

Closing the Food Gap: The Role of Structural Improvements in Agrofood Sector

Introduction

In the wake of lockdowns triggered by the global health crisis, there has been considerable disruption to food supply chains in the early part of 2020. Restrictions on labour mobility have resulted in lower harvesting activity and shutdowns of food processing facilities. Logistical bottlenecks have impeded the transportation of agricultural produce to the marketplace, while closure of international borders have affected the flows of food trade. A number of food exporting countries have also imposed export restrictions on key staple food items in the early period of the COVID-19 outbreak (CFS, 2020). As Governments imposed containment measures and movement restrictions, the ensuing food shortage fears have also prompted widespread panic buying and stocking up of groceries and supplies. These factors have contributed to the lower availability of food and a surge in food price inflation in some parts of the world, which has affected the cost of living especially among the more vulnerable segments of society. The disruptions from COVID-19 pandemic shock have re-ignited and amplified the impact from the existing structural weaknesses in the food security system around the globe including that of Malaysia.

Against this backdrop, this article seeks to provide an assessment of Malaysia's present landscape of food security and how it fares against other countries. It discusses the main sources of vulnerabilities, particularly from the availability aspect by analysing Malaysia's self-sufficiency and imports of food products, while highlighting the growing challenges in ensuring adequate food supply in the future. Finally, the article outlines how structural improvements and adoption of technology within the agrofood industry can play a role in improving the gaps in Malaysia's food security.

Apples to apples: Benchmarking Malaysia's performance in the Global Food Security Index


The overarching objective of achieving food security is to ensure that everyone in the population has adequate and affordable access to sufficient, safe and nutritious food to meet their dietary needs and preferences for an active and healthy life (World Food Summit, 1996). Food security is a multidimensional concept, comprising interrelated aspects of availability, affordability, quality and safety.¹ In recent years, this concept has been expanded to include natural resources and resilience, which assesses a country's exposure to the impact of climate change, alongside its susceptibility to natural resource risks and how countries are adapting to such risks. An international benchmarking exercise using the 2021 Global Food Security Index (GFSI)² shows that Malaysia has performed relatively well, placing 39th in its overall environment (Table 1), compared to 48th in the previous year. A key strength of Malaysia's food security ranking emanates from its better score and ranking in the 'affordability' aspect. This is partly due to the presence of food safety net programmes alongside price controls and subsidies for essential items (Table 2). The Food Bank Malaysia programme by the Ministry of Domestic Trade and Consumer Affairs, for example, distributes food assistance to the less fortunate.

¹ Adapted from The Economic Intelligence Unit's Global Food Security Index.

² GFSI is a dynamic quantitative and qualitative benchmarking model that covers aspects of food affordability, availability, quality and safety, and natural resources and resilience. The index is constructed from 59 unique indicators that measure the fundamental drivers of food security across a set of 113 countries (Source: Economist Intelligence Unit).

T1

Malaysia was Ranked Lower than Resource Scarce Peers

Selected Countries	2021 Rank in Global Food Security Index				
	Overall food security environment	Affordability	Availability	Quality and safety	Natural resources and resilience
 Ireland	1	2	8	3	3
 United Kingdom	3	4	11	14	6
 Germany	4	10	18	18	11
 Switzerland	5	16	4	20	13
 Netherlands	6	13	10	7	18
 Japan	8	11	5	30	16
 United States	9	20	16	2	17
 Israel	12	7	6	10	60
 Singapore	15	23	1	43	65
 New Zealand	16	6	38	33	5
 Qatar	24	31	9	29	91
 Chile	28	38	27	27	24
 Kuwait	30	44	12	20	93
 South Korea	32	43	17	44	43
 Australia	32	29	35	18	81
 China	34	49	2	56	64
 Bulgaria	38	33	51	34	26
 Malaysia	39	28	36	46	66
 Thailand	51	40	59	73	50
 Vietnam	61	64	48	61	78
 Philippines	64	57	67	68	88
 Indonesia	69	54	37	95	113
 India	71	80	29	74	40
 Cambodia	81	65	83	100	102

Source: Economist Intelligence Unit

T2

Malaysia Controlled Food Items and Price Ceilings

Food item	Amount	Ceiling price (RM)	Subsidy amount (RM)
Flour	1 kg	2.50	0.68
Cooking Oil	1 kg	1.35	0.83
Sugar (Coarse)	1 kg	2.84	0
Sugar (Refined)	1 kg	2.94	0
Rice	1 mt	1,200	600 ~ 750

Source: Adapted from Sabirzyanov, R et. al. (2021)

