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What do we know about THE FUTURE OF FOOD SYSTEMS?

CHAPTER 32

What do we know about THE FUTURE OF RICE IN RELATION TO FOOD SYSTEMS?

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Key messages

- Global rice production remained more stable than maize and wheat production in recent years, while rice consumption continues to increase, albeit at a slower pace.
- Rice production and consumption are projected to increase worldwide, with Asia to continue as the world's leading source of rice through 2050.
- Southeast Asia's rice surplus will increase by 2040 by closing the exploitable yield gap by one-half.
- The global rice sector will experience an increasing economic surplus with faster productivity growth and will contribute to a decline in the number of undernourished children and people at risk of hunger.
- Demographic changes and rice trade policy reforms will be key drivers of rice demand and prices in different countries.

RECENT TRENDS AND CHALLENGES

Rice production increased significantly in the past five decades with the efforts of research centers and national governments (Mishra et al. 2022). Globally, rice production was more stable than maize and wheat production in the past two decades. An upward trend in rice consumption occurred during the same period, though growth slowed in recent years. Globally, about 90 percent of current rice production and 85 percent of both consumption and exports are from Asia, while Africa accounts for about 4 percent of production and 8 percent of consumption (USDA 2022). The world rice market remains thin, accounting for just 8–11 percent of global production. Rice prices are also more stable now than in the 1990s and 2000s.

The global rice sector faces a challenge in meeting future demand due to a growing population, which is expected to increase from 8.9 billion to 10.6 billion by 2050 (United Nations 2019). Such a growing population relies on rice for calories and nutrients, and meeting future rice demand requires an acceleration in productivity (Mishra et al. 2022). But prospects for future growth in production are uncertain as rice is susceptible to natural disasters. Furthermore, climate change is expected to have a serious impact on the rice sector by changing the patterns of droughts and floods and spreading more pests and diseases (Kruseman et al. 2020). Food security has also become more fragile since the COVID-19 pandemic, with some major rice-exporting countries occasionally restricting exports for food security reasons.

