

KREI Agri-policy Focus

The Impacts of the COVID-19 on the Korean Agricultural Market

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Summary

This analysis studies the pandemic's impacts on the Korean agricultural market by using the KREI-KASMO Model.

- We used the KREI-KASMO(KREI-Korea Agricultural Simulation Model) to examine overall changes in the agricultural sector after the outbreak of the coronavirus.
- We prepared three scenarios to project the impacts: Scenario I (domestic situation stabilized in end-June, the global pandemic continues), Scenario II (overseas and local pandemic continues for the whole year), Scenario III (continuous pandemic at home and abroad and limited increase in Korea's export value)

The value of agricultural production in Korea decreases 0.4~1.0% compared with the baseline due to economic recession around the world caused by the pandemic.

- The scenario analysis shows that the farming production will drop by 0.4% (Scenario I)~1.0% (Scenario III) compared with the baselines.
- The effect of a decrease in demand for local and overseas produce caused by economic recession is more significant than that of price increase resulted from exchange rate hikes.

A decrease in flower production is the largest followed by poultry, vegetables, and grains. Meantime, the production of meat and fruits increases.

- (Flowers) As the demand decreased due to cancelled school graduation events and performances amid the pandemic, the total production is likely to reduce 5.7~7.0% compared with the baseline.
- (Fruits) A rise in imported fruit prices from the KRW's depreciation caused a drop in fruit imports. As demand for domestic fruits was higher than demand contraction from economic recession, the fruit production is likely to increase 0.4~0.9% compared with the baseline.
- (Meat) While import prices increased due to problems in the international supply chain (closure of meat-processing companies), domestic meat consumption rose. The increase in household consumption is likely to expand production by 0.6~1.5% versus the baseline.

Korea's trade balance is likely to improve by 4.4~7.6% compared with the baseline due to the exchange rate hikes amid the pandemic.

- Import value is likely to drop 3.4~5.5% versus the baseline in proportion to exchange rate hikes.
- Export value is likely to rise 0.0~1.4% versus the baseline in proportion to exchange rate hikes.
- The self-sufficiency rate is likely to expand 0.3~0.4%p due to a decrease of 3.1~4.8% in the import value.

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Scenario Analysis

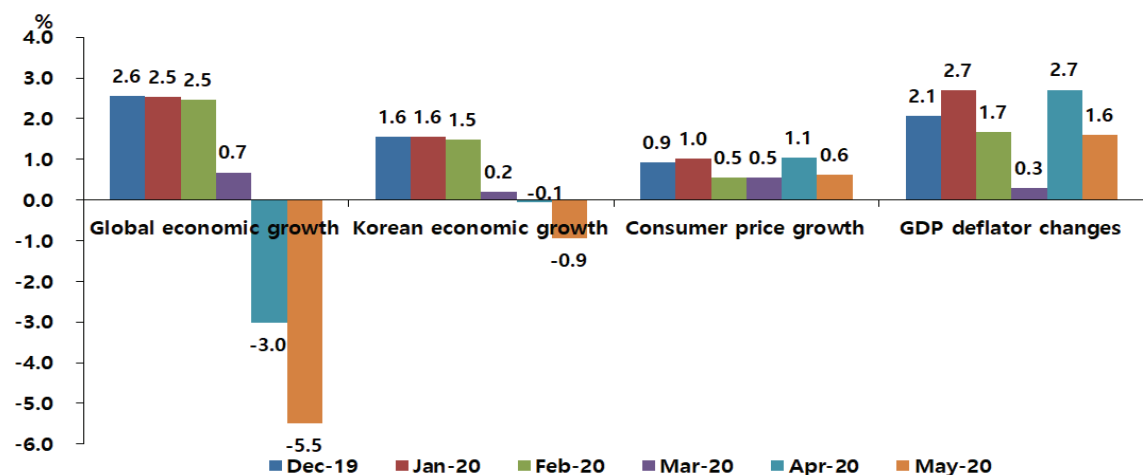
1.1. Background

The outbreak of the COVID-19 is highly likely to decrease macroeconomic indexes at home and abroad.

The coronavirus outbreak hit hard the global economy and financial markets. Amid the outbreak, the economies at home and abroad are likely to shrink down with growth rates lower than expected.

- Global Insight lowered the expected growth of Korea to -0.94: (Dec 2019) 1.55% → (Jan 2020) 1.56 → (Feb 2020) 1.49 → (Mar 2020) 0.21 → (Apr 2020) -0.06 → (May 2020) -0.94
- It lowered the expected growth of the world economy to -5.49: (Dec 2019) 2.56% → (Jan 2020) 2.53 → (Feb 2020) 2.46 → (Mar 2020) 0.68 → (Apr 2020) -3.02 → (May 2020) -5.49

〈Figure 1〉 Monthly changes of 2020 macroeconomic indexes (expected)



Source: Global Insight

〈Table 1〉 IMF’s estimated economic growth after the COVID-19¹⁾

Category	2019	2020	
		Previous projections	Modified projections ²⁾
World	2.9	3.3	-3.0(-6.3%p)
Korea	2.0	2.2	-1.2(-3.0%p)
US	2.3	2.0	-5.9(-7.9%p)

Note 1) IMF announced modified projections on April 14 as the coronavirus spread widely around the world.

2) The numbers in the parentheses are changes vs. baseline estimates.