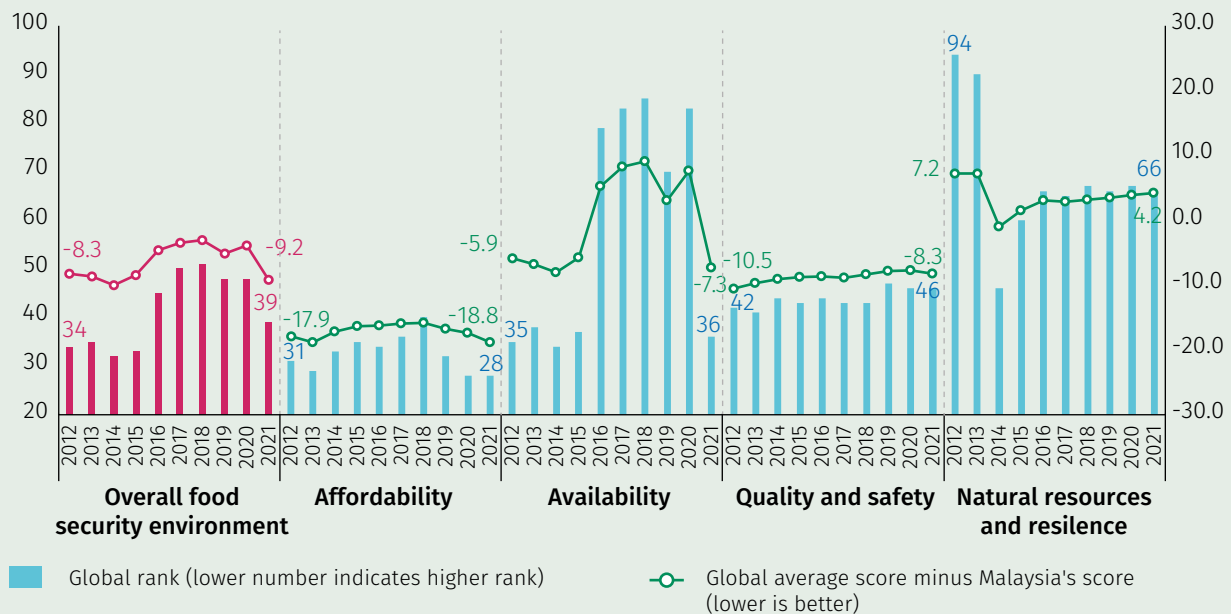
Nevertheless, Malaysia's overall position still lags behind many advanced and resource-scarce countries. For instance, among regional economies, Singapore was ranked first in the world in the 'availability' aspect given their high agriculture R&D activities, high commitment to food security and food access policies, and low political and social barriers to food access. As for Malaysia, despite a sharp improvement in 2021, the performance in the 'availability' aspect appears to be fragile, with the scores having dipped below global averages in the past five years (Chart 1). Meanwhile, there was an apparent deterioration in the 'quality and safety', as well as 'natural resources and resilience' aspects. A deeper examination into the indicators that made up the GFSI revealed that, for the 'availability' aspect, there is room to improve in agricultural research and development, food security and access policy commitments, agriculture infrastructure, volatility of agricultural production, and sufficiency of supply. As for the 'quality and safety' aspect, more effort is needed to ensure adequate nutritional standards, micronutrients, food variety and safety. Finally, weaknesses in the 'natural resources and resilience' aspect is particularly worrying as Malaysia has been performing poorly due to its high dependency on food imports and natural resources for economic output, as well as elevated exposure to climate-related risks and adverse weather phenomenon.

C1

Malaysia's ranking in the Global Food Security Index worsened since 2012

Global rank
(lower number indicates higher rank)

Global average score minus Malaysia's score
(lower is better)



Source: Economist Intelligence Unit, Bank Negara Malaysia

Putting food on the table: It's not just about rice

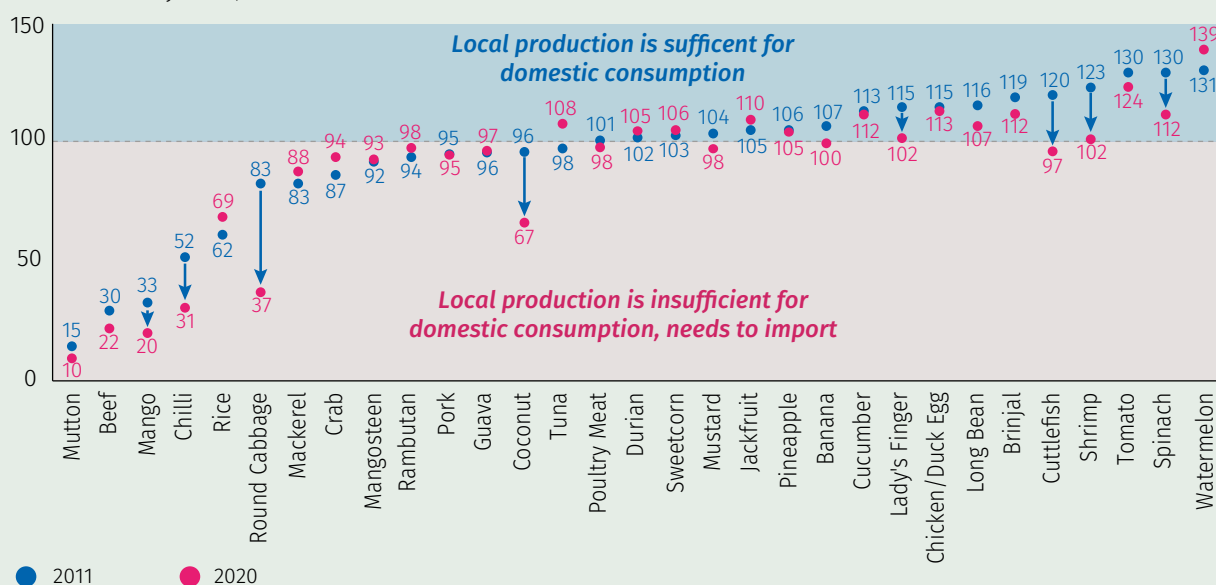
As an overarching strategy towards enhancing the overall food security environment, Malaysia has executed numerous agricultural-related policies, which have long been integral to the nation's economic planning framework and developmental agenda. Since 1984, three National Agricultural Policies (NAPs) were implemented, supporting the country's structural transformation from an agrarian into an industrial- and services-based economy. By raising agricultural productivity and expanding the cultivation of cash crops for exports, the first NAP (1984–1991) has contributed to hunger and poverty reduction as well as increases in incomes of farmers. The second NAP (1992–2010) focused on diversifying export crops and raising food production with the aim of achieving greater self-sufficiency in various food items.³ The third NAP (1998–2010) was a revised version of the NAP2 and reiterated the aim of addressing food security. In response to the 2008 food crisis⁴ that saw sharp surges in cereal prices, rice export restrictions and panic buying, the Government launched the National Food Security Policy (2008–2010) to address rice self-sufficiency. The National Agrofood Policy (2011–2020) was then introduced, with renewed focus on food production.

