World Food Supply and Demand Projections to 2032:
Real prices of grains to decline in the medium to long term

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1. Introduction

Concerns have arisen about potential risks to the global supply of grains and other agricultural commodities since the COVID-19 outbreak in 2020. The situation has become further complicated by Russia's invasion of Ukraine in February 2022, adding more uncertainty to global agricultural markets as well as food supply and demand. The world demand for food is on the rise, particularly in emerging and developing countries, due to their growing populations and economic expansion. Concurrently, advances in agricultural technology have led to increased productivity (yield per unit area, etc.), resulting in a rise in the production of grains and oilseed crops not only in developed countries, but also in developing ones. However, uncertainty surrounding the global supply and demand of food has been escalating in recent years due to a variety of factors, including weather conditions, disease outbreaks, and disputes. Japan's demand for food has been growing due to increasingly diverse and sophisticated dietary habits, with a heavy reliance on imports for a significant portion of its food supply, particularly feed grains and oilseeds like soybeans, essential for producing livestock products and vegetable oils. Therefore, conducting our own quantitative analysis of global food supply and demand trends and future projections is of paramount importance in ensuring Japan's food security, maintaining a stable domestic food supply, and formulating effective food and agricultural policies.

To this end, the Policy Research Institute, Ministry of Agriculture, Forestry and Fisheries (PRIMAFF) has enhanced and developed the "World Food Supply and Demand Model." Since 2008, the institute has been annually forecasting and analyzing trends in global food supply and demand for the next decade, and publicizing the results. The institute published its "World food supply and demand projections to 2032" (hereinafter referred to as the "2032 Projections") in March 2023, using 2020 as the base year (three-year average for the period from 2019 to 2021). The present article provides a summary of these projections. For more detailed information, please refer to the "World food supply and demand projections to 2032" and "Current Trends and Medium- to Long-term Projections for World Food Supply and Demand." [1]

2. Characteristics of the World Food Supply and Demand Model

The World Food Supply and Demand Model is predicated on future projections of macroeconomic indicators such as total population and economic growth rates in the coming decade. It employs a "large-scaled simultaneous equations model for supply-demand balance," which balances the supply and demand for each of the 20 key agricultural commodities (including grains and livestock products) annually, until the target year of 2032. This model treats the entire globe as a large single market, with prices used as a medium, and is composed of approximately 6,000 equations. The forecasted items in the World Food Supply and Demand Model include production volume, consumption volume, net exports (or net imports) by commodity and region, and international reference prices (both real and nominal) by commodity. The aforementioned 20 commodities comprise of six types of arable crops (wheat, corn, rice, other coarse grains, soybeans, other oilseeds); five types of meat and poultry products (beef, pork, chicken meat, mutton, hen eggs); four processed products from arable crops (soybean meal, other oil meals, soybean oil, other vegetable oils); and five dairy products (raw milk, butter, skimmed milk powder, cheese, and whole milk powder).

3. Projection results from the 2032 Food Supply and Demand Outlook

(1) Assumptions for the 2032 Food Supply and Demand Outlook

The World Food Supply and Demand Model derives its projections of global food supply and demand from calculations based on macroeconomic indicators. These include medium-level estimates from the UN's 2022 World Population Prospects, and the International Monetary Fund's (IMF) World Economic Outlook from October 2022 and January 2023.

This year's future projections estimate global food supply and demand for 2032. According to the UN's medium-scenario projection, the total population is expected to primarily increase in emerging and developing countries in South Asia and Sub-Saharan Africa. By 2032, the global population is projected to reach 8.68 billion, an increase of 10.9% from the base year. The medium-scenario projection indicates that the annual average growth rate of the global population, 1.1% over the past decade, is expected to decrease to 0.9% over the next decade. The total population growth rate in Sub-Saharan Africa, an annual average

of 2.9% over the past decade, is expected to slightly decrease to 2.6% over the next decade. Furthermore, population declines are projected not only in Japan, but also in the EU and South Korea. China's population is anticipated to reach its peak and then start declining, while India is projected to become the most populous country in the world.

Projections for future economic growth are based on resources such as the IMF's economic outlook. The uncertainty surrounding Russia's invasion of Ukraine and its widespread impact has led to expectations of a slowdown in global economic growth. This slowdown is anticipated not only in developed countries, but also in emerging and developing nations, due to high inflation triggered by rising energy and resource prices, as well as disruptions in supply chains. The projected rate of economic growth in both developed and developing countries is expected to be slower than before the COVID-19 pandemic. In particular, China is not expected to return to high levels of economic growth, even after recovering from the pandemic. Therefore, the average annual growth rate over the next decade is projected to remain at 4.6%. In contrast, India is forecasted to maintain robust economic growth, with an average annual growth rate of 6.6% over the next ten years. Furthermore, based on the IMF's economic outlook and other sources, the real GDP per capita for the world is projected to increase to US$13,236 by 2032. This represents an increase of 26.8% from the base year.

