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DISCUSSION PAPER 1/22 | 29 SEPTEMBER 2022

The Looming Global Food Crisis: An Overview

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Khazanah Research Institute

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This discussion paper was prepared by Nik Syafiah Anis Nik Sharifulden (researcher) from the Khazanah Research Institute (KRI). The author is grateful for the valuable comments from Dr Rachel Gong, Dr Sarena Che Omar, Prof Jomo Kwame Sundaram, and Khoo Wei Yang.

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The Looming Global Food Crisis: An Overview

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Summary

- The world has experienced two major global food crises over the last five decades, one in 1972 and another in 2008. Similarities between these two global food crises are astounding, where **both the supply and demand sides played roles in driving up food prices. High fuel prices, declining agricultural productivity and global grain stocks, as well as shifts in food demand were some common factors that led to years of high food prices,** affecting many globally. **During the 2008 global food crisis, additional factors such as biofuel policies, importing and exporting countries' events and policies as well as excessive commodities speculation were noted as additional factors that led to price spikes.**

- Currently, the world is once again facing increasing food prices with FAO global food price index recorded the highest increase in early 2022 compared to pre-pandemic. **The conflict between Russia and Ukraine has caused disruptions in global food markets**, as the two countries collectively contribute 12% of total calories traded globally**. High fuel prices, high fertiliser and commodity prices, reduced agricultural production due to climate change, and shortages of agricultural workers due to pandemic impacts** have further caused food price spikes.

- **Current global inflation rates have been climbing to levels similar to the year 2008, causing economic and social unrest**. Poverty rates are expected to increase, and food insecurity will be more profound, especially for the urban poor. **Food baskets of poor households will be less diversified, which may lead to higher prevalence of malnutrition.**

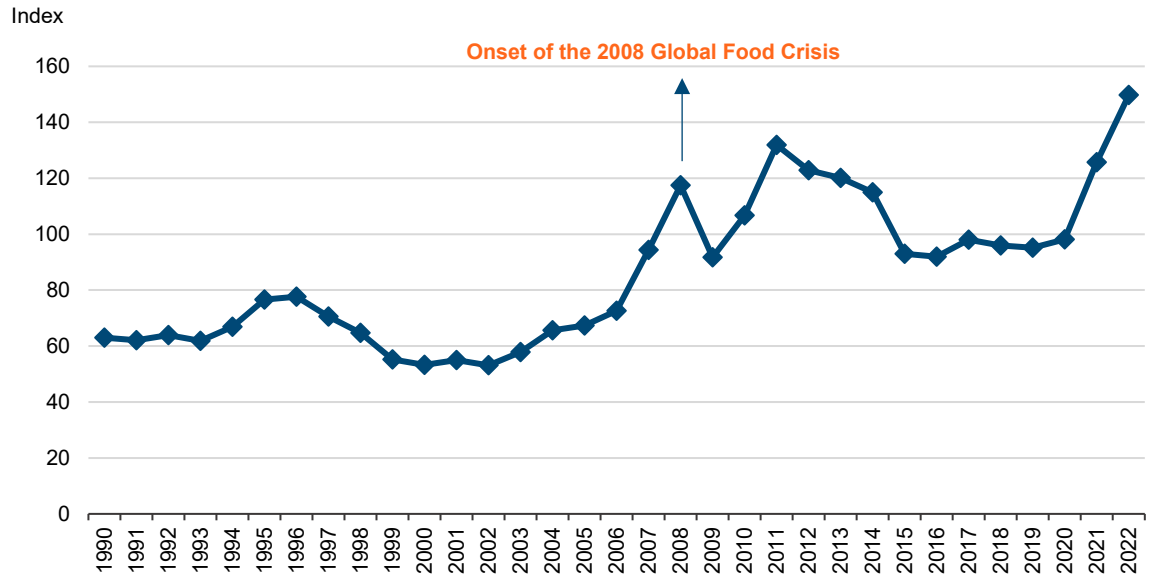
- Malaysia, as a country relying on imports for **more than half of its food availability**, is also affected by current food price increases. Malaysia's overall **food inflation rate went up 7.2%** in August 2022, compared to the same month in 2021, and food categories such as **'Meat', 'Vegetables', and 'Food Away from Home' experienced some of the highest price increases of 9.9%, 8.9%, and 8.4% respectively.**

- **The right balance between both short-term and long-term solutions are needed in facing the looming global food crisis**. Short-term solution solutions may be in the form of producers' subsidies, cash aid and price control, all of which have been implemented by the government. Long-term solutions include ramping up farming digitalisation and agricultural research and development(R&D), in order to achieve food systems resilience.

1. Introduction

Over the last 50 years, food price trends have experienced a series of fluctuations, where consumers have benefited from an extended period of low and stable food prices followed by high and unprecedented food price increases. The years 1974 and 2008 saw unusual food price shocks where food prices more than doubled, especially for staple foods; these periods were later dubbed years of 'global food crisis'. Although there is no consensus on defining a global food crisis, it is usually a period of sudden and sharp food price spikes due to factors such as war, high energy prices or sudden reduction of agricultural productivity due to extreme weather conditions. A particular consequence of a global food crisis is increased hunger and malnutrition at local, national, or global levels as well as increased social unrest[1].

Figure 1 Global Food Price Index, 1990-2022



Source: Food and Agricultural Organisation (FAO)
Note: Due to data limitations, food price index from 1970-1989 could not be retrieved.

Globally, food price increases generally hit low-income food-deficit countries the hardest, where the most vulnerable and food-insecure populations live. Although Malaysia is categorised as an upper middle-income country, it is still vulnerable to food price shocks in the global market as it is still highly reliant on food imports. The impacts of high food prices can be multi-dimensional, it may impair a country's economy besides causing social unrest, signifying the key role of food in everyday life. This paper provides an overview of past global food crises, examining past causes of food price shocks. This is followed by an assessment of current events, looking at the global

[1] Timmer (2010)

and Malaysian contexts, and lastly, insights on ways of moving forward to minimise the impacts of future food crises for Malaysia.