As a staple of the Malaysian diet, an adequate supply of rice has conventionally been viewed as synonymous with food security, and this is reflected in the long-standing focus on elevating rice production. For instance, 88% of agricultural subsidies and 45% of total agricultural budget spending were allocated to the rice production sector (World Bank, 2020). Despite this, the self-sufficiency ratio⁵ (SSR) for rice stands at 69% as at 2019. This indicates that domestic rice production remains inadequate to meet the nation's consumption and imports are needed to close the gap. While increasing the domestic rice production is crucial, it may not truly address Malaysia's food security concerns given the shift in food consumption pattern⁶ driven by population growth, higher income levels, urbanisation and changes in lifestyle.

C2

Self-Sufficiency of Many Food Items Have Deteriorated Over the Last Decade

Self-sufficiency ratio, %



*Note: SSR for rice is based on 2019 figure

Source: Supply and Utilisation Accounts Selected Agricultural Commodities Malaysia, 2011–2015, 2016–2020, Department of Statistics, Malaysia

³ Food security was, however, narrowly interpreted in terms of rice self-sufficiency in the policy (Jomo Kwame Sundaram and Tan Zhai Gen, 2019).

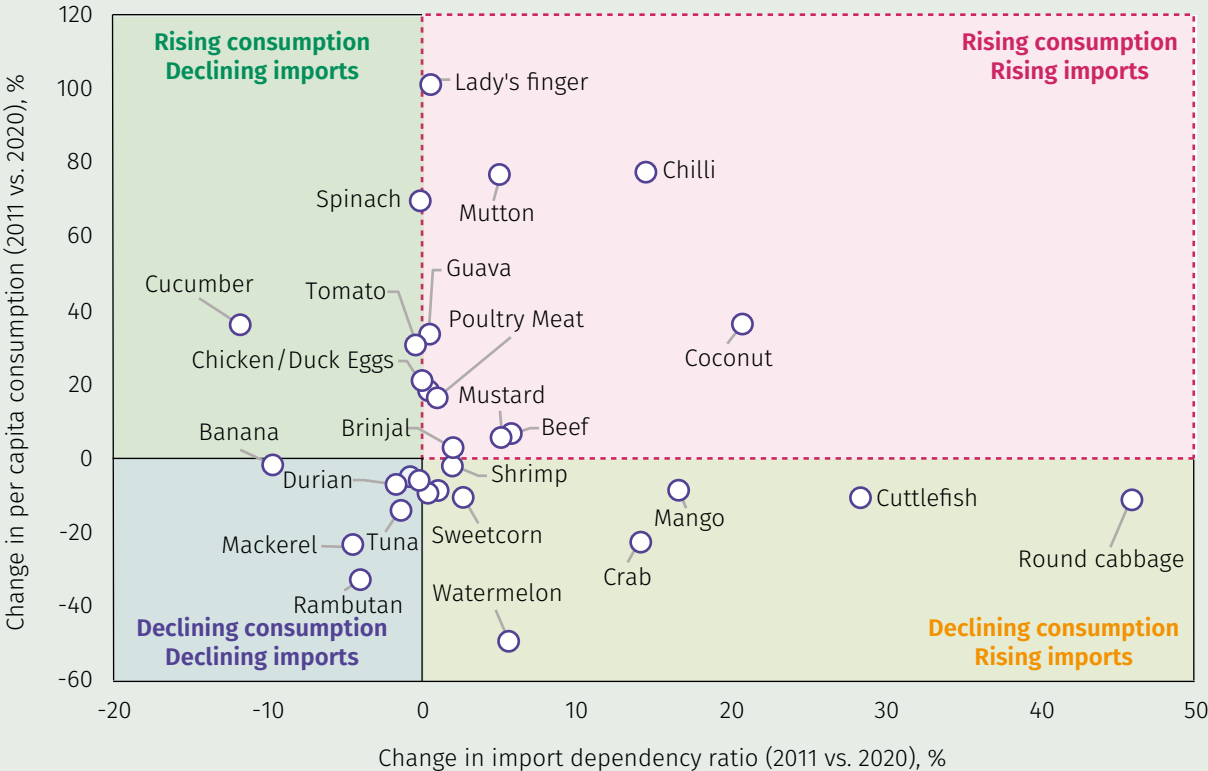
⁴ The 2008 food crisis was accompanied by sharp surges in prices of several commodities, particularly crude oil, due to sustained firm demand, supply concerns, weaker US dollar and to some extent, speculation in the commodity markets. Rice, the world's second-biggest food grain crop during the period, hit successive peaks due to worries over supply shortages, and has been associated with social concerns and export restrictions in several countries (Source: BNM Quarterly Bulletin 1Q 2008).

⁵ The SSR calculates the percentage of food consumed that is produced domestically. The higher the ratio, the higher the percentage of domestic production. An SSR of above 100% indicates that domestic food production is more than enough to satisfy its consumption needs. Conversely, an SSR of below 100% indicate how reliant a country's food consumption needs is on imports.

⁶ 2019 Household Expenditure Survey Report shows that, on average, Malaysian households spend more than twice as much on meats, bread and other cereals compared to rice. Rice only constitutes less than 1% of total household expenditure, due partly to the control on prices of rice. From 2015 to 2019, per capita consumption for rice declined from 87.6 kg per year to 73.9 kg per year. Tey, et al. (2008) shows that Malaysians' dietary preferences have changed where rice consumption declines while the intake of cereals and proteins have increased.