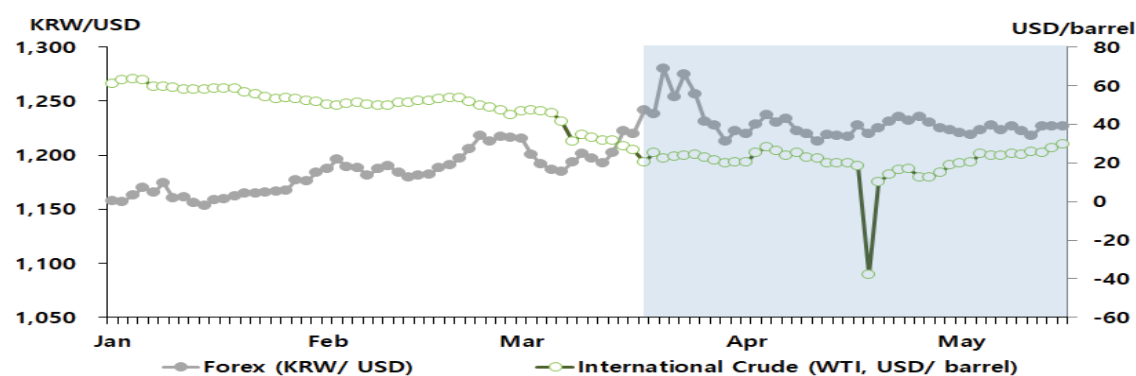
Source: IMF(Apr 14, 2020)

- IMF(Apr 2020) projected down the growth estimates of major countries: China(3.6%→1.2), US(2.0→-5.9), EU(1.3→-7.5), Japan(0.7→-5.2), Asian emerging countries(4.4→-1.0), Korea(2.2→-1.2)

Financial markets are in uncertainties, and oil prices continuously go down.

- Concerns on the global economic recession increased the USD’s demand, resulting in a rise in the KRW-USD exchange rate.
- The Bank of Korea has reduced benchmark rates to 0.5% to tackle economic depression. It also keeps the 5-year treasury bond rate at 1.215% for quantitative easing.
- International oil prices continuously go down along with an increase in the crude oil stocks in the US, oil demand reduction despite OPEC+’s agreement on production reduction amid the COVID-19 (International Energy Agency adjusted down global oil demand), and a rise in the short position as the WTI May matures. As the West Texas Intermediate (WTI) contract for May delivery comes near, crude continues unprecedented sell-off.

〈Figure 2〉 Exchange rates and international oil prices in 2020



Source: Bank of Korea, Korea National Oil Corporation

It is essential to estimate the impacts the pandemic can have on the agricultural sector.

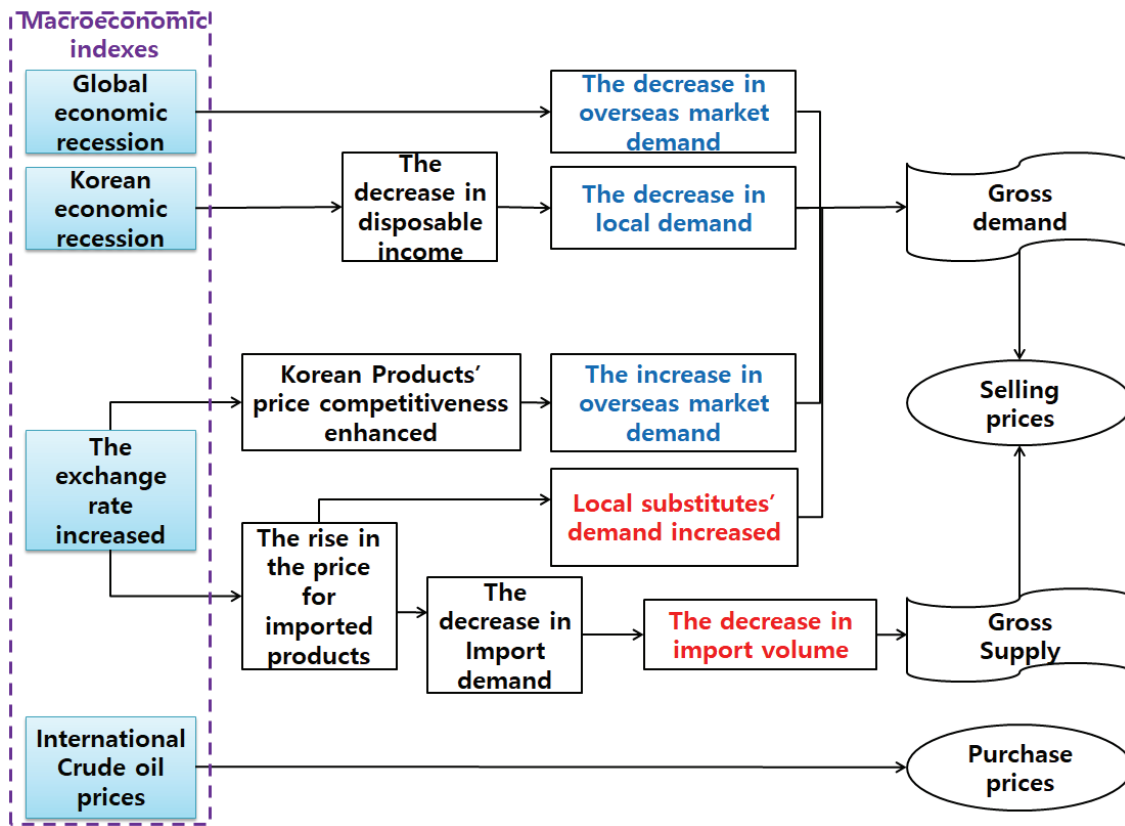
- Restrictions on movement and international travels caused by the pandemic result in social and economic contractions. Negative impacts on the agricultural sector are highly likely.
- Economic recession and social distancing have shrunk the restaurant industry, the largest source of farming produce consumption. Also, it is not easy to secure foreign workers for farming production.
- An overall analysis of the pandemic's impacts on the agricultural sector is inevitable for practical solutions.