LATEST FORESIGHT RESEARCH

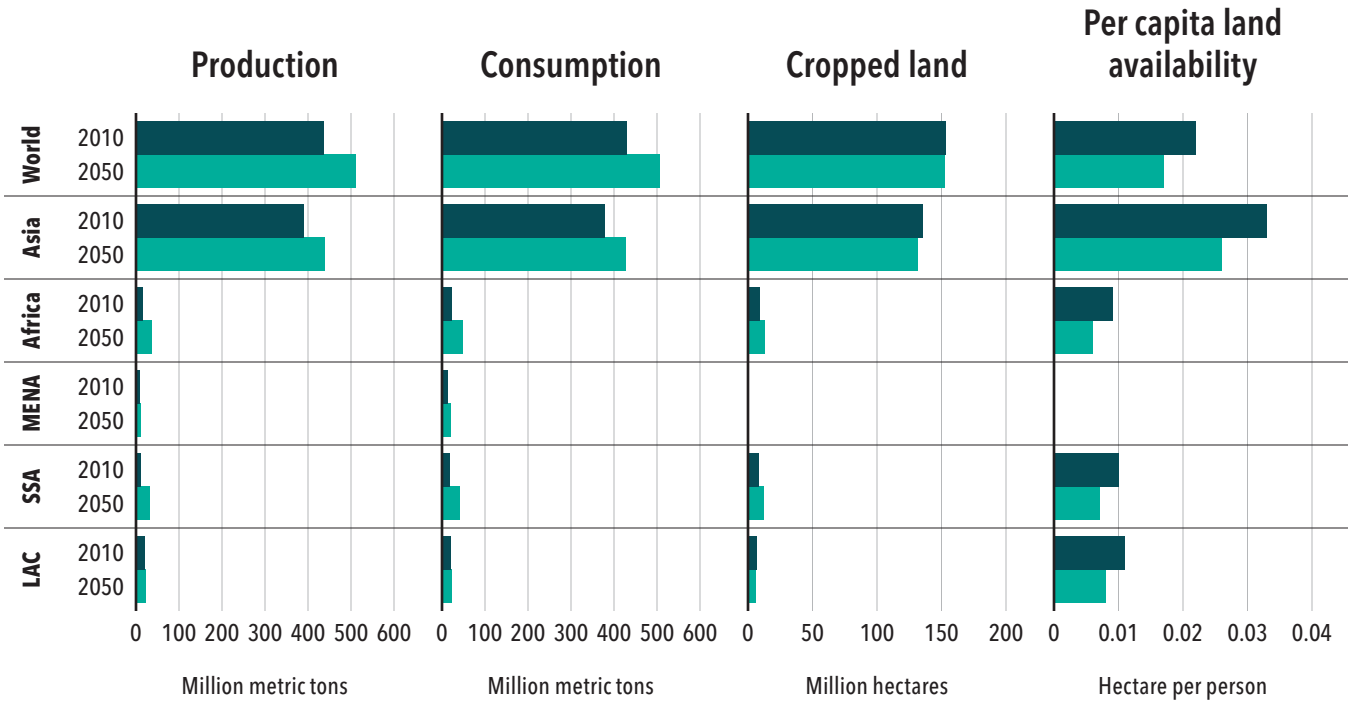
This brief reviews seven studies that provide forward-looking perspectives to support improving food security, reducing poverty, and initiating policy reform. Using the IMPACT-GLOBE model, Wiebe et al. (2021) analyzed the global and regional impacts of a 25 percent increase in yield growth in rice and 19 other food crops from 2015 to 2030 and examined the changes in the value of production and economywide income. Perspectives on rice and other major cereals systems based on the IMPACT model were also provided by Kruseman et al. (2020). The authors examined the impacts of six productivity enhancement scenarios on rice production, consumption, cropped land, and per capita land availability globally and across regions. Using the International Rice Research Institute (IRRI) Global Rice Model (IGRM), Pede et al. (2024) provided projections of supply and demand of rice economies over the next three decades, while Mishra et al. (2024) estimated the impact of the Russia-Ukraine war on fertilizer prices and the impacts of rising fertilizer prices on rice prices and trade.

Yuan et al. (2022) focused on the impact of rice production potential on rice surplus by 2040 in six Southeast Asian countries. The authors estimated the yield potential for irrigated and rainfed lowland rice and per capita rice demand based on the relative change in their average values between 2019–2020 and 2040. They compared the current yield base scenario with continuation of the current yield trend and full and half closures of the exploitable yield gap. At a country level, Mottaleb et al. (2021) estimated the total consumption of rice and wheat and other food commodities in Uganda in 2030 using the Living Standards Measurement Study datasets. Their analysis simulated three scenarios based on high, medium, and low fertility rates of population growth. From the perspective of rice trade policy reform, Balié and Valera (2020) used the IGRM in analyzing rice tariffication scenarios in the Philippines combined with higher yield and support price scenarios to quantify the potential impacts on prices, production, consumption, and imports by 2025.

Figure 1 displays projections of global rice production, consumption, cropped land, and per capita availability of cropped land (Kruseman et al. 2020). Under the reference scenario with climate, global rice production and consumption are projected to increase by 18 percent from 2010 to 2050 (Kruseman et al. 2020). The projected increase in global rice production and consumption is mainly attributed to population growth (Kruseman et al. 2020). Asia is expected to be the world's leading source of rice as production and consumption are expected to reach 439 million and 427 million metric tons in 2050, respectively. In the case of Africa, Kruseman et al. (2020) showed that the region's rice consumption would double by 2050 because of changing diets driven by higher income.

According to the faster agricultural productivity growth scenario in Wiebe et al. (2021), global gross production value (GPV) of rice would increase by 75 percent, from US$95.9 billion in 2015 to US$129.2 billion in 2030. Because of the increase in GPV, economic surplus is

FIGURE 1 Projected production, consumption, cropped land, and per capita availability of cropped land



Source: Based on Kruseman et al. (2020).