2. Causes of Past Food Crises

Both demand and supply factors played roles in increasing food prices, where supply-side factors involved factors such as (1) increasing crude oil prices which led to the increase in agricultural input prices. (2) Extreme weather events leading to crop shortages, and (3) importing and exporting countries' events and policies. Demand-side factors include (1) changes in food demand in developing and developed countries, (2) biofuels policies, and (3) declining global grain stocks[2]. Secondary factors (i.e., commodity speculation) were also noted to have driven food prices up during the 2008 global food crisis.

2.1. Crude oil prices

Before the global food crises in 1974 and 2008, rising energy costs led to increases in the costs of agricultural production. Fertiliser prices have been directly related to fuel prices as fertilisers such as urea, ammonia and phosphoric acid are produced using natural gas and energy, impacting food prices[3]. In 1973, oil prices rose nearly 450%, driven by the Organization for Petroleum Exporting Countries' (OPEC) response to the oil supply disruption crisis following the Yom Kippur War[4]. Similarly, oil prices doubled in 2007-2008, significantly impacting food prices. Grain production costs in the US rose 21.7% which led to export prices increasing by nearly 20%, causing price shocks to global grain markets[5].

2.2. Sudden decline in agricultural productivity

Another significant cause of past food crises is the sudden decline in agricultural productivity in some key producing regions. In the decade leading to 1971, world grain production increased on average by 3% per year. However, in 1972, grain production dropped to 1,073 million metric tons(MT) from 1,109 MT in 1971 (down by 3%)[6]. Some causes include reduced output in Russia where grain production dropped by 7% as well as crop losses in Australia, Asia and Africa due to bad weather. The crisis in 2008 also saw a similar trend where wheat production in Australia and the US dropped by 52% and 16% respectively. The key factor that contributed to sudden decline in agricultural productivity was extreme weather events such as droughts, floods, or extreme temperature drops[7]. Indirect factor such as declined research and development(R&D) due to lowered investment and public support in the agricultural sector also contributed to lowered

[2] IFPRI (2010)
[3] Chen et al. (2012)
[4] Schumacher (1985)
[5] Mitchel (2008)
[6] Schnittker (1973)
[7] Clapp and Cohen (2010)

agricultural productivity, which resulted in less development of crops that are resilient to climatic shocks.

2.3. Decline in food grain reserves

Globally, food grain reserves are used by many countries as a tool for price stabilisation/price control and emergency preparedness. Food grain reserves may stabilise prices by purchasing grains at harvest and releasing stocks later, which kept grains' market prices at certain minimum or maximum prices[8]. In 1972, global stock-to-consumption ratios fell to their lowest levels due to an unprecedented move by the Soviet Union to heavily import grain to balance the impacts of poor harvests. Later, in 2008, the global stock-to-consumption ratio fell again to its lowest levels since 1982[9]. Several factors that led to this event include the general perception of countries whereby holding grain stocks was deemed as costly and inefficient, in which the cost was approximately 15-20% of the total grains' value. Furthermore, since agricultural production was also weather-sensitive, any series of adverse weather conditions will automatically impact grain stocks. Extreme weather events in Russia, Ukraine, Australia, and Morocco in 2007 effectively lowered the global grains stocks by 5%, which led to food price increases in 2008[10].

2.4. Growth and shift in food demand

Growth and shift in food demand has also contributed to the food price increases. In the years leading to the 1972 global food crisis, there was a rapid population growth in developing countries (e.g., China and India whereby both countries held a cumulated population of 1.2 billion people with an average growth rate of 2% from the year 1960-1968[11]). On the other hand, industrialised countries were experiencing a growth in meat demand as consumers became more affluent, this was apparent when Soviet Union imports alone accounted for almost 80% of total global exports[12].

Similarly, in 2008, there was an increase in demand for animal-based food products from emerging economies such as China and India, which was driven by the strong per capita income growth. Both China and India, which held a collective population of 2 billion people at the time, experienced economic growth. This led to increased income and a change in diet from cheap starches to meat and animal-based products such as milk, eggs and cheese. This is in line with Bennett's law which states that as income increases and people become more affluent, there will be a shift in diet from a simple carbohydrate, plant-based diet to a more diverse diet, consisting mainly of meat, dairy products and a wide range of fruits and vegetables[13].

[8] Würdemann, Meijerink, and van Dorp (2011)
[9] Mittal (2009)
[10] Ibid.
[11] Meadows and Club of Rome (1972)
[12] Mitchel (2008)
[13] Godfray (2011)

2.5. Biofuels production policies

An additional cause of the 2008 global food crisis was the introduction of policies regarding biofuels production in the US and EU. In an effort to curb the rising cost of fuel, developed countries started using maize for fuel instead of just for food. This disrupted the global food supply and increased food prices. The US introduced the 2007 Energy Policy which subsidises and reduces tariffs on biofuel imports while the EU targeted 10% of transportation fuel to be biofuel by the year 2020. As a result, the use of corn in the US increased rapidly from the year 2004-2007, in which 70% of the increase in global corn production is utilised for ethanol production[14]. This significantly impacted global commodities prices as producer countries like the US accounted for nearly 30% of global maize production and 70% of global corn exports. On the other hand, the EU increased vegetable oil imports from 4.4 MT in 2000 to 6.9MT in 2007 for biofuel production, which further exacerbated the crisis.