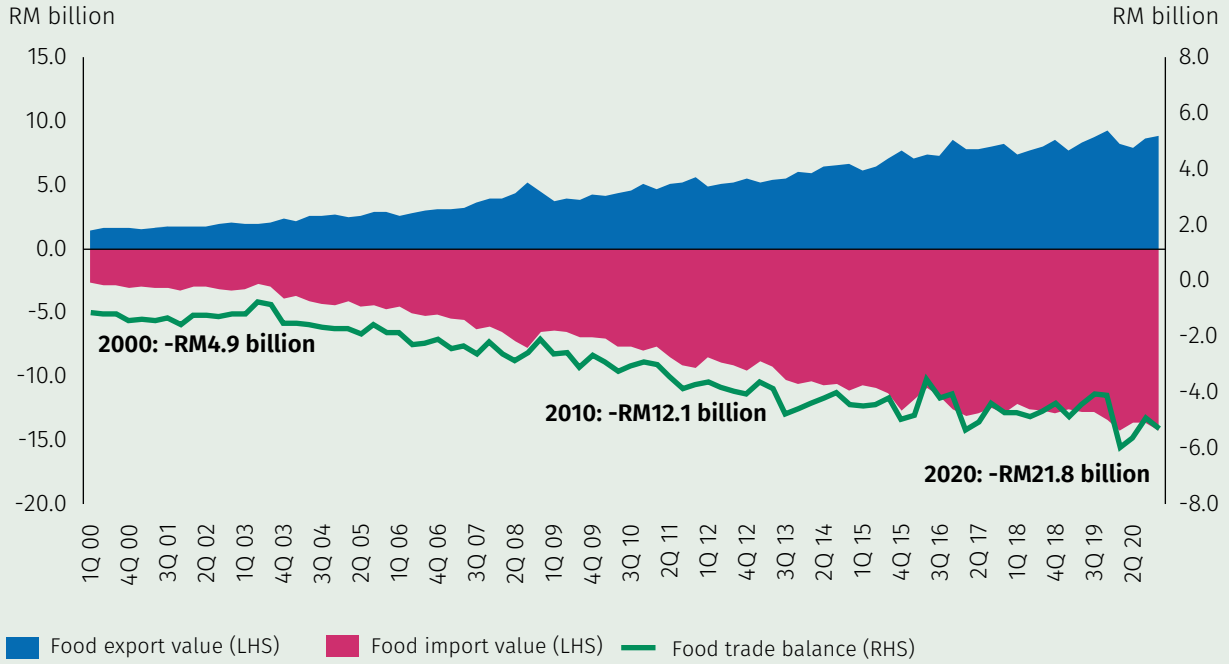
Beyond rice production, self-sufficiency levels of other food items have also deteriorated. Compared to 2011, the SSRs of 19 out of 31 selected food items have declined in 2020 (Chart 2). 13 out of 14 food items that were below self-sufficient levels in 2011, had remained so after a decade. From the perspective of imports, the share of imported content in total food supply amounts to 24%.⁷ In particular, the population have become increasingly reliant on imports to meet growing demand for meats and several fruits and vegetables (Chart 3). As a consequence of greater food import dependency and an underdeveloped agrofood sector, Malaysia has been recording larger food trade deficits over the years (Chart 4). From 2000 to 2020, the compounded annual growth rate (CAGR) of Malaysia's food trade deficit per capita was higher than that of gross national income (GNI) per capita (Chart 5). In other words, on average, the net food import bill of a Malaysian had actually grown faster than his or her income, despite the country's vast resources and latent potential in the agrofood industry. Nonetheless, achieving 100% SSR for all types of food may not be practical because the risks to food availability can itself be minimised through imports.⁸ As highlighted by Bank Negara Malaysia (2019),⁹ countries import food for various reasons: (i) to source food items that is not produced domestically; (ii) to meet consumers' changing demands; (iii) to acquire products that are of higher quality; (iv) to source inputs for local production (e.g. animal feedstock); and (v) to obtain similar goods that are relatively cheaper.

C3 More Food Items were Imported to Meet Higher Domestic Demand



C4

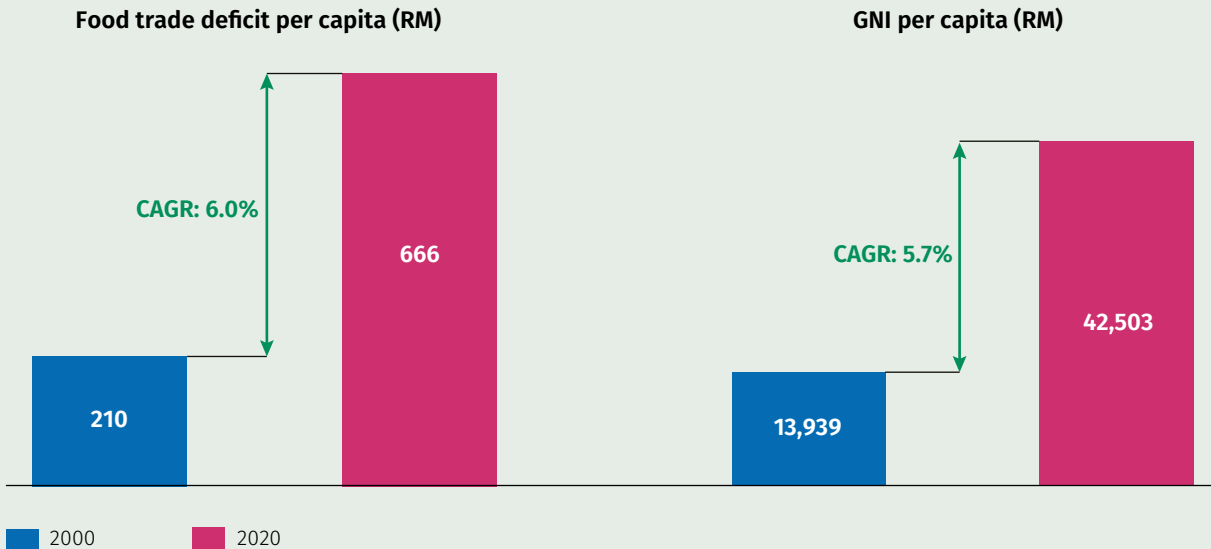
Malaysia's Food Trade Deficits Have Been on an Increasing Trend



Source: Haver Analytics and Department of Statistics, Malaysia

C5

Growth of Malaysia's Food Trade Deficit per Capita Outpaces Growth of GNI per Capita



Source: Haver Analytics, Department of Statistics, Malaysia, Economic Planning Unit (EPU) and Bank Negara Malaysia