1.2. Channels of Impacts

As the pandemic continues, it influences the agricultural sector both positively and negatively following different macroeconomic channels.

- (Global economic recession) The global economic growth has decreased, resulting in export market contraction for Korean farming produce. Consequently, reductions in export and demand cause agricultural goods prices to drop.
- (Domestic economic recession) A decrease in economic growth leads to a reduction in disposable income. Consequently, the low demand for local produce has dropped prices.
 - A drop in the GDP deflator has decreased the nominal growth, causing a reduction in disposable income.
- (Exchange rate hikes) A decrease in the KRW against the USD causes price changes in export and import as well.
 - In export, the price competitiveness of Korean produce will increase and the international demand for export will rise. In import, imported prices will rise and the demand for local substitutes will expand. Consequently, prices of local produce will rise in the Korean market.
- (The fall in the international oil prices) A price drop in agricultural inputs such as fertilizers, pesticides, and heating diminishes purchase price indexes.

〈Figure 3〉 Impact channels following macroeconomic changes



Source: Drawn by the authors.

1.3. Macroeconomic Assumptions

Baselines (projections s for comparison): The total value of agricultural production and economic projections are set as baselines for the scenarios, based on the macroeconomic estimates used in the Agricultural Outlook 2020 (published on Jan 22, 2020).

- Source for macroeconomic projections: BOK (Korean economic growth, consumer price growth), EIA (oil prices), IMF, World Bank (world economic growth), Global Insight (other data)

Scenarios are prepared under the pandemic situations at home and abroad

Scenarios are prepared based on macroeconomic projections announced by the World Bank, Global Insight, and IMP after the pandemic outbreaks in Europe and the US.

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Scenario I assumes a positive state, in which the local situation gets better after the end of June, while the global pandemic continues. Scenario II assumes a pessimistic state, in which the pandemic continues for a whole year.

- The scenarios use Global Insight's projection (May 15, 2020) of -5.49% as global economic growth.
- Regarding Korea's economic growth, Scenario I uses the World Bank's -2.59%. Scenario II applies Global Insight's -0.94%, the most optimistic projection.
- Regarding domestic macroeconomic indexes, consumer price growth, GDP deflator changes, and interest rates use Global Insight's recent projections (May 15, 2020).
 - Consumer price growth 0.63%, GDP deflator changes 1.60%, interest rates 1.35%
- To reflect the rapid changes in international crude prices and exchange rates after the pandemic, we use the recent average (since Mar 9, 2020) and the year's average (since Jan 1, 2020) as the scope for our scenarios.
 - Exchange rates: (before Mar 9) KRW 1,180.9/USD → (after Mar 9) 1,225.9, International crude: (before Mar 9) USD 53.3/barrel → (after Mar 9) 21.7

〈Table 2〉 Macroeconomic projects for the Analysis

Category	Baseline	Scenario I	Scenario II	References
Global economic growth (%)	2.80	-5.49		Global Insight's estimates
Korean economic growth (%)	2.30	-0.94	-2.59	World Bank & Global Insight's estimates
Consumer price growth (%)	1.00	0.63		Global Insight's estimates
GDP deflator changes (%)	2.07	1.60		Global Insight's estimates
KRW-USD exchange rates	1167.7	1204.4 ~ 1227.0		Trends since Jan 2020
International oil prices (USD/barrel)	59.25	21.7 ~ 39.8		Trends since Jan 2020
Interest rates(%)	1.54	1.35		Global Insight's estimates

Source: World Bank('20.3.30.), Global Insight('20.5.15.), Korea National Oil Corporation, IMF('20.4.14.).

- The COVID-19 caused problems in the US meat supply chain, raising meat trading prices. To reflect this situation, we assume that the import prices of beef, pork, and chicken will rise 3.0%, 8.5%, and 2.6%, respectively versus the baselines.
 - Our comparison of importing price changes from the previous year between before the pandemic (Jan ~ Feb) and after the pandemic (Mar ~ Apr) shows that the frozen beef

prices expanded from 4.3% to 7.1%, chilled beef from 1.8% to 4.4%, pork from 13.9% to 22.4%, and chicken from 10.6% to 13.2%.

- Although social distancing after the pandemic decreased demand for dining out, household consumption increased. Specifically, demand for meat, such as pork, beef, and chicken, expanded sharply. To reflect this, we assume that the demand for meat will rise by 0.5% compared with the baseline.

〈Table 3〉 Livestock importing price changes in early 2020 (%)

Category	Month-on-month				Year-on-year			
	2020 ^p				2020 ^p			
	Jan	Feb	Mar	Apr	Jan	Feb	Mar	Apr
Livestock products	-1.2 (0.3)	0.7 (-1.1)	5.6 (3.3)	-3.8 (-5.1)	6.2 (2.7)	8.4 (3.0)	14.5 (6.8)	9.7 (1.9)
Chilled beef	-2.2	5.1	0.1	0.5	1.0	2.7	3.7	5.1
Frozen beef	-1.0	-4.8	6.4	-5.2	3.4	5.3	11.6	2.6
Pork	-0.3	4.5	9.0	-6.1	13.1	14.7	25.1	19.8
Chicken	-3.5	2.5	-0.1	1.4	8.3	13.0	12.0	14.5

Note: Numbers in the parentheses are in USD.

