



Munich Personal RePEc Archive

An Analysis of the COVID-19 and rice-based food security in Asia

Balié, Jean and Valera, Harold Glenn and Pede, Valerien

International Rice Research Institute

April 2020

Online at <https://mpra.ub.uni-muenchen.de/123690/>
MPRA Paper No. 123690, posted 20 Feb 2025 06:47 UTC

An Analysis of the COVID-19 and rice-based food security in Asia¹

Jean Balié, Harold Glenn Valera, Valerien O. Pedo
International Rice Research Institute, Philippines

* Corresponding author can be contacted at: j.balie@irri.org.

Abstract

This paper examines the main channels through which the COVID-19 health crisis could affect the rice-based food security in Asia. We highlight three major channels that require monitoring in the medium term: (i) shortage and/or rising labor cost, especially in low-mechanization countries, (ii) logistics, and (iii) capital flow or shortage of liquidity to the agricultural sector. We also document that the rice market fundamentals were robust, at least at the onset of the COVID-19 health crisis. However, we argue that the COVID-19 health crisis could impact food access, and more particularly rice demand, mainly because: the traditional distribution and logistics channels have been disrupted; employment has declined, and incomes have been suppressed; and food prices have already been negatively impacted in many countries.

Keywords: COVID-19, food security, economic slowdown, rice export ban, rice prices, Asia

¹ This paper was published as policy briefs by the International Rice Research Institute. Links: (a) <https://www.irri.org/news-and-events/news/covid19-threat-stability-rice-price-and-supply>, and (b) <https://www.irri.org/news-and-events/news/what-covid-19-led-global-economic-recession-could-mean-rice-based-food-security>.

1. Introduction

Governments around the world are contemplating an array of policy decisions or already implementing preventive measures to protect food supply, as they are realizing the multiple connections between the COVID-19 health crisis and the global and local food systems. In most cases, these measures are taken in autonomy and with little consideration for the global food systems and their interdependence. Understandably, governments feel a sense of urgency to act. This arises from the rapid spread of the health crisis and the exponential rate of contamination of people by the coronavirus. There are established linkages between health and food systems. However, these two concepts are not the same as they operate under different timescales and conditions. In times of crisis, there is a need to look at these concepts more comprehensively.

Meanwhile, an economic slowdown is now on the horizon due to the COVID-19 crisis. A recent World Bank (2020) report suggests that an economic slowdown in 2020 is inevitable, as suggested by its revised lower global growth forecast. This dark outlook deepens the hardship of people who have lost income due to the lockdown and economic stoppage. An economic slowdown has many negative impacts, but one of the most important is the fall in real income. A substantially lower disposable income can weaken food security among the poor, as people find it more difficult to afford the food they want. In Asia, where rice is the main food staple, it is expected that variations in income will impact rice demand. Specifically, falling income is expected to force poor people to shift to less expensive staples.

However, limited analyses of the impact of the COVID-19 health crisis on food security have been conducted so far. Most of those analyses provide a retrospective account of the previous epidemics, particularly Ebola and the Middle East respiratory syndrome (MERS). In a recent blog, for example, Fan (2020) explained that food and nutrition security

were negatively impacted by HIV/AIDS, Ebola and MERS. In terms of the impact on the rice sector, Fan (2020) documented that rice prices in 2014 in Guinea, Liberia and Sierra Leone rose by more than 30% while cassava price increased by 150% in Liberia when those countries were hit by the Ebola epidemic. In contrast, the experience of epidemics of some countries in the past may not have a significant impact. In South Korea, for example, Jung and Sung (2017) showed that the MERS outbreak did not have a statistically significant effect on grocery sales. There are also studies that examined the economic impacts of SARS and MERS, but their focus was mainly on the tourism, hospitality, and transportation sectors. For example, Joo et al. (2020) estimated that the 2015 MERS outbreak was correlated with a 2.1 million non-citizen visitors decline in South Korea, which is equivalent to tourism loss of about US \$2.6 billion. According to Joo et al. (2020), the estimated decline in non-citizen visitors was notably observed in the accommodation (US \$542 million), food and beverage service (US \$359 million), and transportation sectors (US \$106 million). Regarding the impact of SARS, a cross-country panel data analysis conducted by Keogh-Brown and Smith (2008) for a sample of SARS-affected countries showed that such an outbreak has significant economic effects due to the decline in consumer spending on hotels and restaurants.