Walking on eggshells: Key challenges confronting Malaysia's food security system

By 2050, the world population is projected to reach 9.8 billion persons,¹⁰ with the global demand for food to be at least 60% greater than it is today.¹¹ Under these circumstances there is a critical need to ensure that Malaysia's future food security is preserved by addressing the key challenges to supply risks, both domestically and externally:

1. Overconcentration of import sources for certain food items

Sourcing food supply through foreign trade offers various benefits, particularly if producing the similar food item domestically is more costly. What is concerning is the overconcentration of imports from a narrow source of host markets. For example, 70% of Malaysia's mutton supply is imported from Australia, while mango, coconut and beef were mainly imported from Thailand, Indonesia and India respectively.¹² This exposes the country to external supply risks, especially given the rising threats of climate change, uncertainties in food exports policy, and the potential surges in global demand driven by changes in dietary preferences and shifts in population dynamics.¹³

2. Increasing risks from regular and more extreme climate events

Physical risks stemming from climate change are transboundary, damaging not only domestic agricultural production but also that of other food exporting countries. In addition to direct destruction in agricultural assets (e.g. farms), extreme weather-related disasters and higher carbon emissions also affects the growth, production yields and nutritional value of crops. These will induce food price volatility and create inflationary pressure to food importing countries. As highlighted by the 2021 GFSI, Malaysia's particularly low scores under the 'natural resource and resilience' aspect exposes the country to three critical supply side issues relating to climate change.

Firstly, adverse weather phenomenon is projected to be more volatile amid the rise in global warming. A case in point, the Intergovernmental Panel on Climate Change (IPCC) in its 6th Assessment Report stated that extreme one-day precipitation events would become 1.5 times more frequent under a 1.5°C increase in global temperature scenario (Chart 6). The likelihood also becomes exponential as global temperature rises further. This suggests that agricultural and food supply disruptions in the future will only be more frequent and severe if no adaptive steps are taken today.

Secondly and relatedly, Southeast Asian countries are especially exposed to faster temperature rises and abrupt changes in rainfall patterns which would lead to land degradation and crop failures. In Malaysia alone, there were more than 50 natural disasters recorded over the past two decades, which have led to significant impact to lives and livelihood, particularly those in the agriculture sector. Between 1998 and 2018, the Malaysian economy sustained a total damage of approximately RM8 billion due to major floods and dry spells.¹⁴ Lastly, the geographic concentration of global grain production compounds the climate vulnerability. According to McKinsey Global Institute (2020), 60% of the world's grain supply is produced in just five countries (China, US, India, Brazil, and Argentina). A climate-induced supply shock would also trigger risks in the form of food export restriction and protectionist policies that further amplify the supply risks to importing countries.

¹⁰ 'World Population Prospects: The 2017 Revision', United Nations Department of Economic & Social Affairs.

¹¹ 'Food security and why it matters', World Economic Forum (2016).

¹² Supply & Utilisation Accounts Selected Agricultural Commodities 2016-2020, Department of Statistics, Malaysia

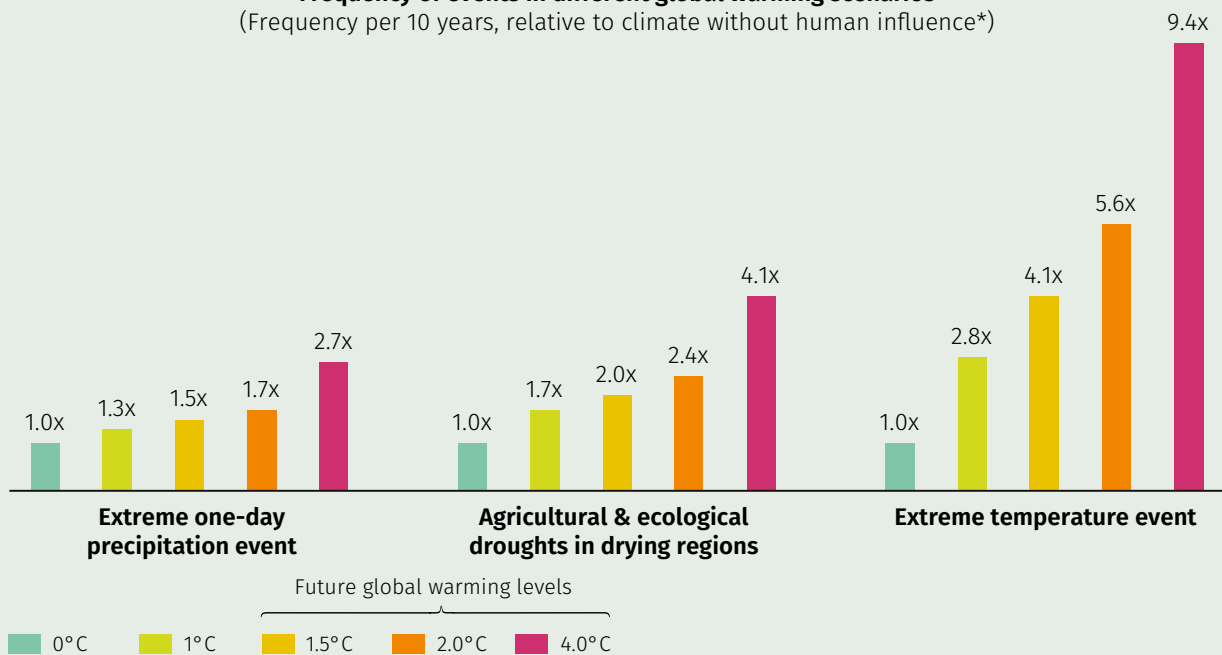
¹³ For example, population growth, along with urbanisation and increasing income levels in large economies such as China, have led to a rise in consumption of meat products and therefore a tightening of global food supply.

¹⁴ 'Climate Change Risks and Opportunities: Respond, Not React', BNM Annual Report 2019.