Source: Korea Trade Statistics Promotion Institute (『Import prices of agricultural and livestock products in April 2020』).

Scenario III for our study assumes that the international logistics system will worsen due to the COVID-19, and exports will be restricted despite exchange rate hikes.

- In theory, exchange rate hikes are likely to increase exports. However, exports are not expected to rise due to reduced air traffic for shipping amid the pandemic.
- Supposing that trades will be restricted amid the pandemic, we assume that the export value of local produce will be as much as the baseline.

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Analysis Results

2.1. Summary

The value of agricultural production in Korea is likely to drop by 0.4~1.0% versus the baseline due to demand decrease caused by contracted consumption.

- (Scenario I) The effect of overseas and domestic demand decrease from economic recession is more significant than that of price increases from exchange rate hikes. Therefore, agricultural production is likely to drop by 0.4% versus the baseline.
- (Scenario II) If the COVID-19 continues for the whole year, demand reduction from the domestic economic recession will expand. Thus, agricultural production will decrease by 0.9% compared with the baseline.
- (Scenario III) Restriction on produce trades will reduce agricultural production by 1.0% versus the baseline.

Production of flowers, poultry, vegetables, and grains will decrease, but non-poultry and fruit production will increase.

- (Flowers) The canceled graduation events and performances to respond to the pandemic decreased consumption. The production is likely to drop by 5.7~7.0% versus the baseline. The reason for the drop is that as flowers are not necessities, their consumption is highly influenced by economic situations.
 - * Sales reduction in February (graduation events, Valentine's Day) and March (school entrance events, etc.) caused flower production to decrease.
- (Fruits) The effect of demand increase in local fruits from a decrease in fruit imports is more significant than that of demand decrease from the economic recession. Consequently, fruit production is likely to increase.

- (Meat) Although import price hikes due to the international supply chain's problems decreased import value and demand for eating out, an increase in household consumption will raise meat production.

The trade balance is likely to improve 4.4~7.6% versus the baseline and the self-sufficiency ratio is likely to rise.

- Scenario I ~ III indicate that trade balance will improve sharply due to import reduction caused by exchange rate hikes.
- Import value is likely to drop by 3.4~5.5% versus the baseline in proportion to exchange rate hikes.
 - Reduction in orange and tropical fruits will be the largest, followed by vegetables, livestock products, and grains.
- Export value is likely to rise by 0.0~ 1.4% versus the baseline in proportion to exchange rate hikes.
 - If the effect of export increase from exchange rate hikes is ignored (Scenario III), the export value will reduce by 2.5% versus the baseline due to a decrease in export unit prices.
- Self-sufficiency is likely to expand 0.3~0.4%p due to a decrease of 3.1~4.8% in imports.

〈Table 4〉 Korean agricultural production amid after the COVID-19

in KRW billions

Category	2019	2020			
		Baseline	Scenario I	Scenario II	Scenario III
Total agricultural production	50,428.4	50,438	-0.4%	-0.9%	-1.0%
Cultivation	30,705.4	30,572	-1.1%	-1.3%	-1.4%
Grains	10,829.6	10,974	-1.1%	-1.4%	-1.4%
Vegetables	11,389.6	10,968	-1.4%	-1.9%	-2.0%
Fruits	4,705.8	4,821	0.4%	0.9%	0.9%
Flowers	524.5	522	-5.7%	-6.7%	-7.0%
Livestock	19,722.9	19,866	0.7%	-0.2%	-0.4%
Non-poultry	14,322.6	14,394	1.5%	0.6%	0.5%
Poultry	4,887.1	4,955	-1.1%	-2.5%	-3.0%

Note: % means changes versus the baseline.

Source: Ministry of Agriculture, Food, and Rural Affairs (MAFRA Annual Statistics).

〈Table 5〉 Impacts of the COVID-19 on trade balance and self-sufficiency¹⁾

Category	2019	2020			
		Baseline	Scenario I ³⁾	Scenario II	Scenario III
Trade deficit (B-A)	210.5	222.6	-4.4%	-7.6%	-6.4%
Total import amount (A)	276.6	290.2	-3.4%	-5.5%	-5.5%
7 major grains	41.8	42.6	-0.7%	-1.1%	-1.1%
5 major vegetables	1.8	2.3	-3.9%	-5.8%	-5.8%
Fruits	12.9	13.3	-4.4%	-6.8%	-6.8%
6 major fruits	1.6	1.6	-2.7%	-4.1%	-4.1%
Orange/ tropical fruits	11.3	11.7	-4.7%	-7.2%	-7.2%
5 major live-stock products	59.7	66.7	-0.3%	-2.2%	-2.3%
Total export amount (B)	66.1	67.6	0.0%	1.4%	-2.5%
7 major grains	0.0	0.0	-0.2%	0.5%	-1.6%
5 major vegetables	1.6	1.3	-2.4%	-2.4%	-3.0%
6 major fruits	1.2	1.2	-1.7%	-0.9%	-1.8%
5 major livestock products	1.9	1.8	-1.9%	-0.7%	-3.5%
Others	52.3	53.8	0.3%	2.0%	-2.5%
Total import value	37,188	38,037.7	-3.1%	-4.8%	-4.8%
Total export value	3,399	3,409.0	1.0%	3.1%	-1.0%
Produce self-sufficiency ²⁾	71.0%	70.8%	0.3%p	0.4%p	0.4%p
Grains	45.2%	45.4%	0.2%p	0.2%p	0.2%p
Meat	62.8%	64.7%	1.1%p	1.5%p	1.5%p

Note 1) 7 major grains include rice, bean, maize, wheat, potato, sweet potato, and barley. 5 major vegetables include cabbage, white radish, garlic, onion, and dried chili. 6 major fruits include apple, grape, peach, tangerine, and persimmon. 5 major livestock products include beef, pork, chicken, egg, and dairy goods.

