korea include a threat to food security, reduced economic activities in impacted sectors, and domestic price increases along with price hikes in imported grains.

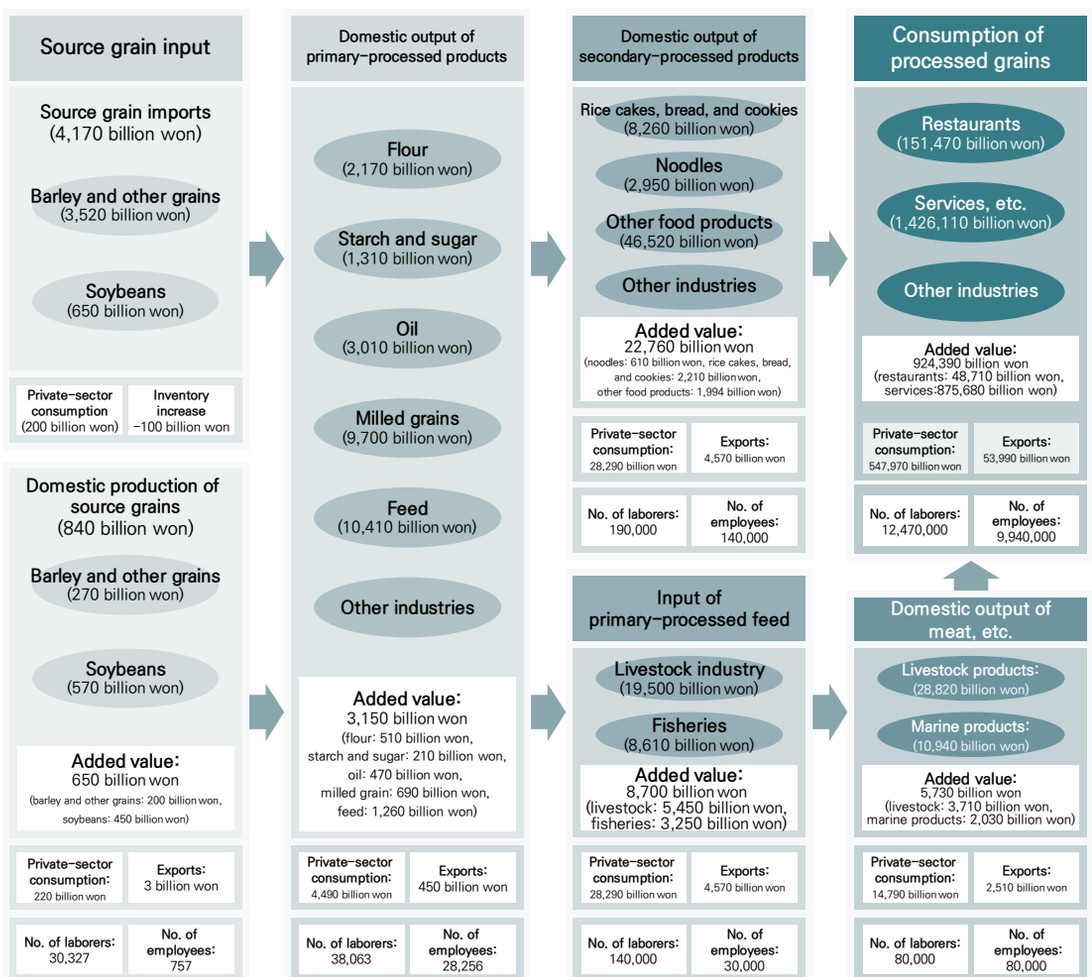
- If the sector continues its effort to seek more from other sources, it will be able to secure the necessary volume. However, import cost increases will be unavoidable.
- If wheat and maize supplies contract in the international market, other grain prices will go up in sync.
- As a consequence of the Ukraine war, Korea will likely face domestic price hikes from rising import costs.

Imported grains are primarily processed in the milling, oil extracting, and feed manufacturing firms, then used as materials for food processing and livestock production. They are critical factors raising prices in livestock products, processed foods, and food services.

- Imported wheat, maize, and soybeans are processed into food materials, such as flour, starch, and soybean oil. They impact industrial output, added values, and employment, along with their end-consumption in households and restaurants. Also, they serve as decisive factors for prices in food processing and services.

- Feed maize, wheat, and soybean meal are used to make assorted feed, thus influencing the prices of assorted feed and livestock products.