With this background, the objective of this study is to examine the relationship between the COVID-19 and the rice-based food security in Asia. As of this writing, several countries around the world are beginning to bear the consequences of the COVID-19 on food security and the economy. The contribution of this paper is twofold. First, it examines key concepts that underpin the association between the COVID-19 and rice price and supply. To complement this analysis, a further contribution of the paper is the simulation of the potential impact of rice export bans scenarios using the IRRI Global Rice Model (IGRM).

Second, this study examines the extent to which the current economic slowdown may raise the demand for rice. A related question that we examine is whether the global rice system is capable of supplying this demand and can avert any negative impact on rice-based food security. The answers to these questions have important bearing on the type of policy interventions that governments should contemplate to address poverty and food security risks, especially in developing countries where large fractions of the population are already suffering from limited or erratic access to health care and other essential services.

The rest of the study is organized as follows. Section 2 provides a description of the data and modelling procedure for simulation rice export ban scenarios. Section 3 discusses the descriptive and simulation results. Section 4 presents conclusions and policy implications.

2. Data and modelling procedure

To address the first objective of this study, we first rely on key statistics of the global rice markets, such as world rice consumption, production, stock and trade. We also present selected rice statistics for China and India. Data were obtained from the USDA Production, Supply and Distribution (PSD) database.

Next, we accomplish our second objective by reporting historical and projected GDP growth for selected Asian countries obtained from the World Bank Development Indicators database and World Bank East Asia and Pacific Economic Update. We also utilize data on per capita rice consumption and retail prices of rice for selected Asian countries from FAOSTAT Food Balance database and GIEWS FPMA Tool of the FAO.

Next, we perform scenario analysis using a modified version of the IGRM. As previously used as an analytical framework for rice trade liberalization research for rice markets in Southeast Asia, Hoang and Myers (2015) described IGRM as a dynamic partial equilibrium framework with a structure similar to the University of Arkansas' well-known

Global Rice Arkansas Model (AGRM) (Wailes and Chavez, 2011). Accordingly, In we used IGRM to extend our simulation of the potential impact of the following: rice export ban scenarios:

Scenario 1: Assumes that only Vietnam implements a rice export ban

Scenario 2: Assumes that Vietnam and Cambodia impose rice export ban

Scenario 3: Assumes that Vietnam, Cambodia and India impose rice export ban

Scenario 4: Assumes rice export ban plus an increase in China's rice imports

The IGRM has four primary components for each country: supply, demand, trade, and price linkages. Production, initial stocks, and imports make up the supply. Rice yield, area, production, per capita consumption, ending stocks, beginning stocks, net imports, net exports, rice farm gate price, retail rice price, wholesale rice price, Thai 5% broken rice price, Vietnam rice export price, world urea price, and fertilizer use are included as endogenous variables. Domestic consumption, ending stock, and exports make up demand. The IGRM also includes macroeconomic indicators such as gross domestic product (GDP), GDP deflator, consumer price index, exchange rates, and total population. Ordinary least squares are used to estimate model equations. The version the IGRM used in this study spans the years 1990 to 2019.

3. Results and discussion

3.1. COVID-19 and the stability of rice price and supply

In Table 1 we show that the market fundamentals are robust. In the short term, there is no reason to expect supply problems. The last rice harvests were good or even better than expected globally. Stocks are high and much higher than what they were in 2008 and 2011. In China, which is both the main producing and importing country, the USDA estimates that

rice stocks (unused rice kept in storage) have reached a record of 113 million tons just below the level of annual consumption. In India, the second-largest consumer and the first world exporter of rice, stocks are sufficient to cover several months of consumption. Hence, a shortage of rice is unlikely in the short run.

Table 1: Main rice market indicators

Variable	2019/2020 (million MT)
World consumption	490
World production	499
World rice stock	182
World trade	44
China consumption	143
India consumption	102

Source: USDA-PSD.

However, there is a need to distinguish short term and medium-term issues. In the medium term, any shock on production that could result in a lower than expected harvest could trigger a price crisis. Likewise, a massive surge in demand fueled by panic buying and hoarding could also trigger a price rise in the medium term. Decisions like limiting the flow of rice within and between countries, including export bans and other trade restrictions as well as excessive buying, can all precipitate a surge in rice price in spite of good market fundamentals (see Table 1).