2.6. Rice Importing and Exporting Countries' Events and Policies

Rice importing and exporting countries' events and policies were also some of the factors that drove rice prices up during the 2008 global food crisis. Starting from September 2007, major rice exporter countries such as Vietnam and India imposed several measures in order to protect their domestic market. For example, Vietnam imposed a ban on commercial sales of rice while India announced a minimum export price(MEP) for all types of rice except premium basmati rice[15]. On the other hand, panic buying of rice by importer countries further contributed to the price increases. In April 2008, the Philippines alongside some other countries such as Nigeria, Bangladesh and Iran made a large purchase in an attempt to lock prices within the domestic market before prices went up. Apart from this, other major importers such as Nigeria, Bangladesh, Iran, and Indonesia also lowered or eliminated rice import tariffs in order to facilitate imports and to stabilise price within their own domestic market. Collectively, all of these importer and exporter countries' events and policies drove rice prices by at least 30% by February 2008[16].

2.7. Commodity Speculation

While demand and supply factors have effectively caused food price hikes, excessive commodity speculation was also reported as one of the causes of food price volatility during the 2008 global food crisis. Speculation can be defined as "the purchase of a good for later resale rather than for use, or a temporary sale of a good with the intention of later repurchase in the hope of profiting from intervening price change"[17]. Traditionally, futures markets were used as a tool for sellers (e.g., farmers) and buyers (e.g., millers) to protect themselves from future price fluctuations, whereby farmers will hedge themselves from selling their commodities on the spot in order to sell in futures markets at a pre-determined price, while millers may hedge from purchasing the goods now in order to do so in the future for a set price. The process was made possible through intermediary hedgers who will buy and sell futures contracts from farmers and to millers, and

[14] IFPRI (2010)
[15] Childs and Kiawu (2009)
[16] Ibid.
[17] Robles, Torero, and von Braun, n.d.

will bear the cost of losses if market price fell below margin, and gain profits if market price rises above the normal market price. The practice, although has caused slight price increases in the grain market due to the presence of intermediaries who sought to make profits, also acted as a tool for market stabilisation and provided assurance and protection to both farmers and millers against sudden price changes. Originally, there were not many speculators within the agricultural commodities market, but over time, the emergence of speculative bubble that consisted of non-traditional speculators such as investment banks, hedge funds, and pension funds started to enter agricultural futures markets with the intention of making profits. These financial speculators are believed to have driven food prices up[18]. In 2008, volume of speculative investments in commodities indexes increased by over 1200% compared to the year 2003[19]. In the period between 2005 and 2008, food prices also rose over 80%, with key commodities prices such as rice and wheat increased by 170% and 127% respectively.

[18] Schutter (2010)
[19] Henn (2011)

3. In The Present: Food Price Increase

Currently, the world is once again experiencing a hike in food prices as a result of several contributing factors. According to the Food and Agricultural Organization (FAO) food price index, the year-on-year increase for food from 2020 to 2022 is recorded at an average of 17%, much higher than the pre-pandemic years (2018-2020), which was recorded at an average of 0.7%[20]. Similar to past trends leading to the global food crises, the current food price increase is caused by determinants from both the supply and demand side.

3.1. Poor harvest in key producing regions

Climate change has been one of the key driving factors of decreased agricultural production in key production areas globally. South America, which contributes 50% and 35% of global soybean and maize production respectively, has seen a decline in the 2022 harvest as a result of water shortage due to prolonged drought[21]. Similarly, India, which is the global second-largest wheat producer is also experiencing a reduced harvest by 3% in 2022 compared to 2021 due to extreme heat. A poor harvest in major production areas has a significant impact on food prices as it introduces disruption to the global food trade. Coupled with existing pressure from population growth and rising income leading to higher food demand, reduced agricultural productivity driven by climate change acts as a multiplier to rising food prices.

3.2. Russia-Ukraine Conflict

The ongoing conflict in Russia and Ukraine has had a significant impact on the agricultural industry as Russia is a major producer of fertilisers and both countries are key producers of commodities such as sunflower oil, wheat, barley, and maize. Collectively contributing 12% of total calories traded globally, the invasion caused shortage issues, especially for countries that are heavily reliant on the two nations in crisis for a staple food supply[22].

Agricultural output for Ukraine, the country being invaded, is already projected to be lower for the year 2022/2023 with maize and sunflower seed production reduced by 28% and 16% respectively compared to 2021[23]. A disruption in the natural gas and fertiliser markets is also apparent as Russia contributed to approximately 10% of the global fertiliser trade. A hike in fertiliser price has a direct impact on agricultural yield and farm income, as it increases the cost of production.

As a ripple effect of the crisis caused by the invasion, a growing number of countries have also imposed export restrictions as a measure to protect domestic supplies. With countries such as India imposing a wheat export ban and Argentina imposing maize and wheat export limitations. This has further caused food prices to climb as export restrictions created supply shortages in the global food trade. Historically, an export ban is a typical measure imposed by major food-

[20] FAO Food Price Index
[21] Colussi, Schnitkey, and Zulauf (2022)
[22] Glauber and Laborde (2022)
[23] Colussi, Schnitkey, and Zulauf (2022)

exporting countries amid food price inflation. As a response to the 2008 global food crisis, countries such as Argentina, China, India, Russia, Ukraine, and Vietnam imposed export restrictions for key commodities, which resulted in a dramatic food price hike and the beggar-thy-neighbour effect[24] as food prices became volatile and food shortages occurred[25].