C6

Adverse Weather Phenomenon Induced by Global Warming are Projected to be More Frequent and More Extreme

Frequency of events in different global warming scenarios
(Frequency per 10 years, relative to climate without human influence*)



Note: *Likelihoods are midpoints around a range, 0°C refers to the period 1850-1900
Source: The Sixth Assessment Report of the United Nations Intergovernmental Panel on Climate Change (IPCC), 2021

3. Low productivity in non-rice agrofood industry

As of 2019, the value-added per worker in Malaysia’s agriculture sector was lower than the average of high income countries by 56%.¹⁵ Contributing to this relatively weak productivity is the predominance of small farmers¹⁶ within the domestic agrofood landscape, which impeded the sector from enjoying the benefits of economies of scale that would enhance productivity and reduce costs. From the operational perspective, it is often uneconomical for small farmers to mechanise due to their limited farm sizes,¹⁷ which makes them rely more on manual approach thereby exposing them to the persistent labour shortage problems that has been plaguing the industry for years. In terms of farming inputs, small farmers are more susceptible to cost fluctuations in fertiliser and feedstock. They also face limited access to R&D innovation, infrastructure and institutional support (Arshad, 2016). The lack of entrepreneurship intensifies their already weak bargaining power compared to other large-scale players and middlemen, such as millers and traders (World Bank, 2019).

4. Slow adoption in new technologies and smart farming techniques

The slow adoption in modern technology (e.g. vertical farming and Internet of Things) forgo effective solutions to counter the threats posed by climate change and structural challenges suffered by small farmers. For example, having a sensor-driven soil moisture monitoring system with automated irrigation can prevent plant and soil degradation, while optimising both water usage and human laborers. However, the domestic agrofood sector lags behind in fully harnessing the benefits offered by technological innovations, owing to lack of awareness, inadequate knowledge transfer to the local farmers,¹⁸ and the lack of capital to procure new technologies that are costly. These issues are especially prevalent among the small farmers. The situation is compounded by the low participation of youths in the agriculture sector, who are generally more entrepreneurial, technology-savvy and educated.¹⁹

¹⁵ Source: World Bank, BNM staff calculation.

¹⁶ Arshad (2016, February) pointed out that 97% of the fruits and vegetable, aquaculture and livestock farms were operated by small farmers, as at 2014.

¹⁷ For example, the average farm size for paddy is 1.1 hectares; vegetables, 1.0 hectares and fruits, 0.7 hectares. Source: Asan, Ibrahim Ngah, and Shri-Dewi (2018).

¹⁸ IDEAS (2018), for example, highlighted that farmers struggle to keep up with yearly output due to disease and weather uncertainties because of poor awareness and knowledge on the availability of modern technologies that can help manage these challenges.

¹⁹ KRI (2020) stated that agriculture and fisheries are the least preferred sectors among youth as more than half of the young workers do not consider agriculture and fisheries as their ideal sectors.

Food for thought: Policy considerations to improve food supply ecosystem

Though varying in scale and scope, many countries in the world face food security challenges with different set of corresponding solutions. For Malaysia, arguably, the key gap lies in the supply ecosystem. Of course, demand-side interventions are important too, especially in shaping preferences towards food consumption that is based on proper nutritional standards. Awareness programmes on public health issues or food wastage will continue to be useful in modifying behavioural decisions on nutritional intake.²⁰ Broader economic policies that could sustainably raise the income levels of Malaysians may also strengthen the overall ability for Malaysians to purchase food from both domestic sources and abroad. This section offers policy considerations that aim to not only address food security but also actions that could help in improving the food supply chain from farm to table, improve the wellbeing of farmers and boost economic growth.

(a) A clear and comprehensive set of policy targets

Food security targets should be clearly defined and reflect the current as well as the future dietary realities. This could avoid the risk of policy mismatch and help secure greater buy-in from the private sector stakeholders, who play an important role in modernising and diversifying the agrofood sector. Overemphasis on rice self-sufficiency should be replaced by nutritional needs and a pivot towards greater non-rice food production. For example, Singapore's "30 by 30" goal aims to produce 30% of its nutritional needs locally by 2030. Furthermore, greater focus on producing vegetables, fruits, animal proteins and fish products could potentially generate higher value-added at the farm level, with cascading positive spillovers along the food supply chain.

(b) Diversification of food import sources

The concentration risks that arise from relying on a select few external suppliers can be minimised by strengthening Malaysia's global procurement capabilities. The relevant government agencies should work closely with industry stakeholders to identify alternative sources of food products from a wide range of international markets, distributors and wholesalers. In times of supply disruptions, this would allow domestic importers to become nimble by securing purchase orders from other parties. In this regard, Malaysia must continue to pursue liberal trade policies and more regional and bilateral trade agreements.

(c) Make use of the latent potential in raising agri-food production

Broadly, Malaysia appears to have prioritized industrial crops (e.g. oil palm, rubber and cocoa) at the expense of food crops (Arshad, 2007). As a result, the country has been under-diversifying its plantation mix, where oil palm accounts for 70% of total cultivated area. Within the existing plantations, the intercropping of oil palm with banana, cassava and pineapple not only reduces fertiliser and herbicide usage but also help stabilise incomes of farmers. Idle land and abandoned buildings can also be utilised to grow a variety of food crops, which is made possible by rapid development in agritech such as hydroponic, indoor and vertical farming.

(d) Improve overall food safety

To address the low GFSI scores in the 'quality and safety' aspect, continued focus should be accorded towards greater adoption of good manufacturing practices (GMP) and halal certification in food processing and preparation. More frequent on-site inspections and laboratory testing of food samples are critical to ensure that Hazard Analysis and Critical Control Point (HACCP) protocols are adhered. Equally important is the development of a strong network of cold chain capabilities which encompasses the logistics, storage and distribution of fresh produce. These initiatives would not only increase the hygiene and safety of food, but also reduce wastage, minimise farm-to-consumer bottlenecks and uplift overall value-add across the supply chain.