〈Figure 12〉 Industries related to imported grains



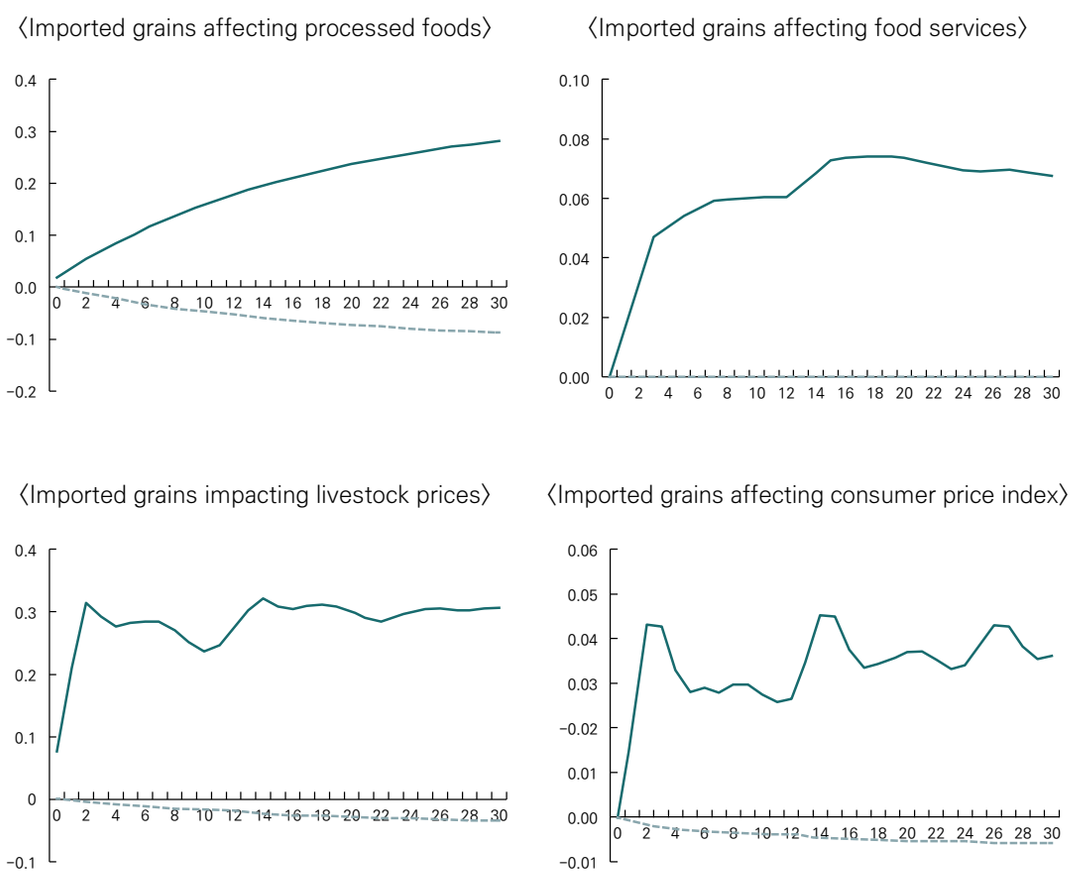
Note: Other food products refer to those except livestock products, fishery products, rice cakes, bread, cookies, oil, seasoning, and feed. Bank of Korea (2020). Prepared based on the 2018 input-output table.
Source: Kim Jong-Jin et al. (2021: 85).

The rising costs of imported grains due to international price hikes significantly affect prices of domestic processed foods, food services, assorted feed, and livestock products.

- World grain prices transfer to import costs with a time gap of 3-7 months due to forward purchases by Korean processing firms. Also, with a time gap, the price hikes transfer to prices of assorted feed, food services, and processed foods.

- According to Kim Jong-Jin et al. (2020)'s study using a time series model on price transmission, a 10% rise in import costs raises processed food prices by 3.40% and food service prices by 0.58%. In addition, the producer prices of assorted feed are up 5.3%, with the consumer prices of livestock products up 1.72-2.94%.
- According to Park Seong-Jin et al. (2019)'s study based on the input-output table, a 10% increase in imported grain prices raises milling prices by 5.7%, with feed up 3.9%, starch and sugar up 3.7%, oil up 3.6%, poultry up 2.4%, and noodles up 1.9%.

〈Figure 13〉 Impacts of imported grains on domestic prices



Note: The solid lines above show impacts from a 1% increase in imported costs. The dotted lines show the impacts from a 1% decline. The horizontal axes show months after the impact.
Source: Reconstructed based on the data by Kim Jong-Jin et al. (2020: 56-58).