3.3. Covid-19 post-pandemic impact

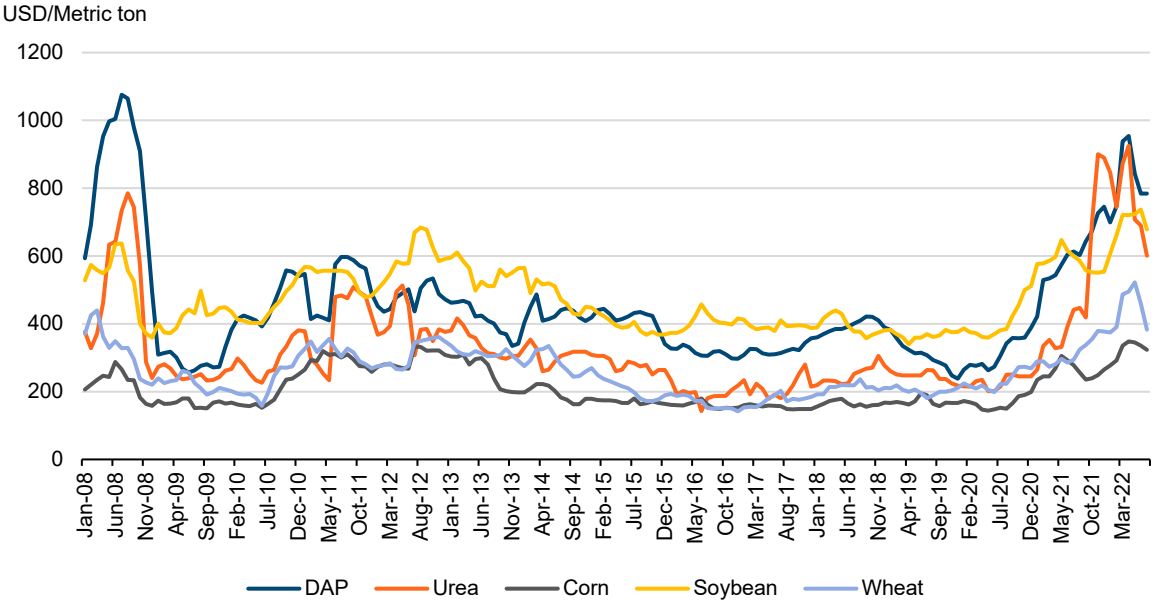
The agriculture industry has been experiencing a labour supply shortage as an effect of the Covid-19 pandemic. Travel restrictions and tighter foreign entry policies imposed by countries' governments and initiatives to send foreign workers back to their origin country have resulted in high retrenchment in the agricultural sector[26]. This is especially apparent in countries that are highly reliant on foreign labour for unskilled or low-skilled jobs (e.g., Malaysia). Although the high foreign workers' retrenchment has potentially opened opportunities for local employment, there is a low take-up of agricultural-related jobs as there is generally a negative perception towards the industry as labour-intensive and low wage[27].

[24] International trade policy that benefits countries enacting it while causing harm to neighbouring countries or trade partners.
[25] Demeke, Pangrazio, and Maetz (2009)
[26] MOF (2021)
[27] Abdullah, Abu Samah, and Othman (2012)

3.4. Price Hike in Fuel, Fertiliser and Several Key Commodities

Similar to past trends of food price increase during the global food crises in 1974 and 2008, a hike in fuel and gas prices correlates to high farming costs as fuel and gas are essential components in farming automation, processing, transportation as well as fertiliser production.

Figure 2 Global Monthly Prices for Selected Fertiliser and Food Commodities (in USD per Metric ton), 2008-2022



Source: indexmundi.com

Note: DAP = diammonium phosphate

Fuel prices have gone up nearly 10% towards the end of 2021 and have shown a fluctuating upward trend until May 2022[28]. As a result, the price of fertilisers such as diammonium phosphate (DAP) and urea doubled in 2022 compared to 2021. Consequently, the price of several key commodities such as corn and soybean which relies on these fertilisers for production also increased, where the highest spike was recorded in March 2022. Although prices for fertilisers and several key commodities have gone down starting from May 2022, it is still comparatively higher than it was in 2021.

The hike in grain prices generally has a two-dimensional impact on the overall food price. Firstly, since grain makes up 2/3 of the global food basket, price increases will automatically increase food expenditure for an average household. Secondly, 40% of the global grain production is used as animal feed, hence the hike in grain prices will cause a ripple effect in the livestock industry, increasing the price of animal-based protein as well[29].

[28] Indexmundi.com
[29] Ourworldindata.org

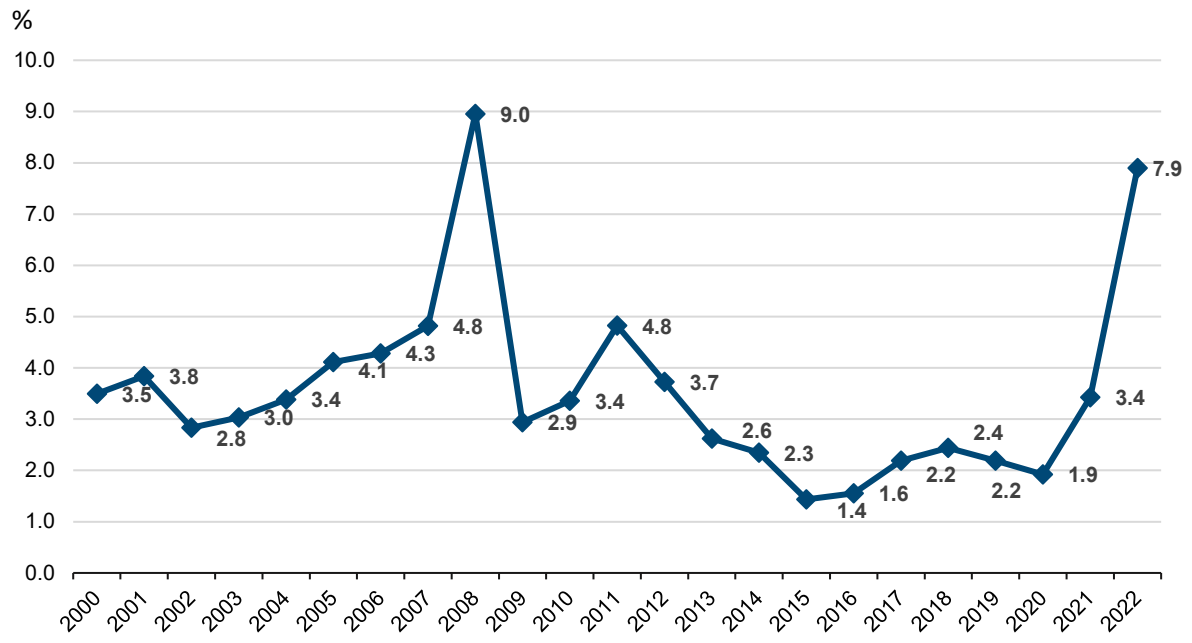
4. Impact of Food Price Increases

4.1. Inflation

Inflation is seen as one of the macroeconomic impacts of food price increases, alongside the rising fiscal cost of subsidies. Inflation reduces consumers' purchasing power, as the value of money depreciates, and more money is required to purchase the same amount of goods or services.