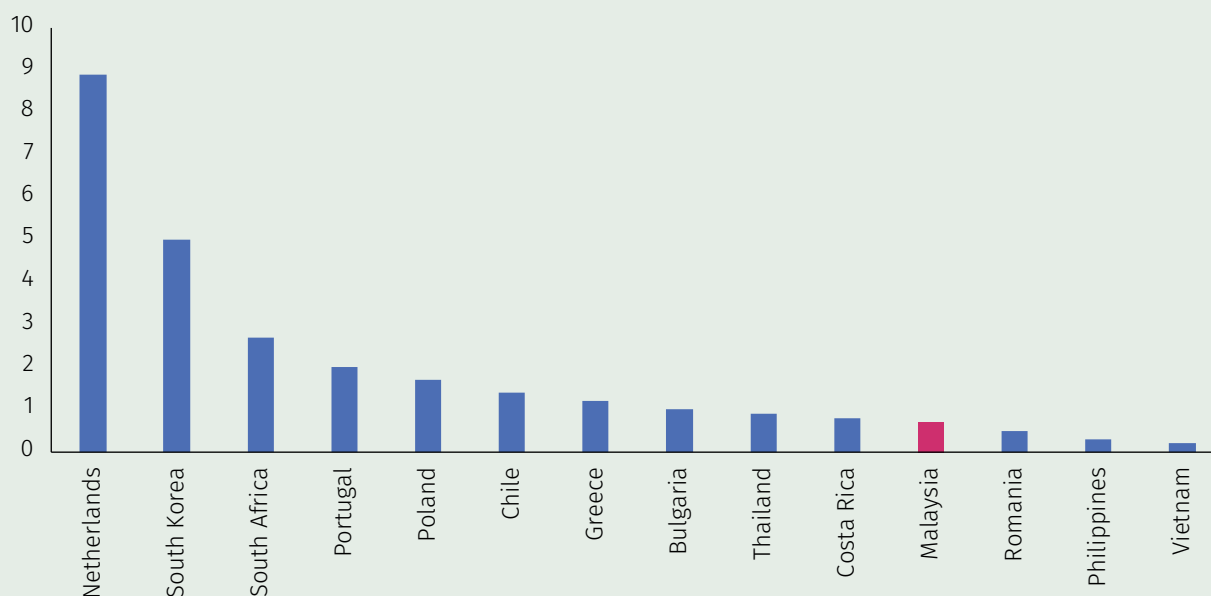
²⁰ In Malaysia, the Ministry of Health had revised the Malaysian Dietary Guidelines in 2020 to emphasise the greater daily intake of fresh fruits and vegetables as opposed to rice and other cereal products.

(e) Improve agricultural productivity through greater use of technology

Despite accounting for only 0.02% of world's total land mass (Malaysia: 0.2%), Netherlands is the world's second largest food exporter. The country's food production system is a result of intensive use of innovative technologies and relentless improvement made through R&D. Furthermore, the Netherlands accords strong emphasis on educating and training its agricultural workforce. In contrast, the agriculture R&D spending in Malaysia is relatively low (Chart 7), and is focused more towards industrial crops such as oil palm. Hence, Malaysia should emulate the approach to enhance productivity by improving the accessibility of new technologies to small farmers.

C7 Malaysia's R&D Spending in Agriculture Sector is Relatively Low

Gross Domestic Expenditure on R&D in Agriculture as Share of Agricultural GDP (%)*



*Note: Based on current local currency unit (LCU). Accounts for public and private sector R&D spending. R&D spending are as of 2017 for all countries, except for Philippines (2015) as well as South Korea, Costa Rica and Malaysia (2018).

Source: World Bank (2020), UNESCO, WDI

Specifically, climate smart and sustainable farming that preserve water, soil quality and biodiversity should be heavily promoted. The Dutch farmers, for example, are committed to *“producing twice as much food using half as many resources”*.²¹ Given the physical threat of climate change to natural capital,²² agricultural growth and productivity in the future will increasingly depend on technology, and rely less on conventional factors of production such as land and labour. In this regard, continued investments on resource-optimising farming technologies (e.g. smart irrigation system, drones) should be emphasised. R&D should also be directed towards improving sustainable farming practices, enhancing crop resilience against climate change and diseases, as well as yield enhancements. Complementing this is the continued role of financial sector and well as the financing support initiatives (e.g. BNM's Agrofood Facility) in catalysing technology adoption among SMEs and agropreneurs. To facilitate financial institutions in assessing the viability and risks associated with agricultural projects, specific guiding principles and use cases relating to the adoption of climate-smart technologies and sustainable practices that contribute to climate change mitigation and adaptation have also been included in 'The Climate Change and Principle-based Taxonomy' issued by the Joint Committee on Climate Change (JC3).

²¹ Source: National Geographic (2017).

²² Natural capital is defined as the stock of natural assets which include geology, soil, air, water and all living things (Source: World Forum on Natural Capital).

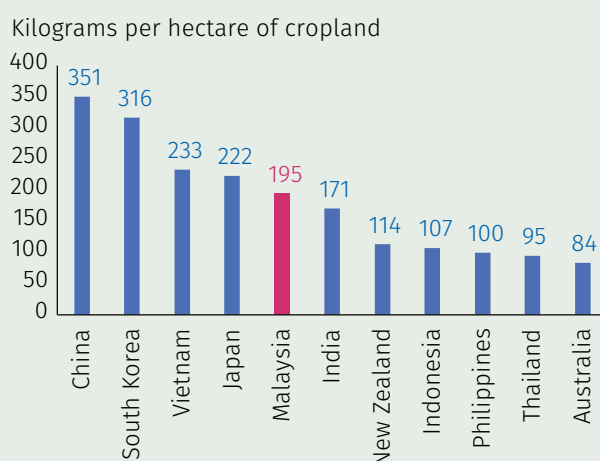
(f) Expand domestic production of organic fertiliser and feedstock

The high dependence on fertiliser and animal feedstock imports such as corn and soybean meal, has been one of the key weak links in the domestic agrofood ecosystem. Within the Asia Pacific region, Malaysia is an intensive user of fertiliser and has been importing substantial quantities to fulfil its agricultural needs (Chart 8). This makes the country susceptible to fertiliser price fluctuations and weaken the Federal Government's finance through higher allocation of fertiliser subsidies to the local farmers. Development of a circular economy within oil palm industry can help to close this gap, with greater emphasis on producing organic fertiliser and feedstock using oil palm biomass and waste such as fronds, leaves and kernel meal.