2) The self-sufficiency calculation formula is local production/ consumption*100. Feed grains are excluded from self-sufficiency calculation for grains and farming goods.

3) % means changes versus the baselines.

Source: Ministry of Agriculture, Food, and Rural Affairs (MAFRA Annual Statistics); Korea Agro-Fisheries & Food Trade Corporation (its export data of agricultural products).

2.2. Analysis Result Summary by Month

This analysis examines the impacts based on the macroeconomic projections announced from institutes each month through the KREI-KASMO model.

As market uncertainties from the COVID-19 since the beginning of March have changed the macroeconomic indexes every month, our analysis uses the revised macroeconomic projections to look into the pandemic's impacts.

- (Positive scenario) The monthly trend of the impacts shows that the production decrease in April is likely to be smaller than March (from -0.8% in Mar to -0.5% in Apr).
 - The projection for GDP deflator changes in April is adjusted up compared with March (from 1.18% in Mar to 2.71% in Apr). The consequent increase in domestic demand is more significant than the effect of demand decrease from the economic growth reduction (from 1.26% in Mar to 0.06% in Apr).
- (Negative scenario) The monthly trend of the impacts on production shows that the production decrease in April is larger than that of March (from -1.2% in Mar to -1.5% in Apr). However, considering the local demand increase for meat and reduced import value amid the pandemic, a decrease in production will be smaller in May (from -1.5% in Apr to -1.0% in May).
- (Self-sufficiency) The ratio is likely to expand by 0.3~0.4%p due to a decrease of 3.1~4.8% in imports.

〈Table 6〉 Macroeconomic projections adjusted each month

Category	Baseline	Positive			Negative		
		Mar	Apr	May	Mar	Apr	May
Global economic growth (%)	2.80	0.68	-3.0	-5.5	0.68	-3.0	-5.5
Korean economic growth (%)	2.30	1.26	-0.06	-0.94	0.21	-2.59	-2.59
Consumer price growth (%)	1.00	0.78	1.05	0.63	0.55	1.05	0.63
GDP deflator changes (%)	2.07	1.18	2.71	1.60	0.28	2.71	1.60
Exchange rate (KRW/USD)	1167.7	1192.1	1197.8	1204.4	1228.6	1225.5	1227.0
International crude (USD/barrel)	59.25	47.5	42.7	39.8	27.5	25.0	21.7
Interest rates(%)	1.54	1.35	1.35	1.35	1.35	1.35	1.35

Note: The baselines are the macroeconomic projections of December 2019 used for the Agricultural Outlook held in Jan 2020.
Source: World Bank('20.3.30.), Global Insight('19.12.15., '20.3.15., '20.4.17., '20.5.15.), Korea National Oil Corporation; IMF('20.4.14.).

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Increases in international meat prices and domestic meat demand improve the May projections compared with the April projections.

- Although farming production forecasts for May drop a bit, projections for meat production rise relatively high.
- Agricultural production projections can change along with different international and local economic conditions due to the pandemic.

<Table 7> The pandemic’s impacts on Korean agricultural production

in KRW billions

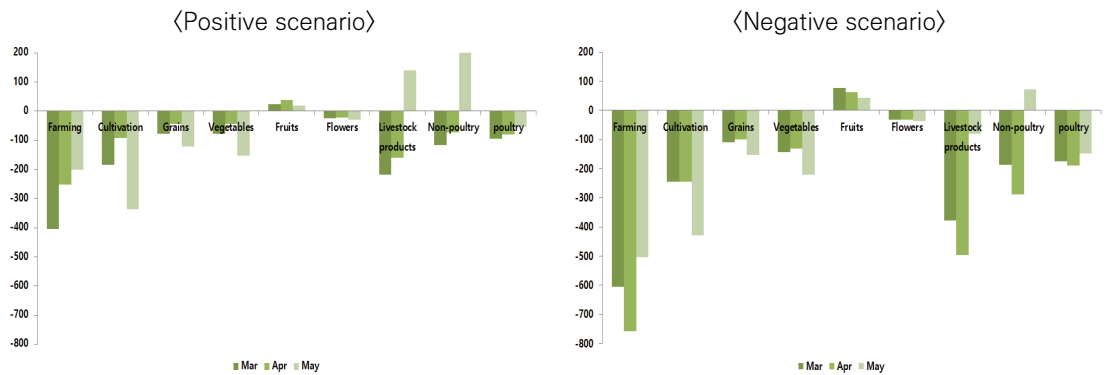
Category	Baseline	Positive			Negative		
		Mar	Apr	May	Mar	Apr	May
Total production	50,438	-0.8%	-0.5%	-0.4%	-1.2%	-1.5%	-1.0%
Cultivation	30,572	-0.6%	-0.3%	-1.1%	-0.8%	-0.8%	-1.4%
Livestock	19,866	-1.1%	-0.8%	0.7%	-1.9%	-2.5%	-0.4%

Note: % means changes versus the baselines.