On the demand side the behavior of China requires attention. If the country decides to massively import for reasons related to a disappointing forecast on harvest or to build up strategic rice reserves, it could have considerable consequences on world markets. On the supply side, policy decisions aiming at keeping domestic prices low such as export bans or export restrictions could also result in price spikes. In India, there are growing concerns that the breakdown of the supply chain after 2 weeks of lockdown could cause a shortage of food as well as other essential goods in the market. The Indian government has decided to restrict the movement of non-essential goods, but the lack of clear definition of an essential good has

generated massive slowdown and, in some cases, interruption of the flow of goods including food.

Similarly, export restrictions or a dramatic increase of the international price of rice could have devastating effects in Africa, a continent that relies on imports to meet its food requirements, especially on rice. Nigeria imported 3.4 million metric tons of rice in 2019, making it the second largest buyer after China. The combination of supply and demand side effects could result in another price crisis in the rice sector after that of 2008 and 2011.

In Figure 1, we show the potential impact of export bans on the world reference price of rice (Thailand 5% broken price) under four scenarios, using the IRRI Global Rice Model (IGRM). When Vietnam and Cambodia impose export bans, world rice prices would increase by 19% (\$84/MT) and 23% (\$100/MT) respectively, from the baseline. In the scenario that India also bans exports, the price spike is more pronounced with world rice price rising by 52% (\$230/MT) from their base level. In the worst case scenario, rice price could spike well above the maximum level reached during the 2008 crisis. Therefore, price is the main variable that will determine if a rice crisis is looming or already underway.

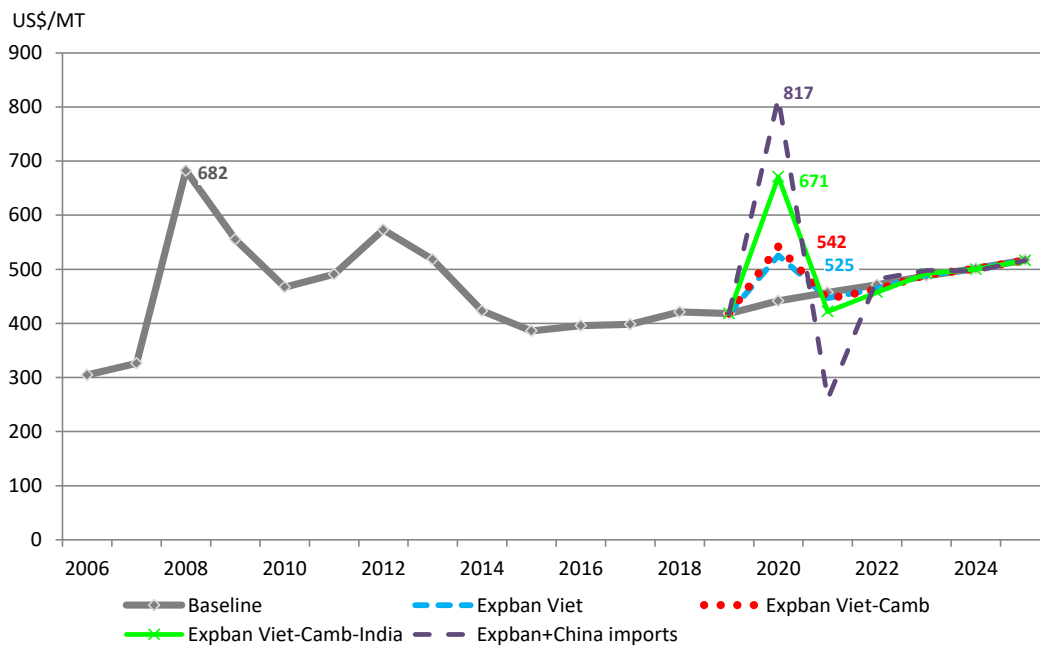


Figure 1. Price effects of various scenarios under COVID19. Authors' own work based on the IRRI Global Rice Model (IGRM).