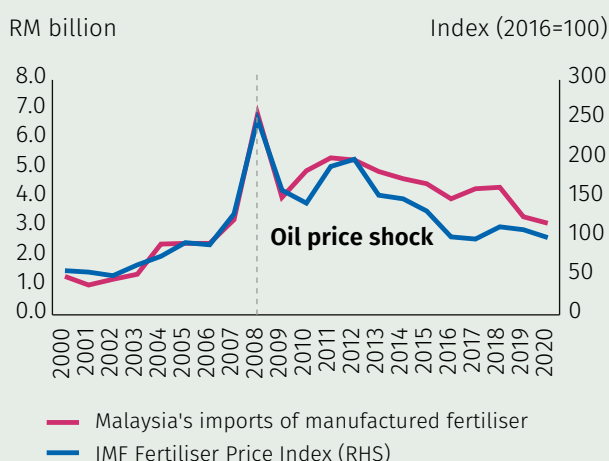
C8

Malaysia is an Intensive User of Fertiliser, and its Imports are Susceptible to Volatile International Price Movements

Fertiliser consumption in selected countries, 2019



Fertiliser imports in Malaysia and Fertiliser Price Index



Note: The primary nutrients of fertiliser are nitrogen, phosphorus, and potassium
Source: FAOSTAT, International Monetary Fund and Department of Statistics, Malaysia

(g) Incentivise quality investments in agrofood sector

Attracting quality investments in the agrofood industry will raise economic complexity and create high-value jobs in the agrofood sector. For example, under the National Investment Aspirations (NIAs) framework, investments in both upstream (e.g. farming) or downstream (e.g. processing) segments that have extensive supply linkages within the domestic agrofood industry would be promoted to encourage knowledge transfer and strengthen the overall supply ecosystem. An important aspect in operationalising the NIAs is that investment incentives policy should shift away from predominantly targeting specific sectors, towards encouraging high-value activities such as advanced R&D and machinery and equipment (e.g. robotics, drones, IR4.0-related technologies).

Conclusion

The COVID-19 pandemic has brought to the foreground the issue of food security and its susceptibility to supply chain disruptions in many parts of the world, with climate change posing an ever-growing threat to its resiliency going forward. Closer to home, Malaysia's existing food supply ecosystem has been further compromised by several structural vulnerabilities. In addition to its high reliance on food imports, Malaysia is also exposed to extreme climate events amid low productivity and slow adoption of new technologies within the agrofood industry. If not managed well, these vulnerabilities could affect adequacy and pricing of food during period of shocks. Urgent policy attention and supply side measures to transform the agrofood industry should therefore be undertaken to close the gap, thereby ensuring sustainable and equitable economic growth.

References

- Arvis, B., et al., (2020). 'Consequences of global climate change and their impacts on Europe — a view on agricultural commodities', Report for the European Environment Agency, Ramboll France, Aix-en-Provence.
- Bank Negara Malaysia (2019). 'Food Imports and the Exchange Rate: More Than Meets the Eye', Box Article in 3Q 2019 BNM Quarterly Bulletin. Kuala Lumpur.
- Bank Negara Malaysia (2020). 'Climate Change Risks and Opportunities: Respond, Not React', Feature Article in BNM Annual Report 2019. Kuala Lumpur.
- Committee on World Food Security. (2020). 'Impacts of COVID-19 on food security and nutrition: developing effective policy responses to address the hunger and malnutrition pandemic'.
- Fatimah Mohamed Arshad. (2016). 'Food Policy in Malaysia', Reference Module in Food Sciences. Elsevier, pp. 1–12.
- Fatimah Mohamed Arshad. (2016, February). 'My Say: Smallholders still crucial to agricultural sector', The Edge Weekly. Retrieved from: <https://www.theedgemarkets.com/article/my-say-smallholders-still-crucial-agricultural-sector>
- Hassan, Asan Ali Golam, Ibrahim Ngah, and Shri-Dewi Applanaidu. (2018). 'Agricultural Transformation in Malaysia: The Role of Smallholders and Area Development'.
- Institute for Democracy and Economic Affairs, IDEAS. (2018). 'Evaluation of Agricultural Subsidies and the Welfare of Rice Farmers'.
- J. Clapp. (2015). 'Food Security and International Trade: Unpacking Disputed Narratives', Rome: FAO. Background Paper for The State of Agricultural Commodity Markets 2015-2016.
- Jomo Kwame Sundaram and Tan Zhai Gen. (2019). 'Achieving Food Security for all Malaysians', Kuala Lumpur: Khazanah Research Institute.
- Khazanah Research Institute, KRI. (2020). 'Agriculture Exodus? Insights from youth aspirations'.
- McKinsey Global Institute. (2020). 'Will the world's breadbaskets become less reliable?' Retrieved from: <https://www.mckinsey.com/business-functions/sustainability/our-insights/will-the-worlds-breadbaskets-become-less-reliable>
- Sabirzyanov, R. et. al. (2021). The Role of Food Price Ceilings versus Food Price Coupons in Mitigating the Impact of Food Price Inflation.
- Viviano, F. (2017, September). 'How the Netherlands Feeds the World', National Geographic. Retrieved from: <https://www.nationalgeographic.com/magazine/article/holland-agriculture-sustainable-farming>
- World Bank. (2019). 'Agricultural Transformation and Inclusive Growth: The Malaysian Experience', The Malaysia Development Experience Series. World Bank, Washington, DC.
- World Bank. (2020). 'Sowing the Seeds', Malaysia Economic Monitor (December), World Bank, Washington, DC.