During the beginning of the pandemic, the inflation rate declined, mainly due to lockdowns and a sudden drop in fuel prices. The inflation rate, however, has been volatile ever since. In mid-2020, there was an increase in inflation as lockdowns were eased and fuel and food prices started to pick up. The inflation rate grew more rapidly as the war between Russia and Ukraine broke out, coupled with other factors such as China's sudden movement control due to Covid-19 variant, which has caused supply disruption in the global trade. Currently, global inflation rate stands at nearly 8%, the highest since 2008 and is partly driven by high food and fuel prices[30].

Figure 3 Global Inflation Rate (%), 2000-2022



Source: Worldbank, 2022

[30] World Bank (2022b)

4.2. Poverty and Food Insecurity

Generally, the impact of food price increases varies between households. In the short run, households that are net producers will reap the benefit as their income increases, while households that are net buyers will suffer as a larger portion of their income will be spent on food[31].

The impact of food price increases on poverty will be especially apparent in urban poor households, given that they are net food buyers and spend a majority of their income on food. Many net buyer households will likely experience a shift in daily diet as food expenditure will be concentrated on buying carbohydrate-rich food due to a lack of affordability to consume other forms of nutrients (e.g., protein, fat, vitamins, and minerals).

As a ripple effect of the food price increase and poverty, vulnerable households are more likely to be more food insecure as their economic access to food lessens. This will result in a higher prevalence of malnutrition as their daily diet becomes less diverse and lacking in essential macronutrients and micronutrients.

4.3. Social Unrest

Historically, increase in food prices have caused social unrest in many parts of the world[32]. Food-related social unrest or food riots can be defined as;

"A violent, collective unrest leading to a loss of control, bodily harm damage to property, essentially motivated by a lack of food availability, accessibility or affordability, as reported by the international media, and which may have other underlying causes of discontent[33]."

In the past, food riots targeted mostly farmers, merchants and traders as food prices were mostly controlled by these parties and riots mostly took place in remote areas, involving the rural poor[34]. However, recent food riots are more political in nature, targeted mainly at food-related organisations, supermarkets or the government and are mostly conducted by the urban working class or social activists[35].

During the global food crisis in 2008, 60 food riots took place in over 30 countries as a response to an increase in food prices[36]. Although riots broke out as a response to the increase in commodities prices, there is also a strong association between food riots and other factors. Economic, demographic, and political factors including high unemployment and poverty rates,

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[31] Headey and Martin (2016)
[32] Messer (2009)
[33] Barbet-Gros and Cuesta, n.d.
[34] Bellemare (2015)
[35] Ibid.
[36] Barbet-Gros and Cuesta, n.d.

high levels of urbanisation or existing political instability in a country have contributed to riots[37]. A study on the past global food crises revealed that food riots started to actively occur when the FAO Food Price Index reached a threshold of 210, indicating an exorbitant food price in the global food market[38].

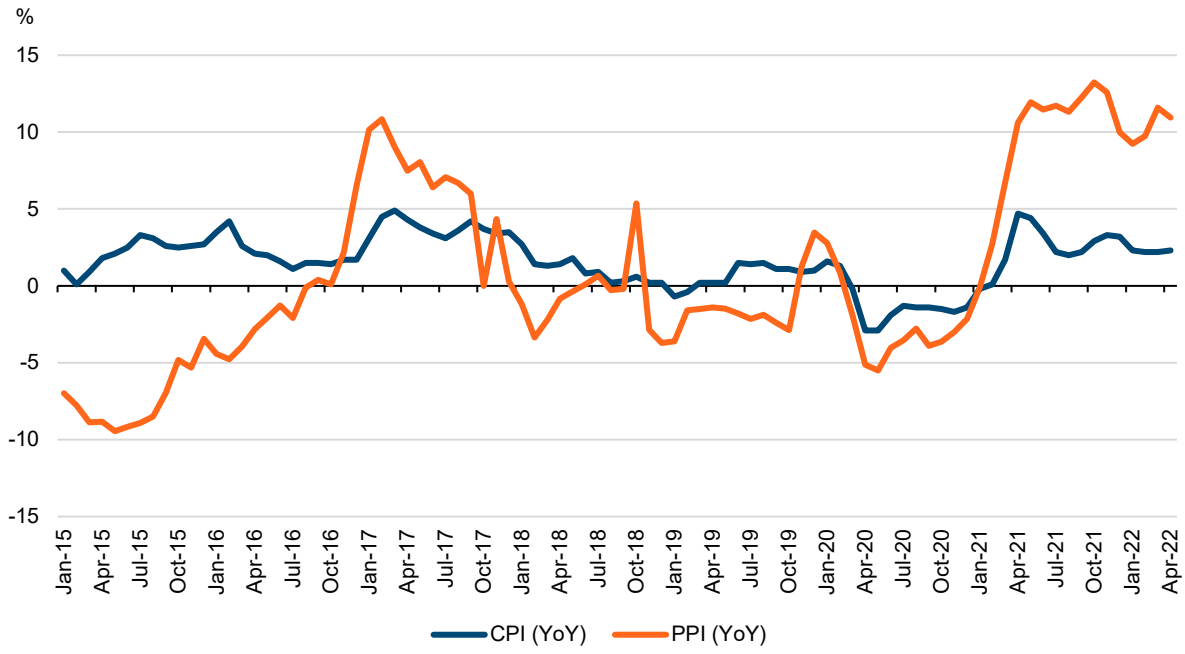
[37] Berazneva and Lee (2013)
[38] Lagi, Bertrand, and Bar-Yam (2011)