Source: Ministry of Agriculture, Food, and Rural Affairs (MAFRA Annual Statistics).

<Figure 4> The pandemic’s impacts on agricultural production by month and by category

in KRW billions



03

Summary and Implications

Our analysis looks into the impacts of COVID-19 on the Korean agricultural market based on the KREI-KASMO model.

- The analysis uses the KREI-KASMO (KREI-Korea Agricultural Simulation Model) model to examine changes in Korean farming caused by the pandemic and macroeconomic changes.

The pandemic is likely to reduce the value of agricultural production by 0.4~1.0% compared with the baseline.

- The value of agricultural production is expected to drop by 0.4% (Scenario I) to 1.0% (Scenario III) versus the baseline.
- The effect of demand reduction at home and abroad due to the economic recession will be more significant than that of price increases from exchange rate hikes.
- Despite the economic recession, reduced demand for eating out, and suspension in school catering services, the pandemic's impacts are not likely significant as farming products are daily necessities.

A reduction in flower production will be the biggest, followed by poultry, vegetables, and grains. Meantime, non-poultry meat and fruit production will rise.

- Regarding flowers, as the demand decreased due to canceled school graduation events and performances amid the pandemic, the production is likely to reduce 5.7~7.0% compared with the baseline.
- Fruit production is likely to expand by 0.4~0.9% versus the baseline as the effect of import decrease and local fruit demand increase due to import price rises will be more significant than that of demand reduction caused by the economic recession.

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- Non-poultry meat production will increase 0.6~1.5% versus the baseline due to import reduction from the problems in the supply chain of major meat-producing countries and a sharp increase in domestic household demand.

Exchange rate hikes amid the pandemic will improve the trade balance by 4.4~7.6% compared with the baseline. Self-sufficiency will go up.

- Import value will drop by 3.4~5.5% versus the baseline in proportion to exchange rate hikes.
- The export value will increase by 0.0~1.4% versus the baseline in proportion to exchange rate hikes.
- Self-sufficiency will expand by 0.3~4.8%p due to a decrease of 3.1~4.8% in import value.

The value of agricultural production can change along with macroeconomic conditions caused by the pandemic.

- An increase in international meat prices due to problems of overseas meat-processing companies and Korea's expanded household demand for meat sharply raise meat production projections for May compared with April.
- If the economic recession lasts long, changes in agricultural labor markets and international logistics will shrink trades and negatively impact farming production.

Although the KREI-KASMO model is useful for the analysis of the pandemic's impacts, it has limitations as it does not reflect overseas agricultural supply and demand.

- The model cannot reflect the whole process from production to distribution caused by the impacts of international grains on the domestic market, international consumption contraction, and the domestic import and export market changes amid the pandemic. Therefore, our analysis uses various assumptions for a useful outcome.
- As the model fails to reflect macroeconomic uncertainties, this analysis considers various macroeconomic assumptions.
 - Recent projections made by overseas institutes and trends in exchange rates and crude oil are reflected in this analysis.

- It is impossible to reflect possible abnormal conditions under the unprecedented economic recession in our model.
- To improve accuracy in our impact analysis, we believe it is inevitable to develop a model that considers local and international supply and demand and market uncertainties.

Our model has limitations in impact analysis. If the pandemic spreads longer than expected, its impacts will expand.

- Despite the economic recession, reduced demand for eating out, and suspension in school catering services, the pandemic's impacts are not likely significant as farming products are necessities.
- The supply and demand for grains are stable at the moment. However, if concerns on international logistics, export restrictions, and import price increases due to exchange rate hikes become a reality, local food and livestock feed prices will rise.
 - If the pandemic lasts, supply and demand in agricultural products and food consumption patterns can change.
 - An increase in livestock feed prices can impact local livestock farmers' production and income and the supply and demand in the domestic meat market.
- Labor force shortage from restrictions on movement, labor cost increases, and international logistics' problems can cause shortages in fertilizers, seeds, and farming materials. Consequently, the agricultural production base can shrink and agro-economic indexes will change worse.
- If the economic recession continues, Korea may face fundamental issues such as problems in the supply of farming products and a decrease in demand.

Appendix

Analysis Result by Scenario

1. Scenario I's Analysis Result

- (Agricultural production) Even if macroeconomic indexes do not aggravate much amid the pandemic, the Korean economy will face a recession. Subsequently, domestic consumption will contract and its total agricultural production will drop by 0.4% compared with the baseline. Specifically, flower production will see the biggest drop of 5.7%, followed by vegetables, grains, and poultry. However, non-poultry and fruit production will rise by 1.5% and 0.4%, respectively.

〈Appendix Table 1〉 The impacts on Korean agricultural production in Scenario I

in KRW billions

Category	Baseline	Scenario I	Changes
Total agricultural production	50,438.4	50,249.7	-0.4% (-188.7)
Cultivation	30,572.4	30,236.9	-1.1% (-335.4)
Grains	10,974.0	10,855.5	-1.1% (-118.4)
Vegetables	10,968.2	10,811.4	-1.4% (-156.9)
Fruits	4,821.0	4,841.9	0.4% (20.8)
Flowers	522.1	492.3	-5.7% (-29.8)
Livestock	19,866.1	20,012.8	0.7% (146.7)
Non-poultry	14,394.1	14,607.6	1.5% (213.5)
Poultry	4,955.4	4,898.5	-1.1% (-56.9)

Source: Ministry of Agriculture, Food, and Rural Affairs (MAFRA Annual Statistics).