Grain price hikes from Russia's invasion of Ukraine are likely to pressure domestic processed foods, assorted feed, livestock products, and food services.

- In the case of applying research results by Kim Jong-Jin et al. (2020) under the assumption[13] that FAO's estimates[14] of world grain prices will transfer to Korea's grain import prices, domestic consumer prices in processed and livestock products based on imported grains will go up, driven by the war in the Black Sea region.
- Specifically, the consumer price index (CPI) for processed foods will go up 3.4-6.8%, with the CPI for dine-out services up 0.6-1.2%, the producer price index (PPI) for assorted feed up 5.3-10.6%.
- However, the results are gained based on imported grain costs except for domestic oil prices and foreign exchange rates. When considering these factors, the upward pressure on prices will likely get bigger.

13) According to a study by Park Seong-Jin et al. (2019), the transmission of world grain prices (FOB prices) into Korea's import prices can be reduced slightly by adjusting purchasing schedules and seeking replacements. However, the study found that 91% of food grains and 95% of feed grains cannot avoid cost transmission.

14) Refer to Section 3.3.

05

Key findings and countermeasures

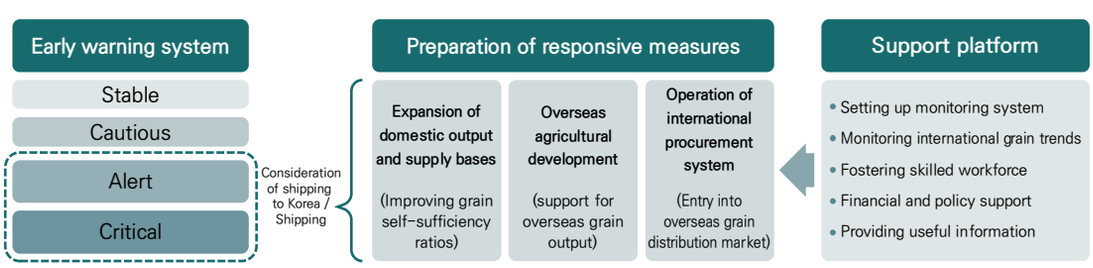
5.1. Countermeasures by the Korean government and industries

The government has activated a response system to tackle rising grain prices due to the Russia-Ukraine war, in addition to increased grain prices since the second half of 2020.

The government has operated a response system based on early warnings since 2014 to prepare for price volatility after the agflation from 2007 to 2008.

- The response system consists of domestic output expansion, overseas agricultural development to secure grains from abroad in emergency, and operation of the international grain procurement system.
- To respond to an emergency, the government determines the level of the crisis based on the early warning system and applies relevant response manuals.

〈Figure 14〉 Response system for global grain crisis



Source: Park Seong-Jin et al. (2019: 85).

The government has implemented measures to relieve industrial burdens and minimize domestic impacts in the first half of 2021 to tackle the grain price hikes which started in the second half of 2020.

- The government raised the national status from “stable” to “cautious” in April 2021 and improved grain import procedures by adopting on-board sampling for quick customs

clearance and fastening the issuance of import declaration certificates. Also, it lowered tariffs on maize from 3% to zero and decreased interest rates to loans extended for grain purchases by feed/food processing firms and restaurants. The government enhanced price trend monitoring and communication with the industries.[15)]

- As the rising trend continued afterward, the government held a meeting of its grain policy committee in June 2021. It reviewed additional measures for tax and financial assistance to relieve industrial burdens and extend financial help for cash-strapped businesses.[16)]

To respond to the prolonged war in Ukraine, the government activated a cooperative body led by the grain policy committee, composed of government officials, industrial experts, and academic specialists. Through the joint work, the government has sought ways to tackle the issue, by lowering interest rates for grain purchases, increasing replacements (unhulled barley and wheat bran), and securing other import sources.[17)]

- To respond to the grain price hikes after the outbreak of the war, the government took measures as follows on March 4: i) lowering interest rates from 2.5-3.0% to 2.0-2.5% for loans of 64.7 billion won for feed manufacturers and 128 billion won for food processors; ii) increasing replacement volumes (unhulled barley from 40,000 tons to 100,000 tons and wheat bran from 30,000 tons to 60,000 tons).
- Amid uncertainties over scheduled shipments to Korea, the government activated a daily monitoring system from February 28. It continuously checks the supplies and stocks of grains, such as maize for processing and feed wheat, while seeking measures such as supply source changes and substitute bids.

5.2. Key findings

The government has executed policies to secure grains and minimize impacts on domestic prices amid supply bottlenecks and surging prices due to the Ukraine conflict. Nevertheless, the measures are limited.