5. How Does Malaysia Fare?

Malaysia, like any other country in the world, has also been bearing the impact of food price increases over the past year, as a result of the pandemic and further exacerbated by the Russian-Ukraine conflict. Although the conflict does not directly impact Malaysia as food imports from the two countries in conflict are not as significant as other countries (e.g., Egypt, Tunisia) that heavily rely on Russia and Ukraine for food sources, Malaysia's food prices are still on an upward trend as the agriculture and food industry relies heavily on imported fertiliser and feed, whose prices in the global market are increasing.

The high input costs are particularly reflected in the Producer Price Index (PPI) which has been increasing steeply since early 2021. Similarly, the Consumer Price Index (CPI) which is the average cost of a basket of goods purchased by consumers, has been trending upwards, though not as steeply as PPI during the same period, signifying price increases have reached both producers and consumers simultaneously. As seen in Figure 4, CPI remains low due to government interventions such as fuel subsidies and price control mechanisms. In contrast, the high PPI indicates that producers have been absorbing price increases without passing the burden to consumers[39]. Malaysia's food inflation rose by 7.2% in August 2022 as compared to August 2021, largely contributed by price increases in major food groups such as flour, meat, vegetables, milk, cheese, and eggs[40].

Figure 4 Consumer Price Index and Producer Price Index (yoy), 2015 - 2022



Source: Macromicro.me

[39] World Bank (2022a)
[40] DOSM (2022a)

One of the industries in Malaysia hard-hit by food price increase is the poultry industry, where the year-on-year increase in June 2022 reached 11.9% compared to the same month in 2021, mainly due to its high dependency on imported feed such as corn and soy. As a response to the commodity price increase, the Malaysian government introduced a ceiling price of RM 8.90 for standard chicken starting from February to June 2022 to curb the price shocks on the consumers' side. Similarly, on the producers' side, a 60 cents subsidy was introduced for every kilogram of standard chickens and 5 cents subsidy per grade A, B, and C eggs, in order to reduce producers' burden due to the increasing farming input costs[41]. Other measures such as export ban of chicken and the removal of approved permits (AP) of all food commodities except rice were taken to stabilise price and local food supply.

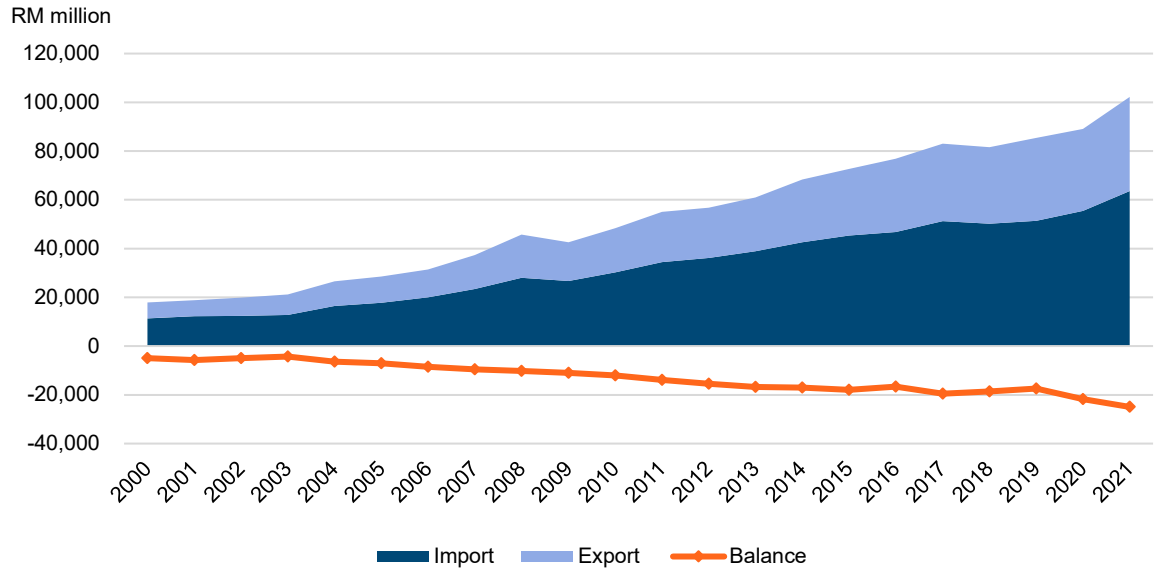
Similarly, as a direct impact of the hike in global fertiliser prices, vegetable prices in Malaysia also recorded an increase of around 8.9% in August 2022 compared to the same month in 2021[42]. Another food group that is heavily impacted by the food price increase is the 'food away from home' category, which rose by 8.4% this year, indicating the collective increase of all other food categories.

[41] Berazneva and Lee (2013)
[42] DOSM (2022)

5.1. Food Trade Trends

In terms of food trade, in 2021, Malaysia's food imports stood at RM 63.6 billion while food exports amounted to RM 38.6 billion, leading to a trade deficit of RM 25 billion, which is 15.0% higher than in 2020. Malaysia's food import is on an increasing trend with an average increase of 8.0% since the year 2000. According to Che Omar, the current Malaysia food import value does not include categories of "animal or vegetable fats and oils" since fats and oil used for cooking are typically considered as commodity rather than food. However, if this category is factored into the calculation of total food import, then the value would be much higher which is at RM 78.8 billion[43]. Assuming similar increasing import trend (Figure 5) is projected for the year 2022, this will make Malaysia to be more vulnerable to food price increases as domestic food prices will be influenced by prices in the global trade market.