In the medium term, there are three main channels that need to be monitored:

(i) The primary channel through rice production could be impacted is labor, due to shortage and/or rising labor cost, especially in countries where mechanization is low. If the COVID19 pandemic evolves into a protracted crisis, it could mean that the workforce available in agriculture could decline. This would result in higher costs of labor when this already represents a source lack of competitiveness in most countries (Philippines, Indonesia). A shortage of or prohibitive cost of labor could affect the critical stages of transplanting, weeding, and irrigation control (stages that are very labor intensive) and negatively impact the next harvest. The role of women in rice production is essential, in particular for transplanting and weeding. COVID-19 may limit the time they can spend in the field as they also are traditionally responsible for the care of children, the sick, and elderly. This also means they could have increased exposure to the virus, with ripple effects on rice production and nutrition (meal preparation). It is also the case that rice farmers tend to be older than

average in most Asian and African countries because youth have often migrated to urban areas. Older farmers are more vulnerable to the coronavirus.

(ii) The secondary channel to watch carefully is the logistics. The COVID-19 pandemic has primarily disrupted transport and distribution networks. These logistics issues could impact the supply of inputs for agriculture, like seeds and fertilizers. There is growing evidence that the supply chain in and outside agriculture could be massively impacted by the current crisis. This could have significant consequences on planting and crop management.

(iii) The third channel is the capital flow or shortage of liquidity to the agricultural sector. This could constraint credit to farmers for the growing season. The main risk relates to credit cost (short term interest rate) as not all governments can afford to design and implement a quantitative easing monetary policy to maintain the level of liquidities and keep interest rates low. It is well known that in the rice sector many types of credit are not transacted through a bank but are the result of informal lending. Farmers may have to face prohibitive interest rates in times of shortage of liquidity and volatile financial market conditions.

3.2. COVID-19 led Global Economic Recession and Rice-based Food Security in Asia

3.2.1. Rice consumption and economic slowdown

The COVID-19 pandemic, initially seen as a public health crisis, has triggered two types of GDP forecasts, one in which output continues to grow but at a slower rate than before, and one in which there is no growth but instead a period of fall in output, as shown in the recent projections by the World Bank and the International Monetary Fund. The former refers to economic slowdown, while the latter to economic downturn. An example of economic slowdown is the 2.3% GDP growth forecast for China in 2020 (see Figure 2). In contrast, the GDP growth forecast in 2020 for Thailand is -3.0%, which means that the economy is projected to contract.

In Figure 2, we capture past and projected economic slowdowns or downturns. During the 2008-2009 global financial crisis (GFC), economic slowdowns and downturns were noticeable for major Asian economies where rice plays an important role for food security and diets. In the case of India, real GDP growth slowed down in 2008 but recovered in the following year. Another major slowdown in these Asian countries was last seen in the aftermath of the 2011 financial crisis.

It is important to remember how fast the world’s attention turned to agriculture to address the food security crisis that resulted from those economic crises. While the current COVID-19 health crisis originates outside the financial system, the connections to and implications for the food systems and ultimately food security have been rapidly established (see IRRI, WFP and IFPRI for examples). Food systems have been and will continue to be impacted at multiple levels and in multiple ways through first order (drop or shift in demand, supply disruptions, labor shortage, trade restrictions, etc.) and second order economic effects (economic recessions, massive unemployment, inflation risks, etc.).