Building upon these premises, the projections in the next decade for global food supply and demand, as per the World Food Supply and Demand Model, are essentially baseline forecasts that assume each country will uphold its current policies, and that weather patterns will follow typical trends.

(2) Grain and Oilseed Crop Price Trends and Future Projections

Concerning the recent trends in grain and soybean prices, they remained stable at low levels until the end of 2019, thanks to the anticipation of a bountiful harvest. However, in 2020, these prices experienced significant fluctuations due to the impact of COVID-19, and disruptions in the supply chain. Furthermore, adverse weather conditions such as high temperatures and drought persisted in major producing regions in North and South America. All this uncertainty was further amplified by Russia's invasion into Ukraine in February 2022. Coupled with soaring energy and resource prices, these factors propelled international grain and soybean prices to their highest levels in approximately a decade. However, they regained some stability towards the end of 2022 and returned to their levels prior to the Ukraine invasion, although they continued to hover in the high price range.

Looking ahead, based on the aforementioned IMF's economic outlook and other sources, it is anticipated that the global economy will experience a slower growth rate than before the onset of COVID-19. This slowdown is expected not only in developed countries but also in many developing nations, resulting in a more moderate economic growth compared to the past decade. Consequently, future growth in global food demand is expected to decelerate compared to previous years. This will slow down the global demand for grains and soybeans, which underpins the lower price projections for these commodities. This deceleration is expected to be seen in emerging countries as well, including China. Despite this, demand for food and feed will continue to rise gradually due to population growth and other factors in developing regions such as South Asia and Africa, as well as relative improvements in income levels in emerging and developing countries. However, this growth is expected to be more gradual than before the COVID-19 outbreak.

The global consumption of grains, encompassing both food and feed, is projected to rise from 2.72 billion tons (recorded in the base year), to 3.13 billion tons by 2032. The consumption of grains for feed purposes is anticipated to see an 18% increase compared to the base year, a rate higher than the expected 14% rise in grain consumption for human food and other non-feed uses. However, this growth is anticipated to be significantly lower than that observed in grain consumption for feed purposes over the past decade. On the supply side for grains and soybeans, despite a projected minor reduction in the cropland harvested area for all grains in the coming decade, production volumes are projected to continue their upward trend, primarily driven by improvements in productivity measures such as yield, per unit harvested area.

Consequently, the real prices of grains and soybeans are not anticipated to revert to the low levels observed prior to 2006, before the surge in resource and grain prices. However, the rate of increase is expected to be curtailed over the medium to long term, and their downward trend to become slightly more pronounced. Regarding the real prices of various grain and soybean commodities (Table 1), wheat prices are projected to experience a decline of 0.4% from the base year, despite the demand in Southeast Asia and Africa. Corn prices are expected to decrease by 0.5% from the base year due to a deceleration in demand growth for feedstuffs, influenced by slower economic expansion in China among

Table 1. Projected Changes in Real Prices of Grains and Soybeans

Commodities	2032
	Changes in real prices (%)
Wheat	-0.4
Corn	-0.5
Rice	-0.9
Other grains	-0.8
Soybeans	0.4

Source: "World food supply and demand projections to 2032," Policy Research Institute, Ministry of Agriculture, Forestry and Fisheries.
Note: Changes in real prices projected for 2032 in comparison to 2020 (base year).

other countries. Other coarse grains (such as barley and sorghum) will see a 0.8% reduction from the base year, a decline greater than that of wheat and corn, due to a slowdown in feed demand growth. Despite robust demand in sub-Saharan Africa, rice prices are projected to decrease by 0.9% from the base year owing to slower demand growth in Asia, and an increase in net exports from countries like India. The real price of soybeans is projected to rise by 0.4% compared to the base year, but this rate of increase is expected to be more restrained than in previous years.

However, the ongoing uncertainty surrounding Russia's invasion of Ukraine, coupled with concerns about the deceleration of economic growth continues to cause disruptions in the supply chain and exert inflationary pressures. This is because both Russia and Ukraine are key exporters of grains and other commodities in the global agricultural market. Consequently, there is a lingering risk that prices for grains and other commodities may surge significantly in the short term beyond 2023. This could potentially exacerbate the deceleration of economic growth in many countries. Amidst this situation, the Policy Research Institute, Ministry of Agriculture, Forestry and Fisheries (PRIMAFF) plans to persistently analyze the trends in food supply and demand based on the most recent statistics and changes in conditions, and to provide future projections.

Note 1: "Outlook on World Food Supply and Demand for 2032," Policy Research Institute, Ministry of Agriculture, Forestry and Fisheries, March 2023
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