Note: MENA = Middle East and North Africa, SSA = Sub-Saharan Africa, LAC = Latin America and the Caribbean.

estimated to reach as much as US$59.3 billion in 2030, while the global poverty rate would decline from 20.7 percent in 2015 to 18.8 percent in 2030. In terms of nutrition outcomes, Wiebe et al. (2021) estimated that faster productivity growth would lead to a reduction in global numbers of undernourished children by 361,000 (0.3 percent) and in the population at risk of hunger by 10.6 million (2.1 percent).

Using the IGRM, Pede et al. (2024) found that due to increasing population, an additional 75 million tons of rice will be needed in 2050 to meet global demand. The study noted potential in Africa, where both cultivated rice area (18.3 percent) and yields (55.3 percent) are expected to increase from 2022 to 2050. Asia is also projected to remain the major rice-producing region, albeit with lower increases in rice area (0.2 percent) and yields (8.0 percent). Using the same model, Mishra et al. (2024) estimated the impacts of increasing fertilizer prices due to the Russia-Ukraine war. Their findings show that yields would reduce by 0.5 percent to 1.3 percent, which would lead to a 7 percent to 23 percent increase in rice prices between 2022 and 2025. The increase in world fertilizer prices may have reduced harvests in the short term, but since their peak in April 2022, urea prices have plunged sharply.

Yuan et al. (2022) showed that, if the current yield stagnation in Southeast Asia continues until 2040, the self-sufficiency ratio (SSR) at a regional level would decline from 1.10 to 1.03, and the region's rice surplus would be nearly eliminated. Assuming a full closure of the exploitable yield gap by 2040, these authors estimated a regional SSR of 1.55 and a total rice surplus of 100 million tons. The Southeast Asia regional SSR would increase to 1.29, with the rice surplus estimated to reach as much as 54 million tons when half closure of the exploitable yield gap is assumed.

In their country-level foresight analysis, Mottaleb et al. (2021) projected that the combined total demand for rice and wheat in Uganda would significantly increase by 2030 in line with its projected increase in income and population. Taking into account adjustments in per capita consumption, the authors projected that the combined consumption of rice and wheat in 2030 would range between 3.9 million and 4.0 million tons for low and high fertility rates of population growth, respectively.

Assuming constant per capita consumption, they estimated that consumption of rice and wheat in 2030 would be in the vicinity of 1.3 million tons (low fertility) and 1.39 million tons (high fertility).

In the Philippines, the government started implementing its rice tariffication policy in March 2019. Under the tariffication and higher rice yield scenario, imports are estimated to reach 3 million tons by 2025 (Balié and Valera 2020), while farm and retail prices are expected to decline by 30.1 percent and 17.4 percent, respectively. The same scenario estimated that per capita and total rice consumption would reach 132 kilograms and 16 million tons, respectively.

KEY GAPS AND OPPORTUNITIES FOR FORESIGHT RESEARCH

The above analyses of the future of rice consumption and production assume the prevailing paradigm of feeding the world with abundant and cheap agricultural produce from sustained intensification. But the paradigm of agricultural research in the recent decade has been shifting to incorporate food systems, considering economic, social, and environmental sustainability with food and nutrition security under a climate change imperative. This has shifted the focus of funding for technological development and other innovations in the food system to healthy, affordable, and sustainably produced food. However, populations in developing and emerging economies continue to lack diet diversity, leading to micronutrient deficiencies (for example, iron and zinc). Thus, foresight research should give considerable attention to the analysis of the future of nutritional rice varieties: low-glycemic index rice, high-zinc rice, high-iron rice, and rice with high protein content. Existing studies on the impact of the increase in demand from population expansion and income growth are outdated and also need a fresh look.

Another major gap in foresight research is the estimation of impacts of existing rice trade policies currently in place in major rice markets, as well as trade agreements already set to take effect in the medium term for some countries. Studies also need to factor in the potential effects of disruptions caused by possible future pandemics, as well as more frequent natural disasters due to climate change.

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Related chapters on the future of food system drivers and impacts, regional and national perspectives, food commodities, and foresight tools are available in our Table of Contents.

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