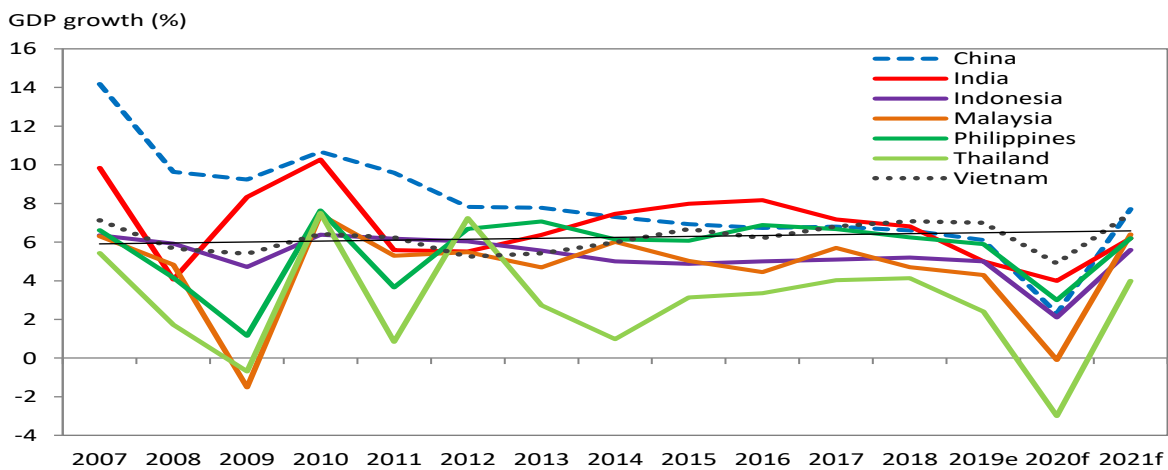


Figure 2. GDP growth: historical and projections, 2007-2021. Source: World Development Indicators database and World Bank East Asia and Pacific Economic Update April 2020. Notes: 2019e is GDP growth estimate. 2020f and 2021f GDP growth forecasts refer to a scenario of severe growth slowdown followed by a strong recovery.

The impact of the COVID-19 crisis on rice-based agri-food systems is expected to be much more serious and deeper than the 2008-2009 GFC. Containment efforts to address the pandemic have already severely disrupted farm supplies such as seed, fertilizer, and other agro-inputs. The lockdowns imposed in countries heavily impacted by the COVID-19 pandemic have also created important labor shortage and migration within countries (e.g. India). This could result in a higher rural wage rate if limited labor availability continues.

The lockdowns are also changing the behavior of consumers. They have been stockpiling food and other essential items. Consumers have also tended to change their spending expectations, anticipating a much longer negative financial impact of the crisis.

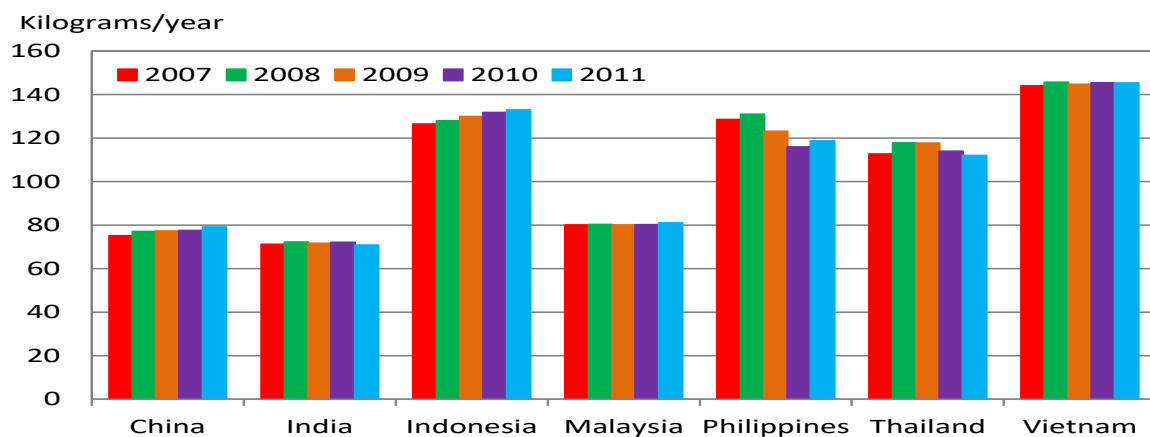


Figure 3. Per capita rice consumption in Asia. Source: FAOSTAT Food Balance database.

For the food security of Asian countries, one obvious consideration relates to the availability and affordability of rice. During the past episodes of global economic slowdowns and ensuing food crisis, per capita rice consumption rose in most of the rice-importing countries including China, Indonesia, Malaysia, and the Philippines (see Figure 3). Notice too that the economic slowdown in 2008 has coincided with increases in rice consumption in large rice-exporting countries such as India, Thailand, and Vietnam.

We argue that the COVID-19 pandemic could also impact food access, and more particularly rice demand, for three main reasons. First, the traditional distribution (retail, restaurants, and food stores) and logistic (ground, air and maritime transportation, as well as processing) channels have been disrupted. Second, employment has declined and incomes have been suppressed, especially for wage earners. Third, food prices have already been negatively impacted in many countries. The price of rice has increased in many Southeast Asian countries between early March and mid-April 2020 as reported in the popular media.