Figure 5 Malaysia Food Import, Export and Balance of Trade (RM million), 2000-2021



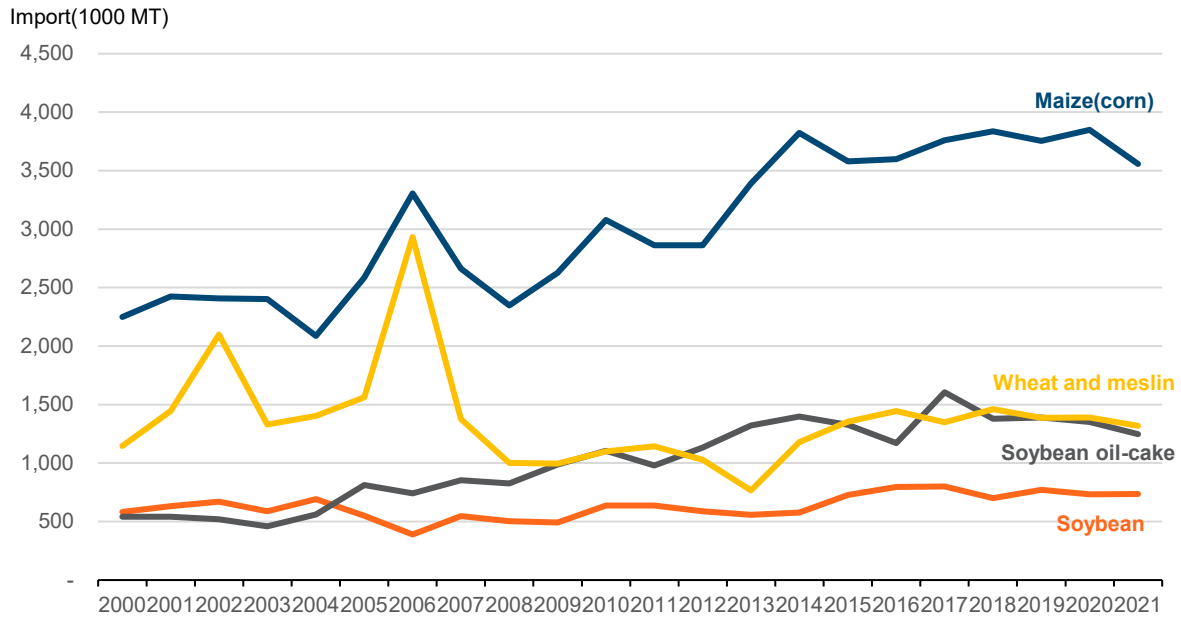
Source: DOSM

Malaysia's ability to produce more food in order to reduce import is limited due to land scarcity issue. Arable land, or land that is suitable for growing of crops makes up only 9.64% out of the total agricultural land in Malaysia in 2018[44]. The majority of agricultural land in Malaysia, however, is used for industrial crops such as palm oil and rubber, which was a result of past policies that focuses on planting crops for export. Malaysia's high food import is also partly contributed by the high input costs within local food production, which resulted in cheaper imported food compared to locally grown crops, therefore more favourable in the domestic market. Currently, Malaysia is a net importer of food products with categories such as "Cereals & cereals preparations" and "Vegetables & fruits" amounted to RM11 billion and RM10 billion

[43] Che Omar (2022)
[44] Wu et al. (2018)

respectively[45]. Meanwhile, food products such as beef, mutton, milk, round cabbage, and chilli have the highest import dependency ratio compared to other food products[46]. Multiple constraints within the agricultural industry have made it difficult for Malaysia to reduce its reliance on imports of these staple food products. Taking beef (both cattle and buffalo) production as example, Malaysia's import dependency ratio for beef is 78.1% in 2020, where the majority of imported beef comes from India and Australia. Malaysia's beef industry has been small for many reasons such as limited availability of suitable land for grazing, low supply of high-quality breed, inconsistent supply of high-quality feed, and lack of marketing system in the supply chain[47].