- The war broke out when the world was in supply chain issues, triggering a surge in grain prices. The upward trend will likely continue for a considerable period because of the

15) MAFRA's press release on April 7, 2021.
16) MAFRA's press release on June 28, 2021.
17) MAFRA's press release on March 4, 2022.

hurdles to the Black Sea region's grain output and exports and rising prices in fertilizers and farming machines in the area.

In the short term, the government must seek replacement sources and extend financial and tax assistance to relieve impacts on domestic prices. In the long term, it should expand domestic supply bases, including grain stockpiling, and set up an international procurement system for domestic grain distributors to enter the global distribution market.

- As the upward trend will likely continue for a considerable period, it will affect domestic prices in processed foods, assorted feed, livestock products, and dining services. Therefore, the government must prioritize price control measures.
- In the mid to long term, the government must seek responsive measures, such as improving grain self-sufficiency, expanding grain stockpiles, stabilizing supply chains through forward purchases and long-term contracts, enhancing support for overseas agricultural development, and helping private firms' entry into the international grain distribution market.

References

관세청 수출입무역통계. 〈https://unipass.customs.go.kr〉. Access date: Mar 16, 2022.

김종진·김상현·이용건·최재현. 2021.『수입곡물 가치사슬 분석과 과제』. P272. 한국농촌경제연구원.

김종진·박성진·박지원. 2020. "수입곡물 가격변동이 국내 소비자물가에 미치는 영향 분석."『농촌경제』. 제43권 제2호.

농림축산식품부 보도자료. 2021. 6. 28. "국제곡물 가격 상승에 대응, 업계 부담 완화 추가 방안 추진."

농림축산식품부 보도자료. 2021. 4. 7. "국제곡물 가격 상승에 따른 국내 영향 최소화 대책 추진."

농림축산식품부 보도자료. 2022. 3. 4. "러시아-우크라이나 사태로 인한 국제곡물 시장 불안에 대응, 사료·식품 원료구매자금 금리 인하 및 사료곡물 대체원료 할당물량 증량 등 추진."

박성진·김종진·박지원. 2019.『해외곡물 도입 정책 진단과 개선 방안』. R887. 한국농촌경제연구원.

시카고 상품거래소(CBOT). 선물가격. 〈http://www.krei.re.kr:18181/new_sub01〉. Access date: Mar 21, 2022.

Chatham House. ResourceTrade.Earth. 〈https://resourcetrade.earth/〉. Access date: Mar 16, 2022.

FAO STAT. 〈https://www.fao.org/faostat/en/#home〉. Access date: Mar 16, 2022.

FAO. 2022. Information Note: The importance of Ukraine and the Russian Federation for global agricultural markets and the risks associated with the current conflict.

IGC, Grains and Oilseeds Index. 〈https://www.igc.int/en/markets/marketinfo-goi.aspx〉. Access date: Mar 16, 2022.

McConnell, Michael, Olga Liefert, Angelica Williams, and Claire Hutchins. 2022. Feed Outlook: March 2022, FDS-22c, U.S. Department of Agriculture, Economic Research Service, March 11, 2022.

Sowell, Andrew R. and Bryn Swearingen. 2022. Wheat Outlook: March 2022, WHS-22c, U.S. Department of Agriculture, Economic Research Service.

USDA, March 2022 WASDE Report. 〈https://www.usda.gov/oce/commodity/wasde〉. Access date: Mar 16, 2022.

USDA, PSD Online. 〈https://apps.fas.usda.gov/psdonline〉. Access date: Mar 16, 2022.

KREI Agri-policy Focus

Supervision	Gouk Seung-Yong	061-820-2275	gouksy@krei.re.kr
Content inquiry	Kim Jong-Jin	061-820-2382	jkim@krei.re.kr
Book inquiry	Yoo Jung-In	061-820-2212	edela@krei.re.kr

※ KREI Agri-policy Focus publishes summarized studies on significant trends and policy issues in the agricultural sector.

※ This publication is also on the KREI website (www.krei.re.kr).

KREI Agri-policy Focus No. 205

Impacts of Ukraine-Russia Conflict on Global Grain Prices

Registration No.	6-0007 (May 25, 1979)
Publication date	March 2022
Publisher	Kim Hong-Sang
Published by	Korea Rural Economic Institute 601, Bitgaram-ro, Naju-si, Jeollanam-do, ROK # 58321 Tel +821833-5500
Printed by	HAN Company, Ltd.
ISSN	2672-0159