The combined effect of these forces could lead to a shift in rice demand. As the income of families will decline substantially, households will spend less on relatively more expensive food items like meat, milk, vegetables, and fruits. Hence, in most Asian countries where rice consumption per capita is already high, we could see both a moderate increase in rice consumption per capita and an overall increase in rice consumption due to the fact that more people will have fallen below the poverty line. For them, the only affordable food is likely to be rice. However, these poor consumers are already negatively affected by the price spikes for rice, which further compounds their purchasing power (see real price levels in Figure 4). These two mechanisms (contraction of incomes and higher rice prices) have the potential to worsen the food insecurity situation of the most vulnerable and poorest segments of the population.

Fortunately, at the onset of the COVID-19 health crisis, the rice market fundamentals were robust. There has been no reason to expect supply problems in the short-term, as pointed out in the earlier policy brief (see IRRI). Rice production in Asia has actually exceeded consumption in the last four years by an average of 34 million tons. The record production that the region has reached during this period was mostly driven by yield growth rather than area expansion. However, rice yields are plateauing in most countries. Further increases in

productivity will require investment in genetic improvement, best crop management practices, and post-harvest technologies.

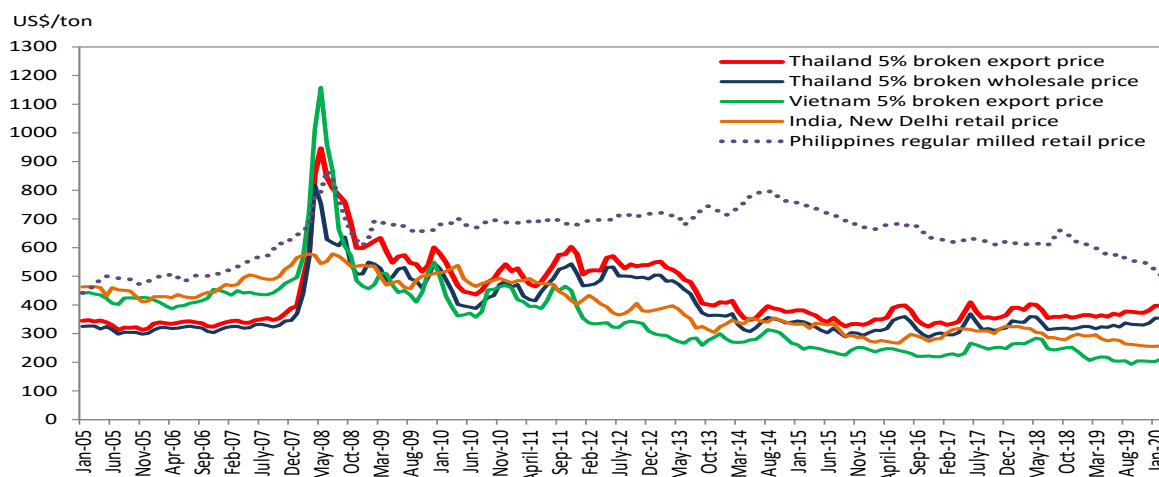


Figure 4. Trends in rice prices for selected countries. Source of data: GIEWS FPMA Tool.

5. Concluding remarks and policy implications

Lessons can be learned from the past global food price crises in 2008 and 2011. We know that there is a risk of collective action problems, whereby the decision made by one government to improve its own situation in the short term can make the situation worse for others. There is also the risk that when one government decides to adopt a “competitive” rather than “cooperative” policy, it will be followed by other governments, triggering a chain reaction. When governments take unilateral decisions they can fuel the problem of rising food prices. By contrast, we have also learned that policy coordination and trade facilitation can relax the tension in markets. This is the main reason that pushed the G20 to establish the Agricultural Market Information System, which is jointly implemented by FAO and OECD.

We need to carefully monitor policy decisions. We need to encourage governments to talk and coordinate their actions. The current global outbreak of COVID-19 has the potential

to disrupt agriculture and food systems, and the rice sector in particular. To address this challenge effectively, learning the lessons from the past is paramount.