- (Export & import) The total import value and amount will drop by 3.1% and 3.4%, respectively, due to exchange rate hikes. The biggest decrease (4.7%) is in orange and tropical fruits, followed by five major vegetables and seven major grains. The total export value and amount are similar to their baselines. Five major vegetables will drop the largest, followed by five livestock products, six major fruits, and seven major grains. Meantime, other processed goods will increase.
- (Trade balance) Import reduction and export expansion due to exchange rate hikes will improve the trade balance by 4.4%.

- (Self-sufficiency) The self-sufficiency ratio of agricultural products will rise by 0.3%p helped by import reduction. The meat self-sufficiency will increase thanks to chicken and beef, while the grain self-sufficiency will increase by 0.2%p thanks to potato.

〈Appendix Table 2〉 The impacts on trade balance and self-sufficiency in Scenario I¹⁾

in KRW hundred millions, thousand tons

Category	Baseline	Scenario I	Changes ³⁾
Trade deficit (B-A)	222.6	212.9	-4.4%
Total import amount (A)	290.2	280.5	-3.4%
7 major grains	42.6	42.3	-0.7%
5 major vegetables	2.3	2.2	-3.9%
Fruits	13.3	12.7	-4.4%
6 major fruits	1.6	1.5	-2.7%
Orange/ tropical fruits	11.7	11.2	-4.7%
5 major livestock products	66.7	66.5	-0.3%
Total export amount (B)	67.6	67.5	0.0%
7 major grains	0.0	0.0	-0.2%
5 major vegetables	1.3	1.3	-2.4%
6 major fruits	1.2	1.2	-1.7%
5 major livestock products	1.8	1.8	-1.9%
Others	53.8	54.0	0.3%
Total import value	38,037.7	36,843.1	-3.1%
Total export value	3,409.0	3,442.1	1.0%
Agricultural product self-sufficiency ²⁾	70.8%	71.1%	0.3%p
Grains	45.4%	45.5%	0.2%p
Meat	64.7%	65.7%	1.1%p

Note 1) 7 major grains include rice, bean, maize, wheat, potato, sweet potato, and barley. 5 major vegetables include cabbage, white radish, garlic, onion, and dried chili. 6 major fruits include apple, grape, peach, tangerine, and persimmon. 5 major livestock products include beef, pork, chicken, egg, and dairy goods.

2) The self-sufficiency calculation formula is local production/ consumption*100. Feed grains are excluded from self-sufficiency calculation for grains and farming goods.

3) % means changes versus the baselines.

Source: Ministry of Agriculture, Food, and Rural Affairs (MAFRA Annual Statistics); Korea Agro-Fisheries & Food Trade Corporation (its export data of agricultural products).

2. Scenario II's Analysis Result

- (Agricultural production) If economies around the world fall in recession due to the pandemic, total agricultural production will drop by 0.9% versus the baseline because of consumption contraction. Specifically, the flower production will decrease the largest (-6.7%), followed by poultry, vegetables, and grains. However, fruit production will

increase 0.9%, helped by import decrease. Non-poultry production will expand 0.6% due to import decrease and local demand increase.

〈Appendix Table 3〉 The impacts on Korean agricultural production in Scenario II

in KRW billions

Category	Baseline	Scenario II	Changes
Total agricultural production	50,438.4	49,986.0	-0.9% (-452.5)
Cultivation	30,572.4	30,168.0	-1.3% (-404.3)
Grains	10,974.0	10,821.4	-1.4% (-152.6)
Vegetables	10,968.2	10,764.7	-1.9% (-203.6)
Fruits	4,821.0	4,866.3	0.9% (45.3)
Flowers	522.1	486.9	-6.7% (-35.2)
Livestock	19,866.1	19,817.9	-0.2% (-48.1)
Non-poultry	14,394.1	14,485.2	0.6% (91.2)
Poultry	4,955.4	4,833.7	-2.5% (-121.7)

Source: Ministry of Agriculture, Food, and Rural Affairs (its annual statistical data).

- (Export & import) The total import value and amount will drop 4.8% and 5.5%, respectively due to exchange rate hikes. Orange and tropical fruits will see the biggest drop at 7.2%, followed by five major vegetables, six major fruits, five livestock products, and seven major grains. The total export value and amount will increase 3.1% and 1.4%, respectively. The largest increase will be in five major vegetables, followed by six major fruits, and five livestock products. Meantime, the export of seven major grains and other processed goods will increase.
- (Trade balance) Import decrease and export increase due to exchange rate hikes are likely to improve the trade balance by 7.6%.
- (Self-sufficiency) The self-sufficiency of agricultural goods will rise by 0.4%p helped by a decrease in the import value. Meat self-sufficiency, including chicken and beef, will increase by 1.5%p. Grain self-sufficiency, including potato, will rise by 0.2%p.