It is equally important to recognize the need for informed and science-based decision making. Governments need to support the collection and dissemination of timely and credible information and its analysis by reputable institutions. Evidence can help governments avoid disproportionate responses to perceived threats that could aggravate the problem.

Ultimately, ill-conceived decisions and uncoordinated actions on food policy will invariably affect the food and nutrition security of the most vulnerable. The most concerning issues at the moment regard the lack of willingness for coordinated action among governments. The COVID-19 pandemic can also be turned into an opportunity to identify and address the major vulnerabilities and inequities in our food systems, with a view to make them more resilient to the next crisis.

Looking into the future, it is still unclear how bad the economic slowdown will be in 2020 and how long it will last. However, there is little doubt about its relevance for rice-based food security. Rice remains the anchor of food security in Asia. As we explained, rice demand is expected to rise. If this demand is not matched by a concurrent increase in supply, prices are likely to increase sharply. A scenario where rice supply would be less than expected in 2020 cannot be ruled out given the multiple threats that the COVID-19 pandemic and its ramifications have caused to global food systems. Under a scenario of prolonged lockdowns and restrictions of movements of people and goods, rice supply could be constrained by shortage of labor, especially in many poorly mechanized countries, and other disruption to input supplies. Critical activities could be affected including planting, transplanting, weeding, harvesting and even processing. As the past economic slowdowns have shown, a credit crunch is likely in the wake of the current COVID-19 crisis. This in turn

would further tighten funding for agriculture as well as for agricultural research for development. This is a sobering scenario as too many people remain in poverty in Asia, especially in rice-importing countries of the region.

Given the dangers of a global and long recession, our view is that policy makers and donors must consider the short-term challenges of the global rice sector. To tackle higher rice demand through adequate supply and to help bolster rice-based agri-food systems resilience against future economic shocks, it is important to revitalize rice yield growth. This requires increased investment in the global rice sector, especially in research and infrastructure development. Furthermore, the resilience of the poorest consumers and most vulnerable households needs to be addressed by providing adequate safety nets. These families would be protected when, and even before, the income shock threatens their food security. A suitable approach in this direction would be to expand existing cash transfer programs or to develop such programs where they do not exist yet. Policymakers, however, would have to ensure that safety nets are well-targeted to the poor and are endowed with enough fiscal resources.

The question is no longer whether the looming economic recession will depress income levels, generate widespread unemployment, and result in increased rice prices ultimately affecting food security but rather when. It is also very likely that this unprecedented crisis will translate into increased rice demand in Asian countries where rice dominates the traditional diets. These countries roughly represent 55% of the world population or around 4 billion people.

Dwindling investments to strengthen agricultural research and development in the recent past reflects donors' neglect of increasingly visible risks. The international community must recognize that investing in agriculture, and rice-based agri-food systems in particular, is a priority for the world stability once again. The COVID-19 pandemic compounds the

challenge posed by climate change to build more resilient rice-based agri-food systems. This is the time to bolster investments in the global rice sector to ensure sufficient food will continue to be available to feed the world. There is no time and space for complacency given the growing threat to food insecurity.

References

Fan, S. (2020, March 6). Preventing global food security crisis under COVID-19 emergency. Retrieve from <https://www.ifpri.org/blog/preventing-global-food-security-crisis-under-covid-19-emergency/>.

Hoang, H. K., & Meyers, W. H. (2015). Price stabilization and impacts of trade liberalization in the Southeast Asian rice market. *Food Policy*, 57, 26-39.
<https://doi.org/10.1016/j.foodpol.2015.07.009>

Joo, H., Maskery, B. A., Berro, A. D., Rotz, L. D., Lee, Y. K., & Brown, C. M. (2019). Korea's tourism-related industries. *Health Security*, 17(2), 100-108.
<https://doi.org/10.1089/hs.2018.0115>

Jung, E., & Sung, H. (2017). The influence of the Middle East Respiratory Syndrome outbreak on online and offline markets for retail sales. *Sustainability*, 9(3), 411.

Keogh-Brown, M. R., & Smith, R. D. (2008). The economic impact of SARS: How does the reality match the predictions? *Health Policy*, 88(1), 110-120

World Bank. (2020). World Bank East Asia and Pacific economic update, April 2020: East Asia and Pacific in the time of COVID-19. Washington, DC: World Bank.
<http://hdl.handle.net/10986/33477>.