〈Appendix Table 4〉 The impacts on trade balance and self-sufficiency in Scenario II ¹⁾

in KRW hundred millions, thousand tons

Category	Baseline	Scenario II	Changes ³⁾
Trade deficit(B-A)	222.6	205.7	-7.6%
Total import amount (A)	290.2	274.3	-5.5%
7 major grains	42.6	42.1	-1.1%
5 major vegetables	2.3	2.1	-5.8%
Fruits	13.3	12.4	-6.8%
6 major fruits	1.6	1.5	-4.1%
Orange/ tropical fruits	11.7	10.9	-7.2%
5 major livestock products	66.7	65.2	-2.2%
Total export amount (B)	67.6	68.5	1.4%
7 major grains	0.0	0.0	0.5%
5 major vegetables	1.3	1.3	-2.4%
6 major fruits	1.2	1.2	-0.9%
5 major livestock products	1.8	1.8	-0.7%
Others	53.8	54.9	2.0%
Total import value	38,037.7	36,220.8	-4.8%
Total export value	3,409.0	3,514.7	3.1%
Agricultural product self-sufficiency ²⁾	70.8%	71.2%	0.4%p
Grains	45.4%	45.6%	0.2%p
Meat	64.7%	66.2%	1.5%p

Note 1) 7 major grains include rice, bean, maize, wheat, potato, sweet potato, and barley. 5 major vegetables include cabbage, white radish, garlic, onion, and dried chili. 6 major fruits include apple, grape, peach, tangerine, and persimmon. 5 major livestock products include beef, pork, chicken, egg, and dairy goods.

2) The self-sufficiency calculation formula is local production/ consumption*100. Feed grains are excluded from self-sufficiency calculation for grains and farming goods.

3) % means changes versus the baselines.

Source: Ministry of Agriculture, Food, and Rural Affairs (MAFRA Annual Statistics); Korea Agro-Fisheries & Food Trade Corporation (its export data of agricultural products).

3. Scenario III's Analysis Result

- (Agricultural production) As the world economy goes into recession amid the pandemic, agricultural production in total will drop by 1.0% versus the baseline because of consumption contraction. Accurately, flower production will drop the largest at 7.0%, followed by poultry, vegetables, and grains. Non-poultry production will rise 0.5% due to import decrease and local demand increase. Fruit production will increase 0.9% due to import decrease.

〈Appendix Table 5〉 The impacts on Korean agricultural production in Scenario III

in KRW billions

Category	Baseline	Scenario III	Changes
Total value of agricultural production	50,438.4	49,925.1	-1.0% (-513.3)
Cultivation	30,572.4	30,147.4	-1.4% (-424.9)
Grains	10,974.0	10,821.4	-1.4% (-152.6)
Vegetables	10,968.2	10,751.9	-2.0% (-216.4)
Fruits	4,821.0	4,865.3	0.9% (44.3)
Flowers	522.1	485.7	-7.0% (-36.4)
Livestock products	19,866.1	19,777.6	-0.4% (-88.4)
Non-poultry	14,394.1	14,470.7	0.5% (76.6)
Poultry	4,955.4	4,808.6	-3.0% (-146.8)

Source: Ministry of Agriculture, Food, and Rural Affairs (MAFRA Annual Statistics).

- (Export & import) The total import value and amount will decrease 4.8% and 5.5% respectively due to exchange rate hikes. Orange and tropical fruits will see the biggest drop of 7.2%, followed by five major vegetables and five major livestock products. If trades are restricted, the total export amount is likely to reduce by 2.5%.
- (Trade balance) Export reduction due to export restrictions will worsen the trade balance by 1.2%p compared with Scenario II.
- (Self-sufficiency) The self-sufficiency of agricultural goods will rise by 0.4%p thanks to import reduction. The meat self-sufficiency, including chicken and beef, will rise by 1.5%p and the grain self-sufficiency including potato will increase by 0.2%p.

〈Appendix Table 6〉 The impacts on trade balance and self-sufficiency in Scenario III ¹⁾

in KRW hundred millions, thousand tons

Category	Baseline	Scenario III	Changes ³⁾
Trade deficit (B-A)	222.6	208.3	-6.4%
Total import amount (A)	290.2	274.2	-5.5%
7 major grains	42.6	42.1	-1.1%
5 major vegetables	2.3	2.1	-5.8%
Fruits	13.3	12.4	-6.8%
6 major fruits	1.6	1.5	-4.1%
Orange/ tropical fruits	11.7	10.9	-7.2%
5 major livestock products	66.7	65.1	-2.3%
Total export amount (B)	67.6	65.8	-2.5%
7 major grains	42.6	0.0	-1.6%
5 major vegetables	2.3	1.3	-3.0%
6 major fruits	1.6	1.2	-1.8%
5 major livestock products	66.7	1.7	-3.5%
Others	53.8	52.5	-2.5%
Total import value	38,037.7	36,218.6	-4.8%
Total export value	3,409.0	3,409.0	-1.0%
Agricultural product self-sufficiency ²⁾	70.8%	71.2%	0.4%p
Grains	45.4%	45.6%	0.2%p
Meat	64.7%	66.2%	1.5%p

Note 1) 7 major grains include rice, bean, maize, wheat, potato, sweet potato, and barley. 5 major vegetables include cabbage, white radish, garlic, onion, and dried chili. 6 major fruits include apple, grape, peach, tangerine, and persimmon. 5 major livestock products include beef, pork, chicken, egg, and dairy goods.

2) The self-sufficiency calculation formula is local production/ consumption*100. Feed grains are excluded from self-sufficiency calculation for grains and farming goods.

3) % means changes versus the baselines.

Source: Ministry of Agriculture, Food, and Rural Affairs (its annual statistical data); Korea Agro-Fisheries & Food Trade Corporation (its export data of agricultural products).

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