Figure 6 Malaysia Grain Import (1000 MT), 2000-2022



Source: UN Comtrade

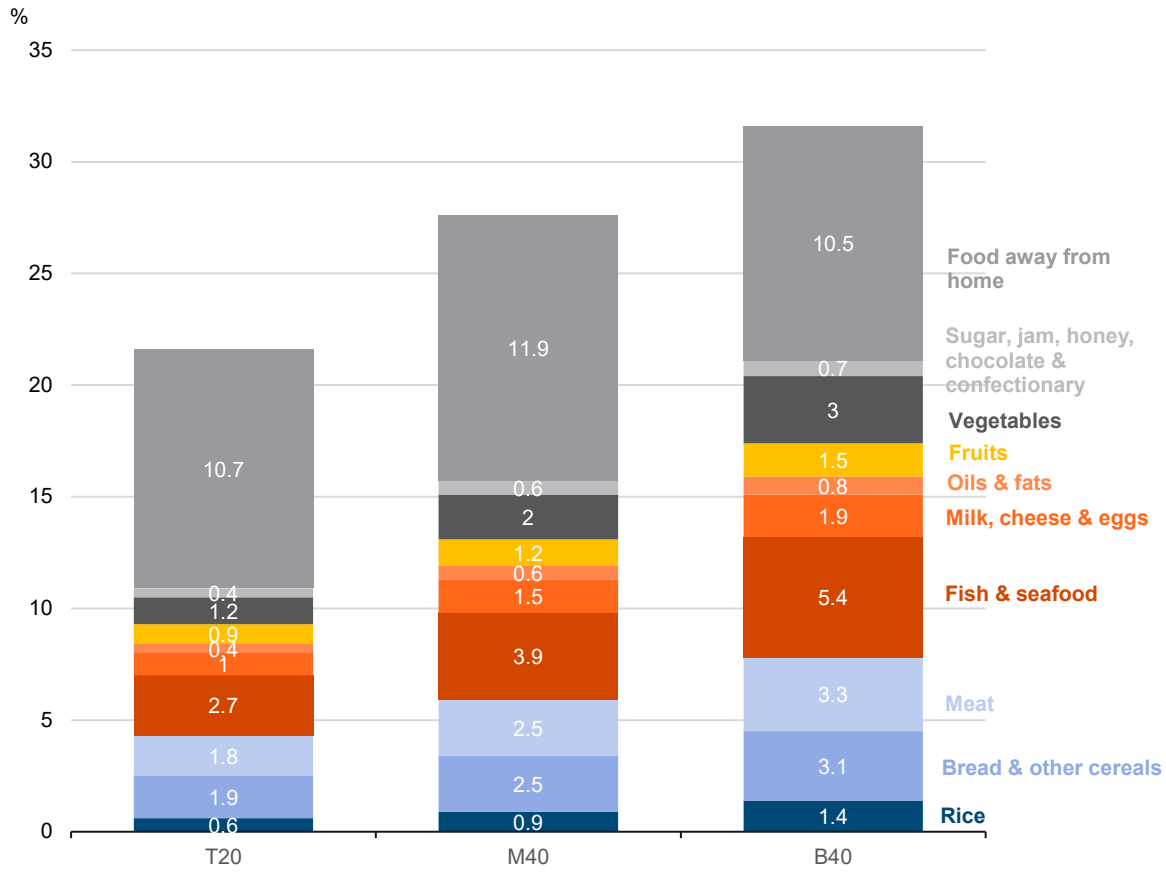
Malaysia's grain imports have been fluctuating with an increasing trend, where the average growth rates for major commodity such as maize(corn), soybean, soybean oil-cake as well as wheat and meslin are 3%, 2%, 5%, and 5% respectively since 2000. Corn and soybean oil-cake are two major components used in animal feed while soybean, wheat, and meslin are mainly for human consumption. As mentioned in Section 3.4, high grain prices will have an impact on both food producers and consumers. Malaysia's inability to produce these grains for feed and human consumption is driven by several factors such as unsuitable climatic conditions and lack of arable land[48]. Although the Malaysian government has made initiatives to reduce grain import dependency (e.g., corn) through Grain Corn Development Master Plan (2018-2032) which aimed to produce 30% of corn for domestic consumption by 2032, grain corn production for livestock feed remains negligible.

[45] DOSM (2022b)
[46] DOSM (2021)
[47] Ariff, Sharifah, and Hafidz (2015)
[48] Rosali et al. (2019)

5.2. Linking Food Price Increases and Food Insecurity

As Malaysia's absolute poverty rate has also been increasing, from 5.6% in 2019 to 8.4% in 2020, due to Covid-19, rising food prices are expected to push more households to be more food insecure[49]. Households tend to fall into absolute poverty when their income falls below the Poverty Line Income (PLI) of RM 2,208, which is considered insufficient to meet basic needs with a limited amount of disposable income, making them unable to diversify their food basket to be food secure. Households that are headed by women or the elderly (>60 years), have low academic qualifications and are dependent on single incomes tend to be more vulnerable to falling into poverty[50]. As a result of poverty, households' food expenditure is likely to focus on purchasing carbohydrate-dense food in order to stay full longer, hence exposing these households to the risk of being malnourished due to the lack of consumption of other nutrients.

Figure 7 Monthly Household Food Consumption Expenditure (%), 2019



Source: DOSM HIES 2019

Pre-pandemic consumption showed that low-income households spent a higher percentage of their income for staple food and food away from home despite it being lower in value. T20

[49] DOSM (2021)

[50] Hawati Abdul Hamid, Ho, and Suraya Ismail (2019)

households spent a total of RM 1,990 per month for staple food and food away from home while M40 and B40 households spent RM 1,254 and RM 784 respectively[51]. As food prices start to increase, low-income households' expenditure pattern will shift towards a cheaper form of carbohydrate and their expenditure on high protein food and other form of nutrients will be lesser. The relationship between demand for a certain food and its price is termed as 'own price elasticities of demand'. Own price elasticity of demand showcases percentage change in a certain food demand as a result of 1% increase of food prices, and the value is usually negative as increase in price will always reduce demand. Typically, scale of elasticity depends on several factors such as necessity of food, consumption expenditure, and availability of food substitute[52]. For example, staple food such as rice will have smaller elasticity as it is cheaper and an essential in daily diet while foods such as meat or fish will have larger elasticity as it is more expensive and make up a larger portion of household monthly consumption expenditure. Therefore, higher food prices in all food categories will eventually reduce demand. Although there is a lack of data on how Malaysian consumption pattern has changed post-pandemic and after the rise in food prices, but by using the same theory of own price elasticities of demand, it is expected that low-income households' consumption pattern will shift towards a less diversified food basket as a coping mechanism to the price increase.

[51] DOSM (2020)

[52] Green et al. (2013)

6. Moving Forward

As global food prices continue to fluctuate, driven by the ongoing disruption of the Russia-Ukraine conflict and the continuous impact of climate change on agricultural produce coupled with other factors, there is no one-size-fits-all solution to curb recurring food price shocks in the future. There are, however, measures to minimise the social and economic impacts of the food price increase.

As food prices in the global market remain volatile to any unprecedented shocks, it is crucial for Malaysia to find both short-term and long-term solutions. Immediate short-term measures are needed to alleviate the impact of price hikes on households. These short-term measures can be divided into three categories which are (1) producer-oriented measures (e.g., agricultural subsidies and incentives), (2) market and trade policy measures (e.g., price control, tariffs reduction), and (3) safety net measures (e.g., cash and food transfers)[53]. These measures have already been done by the government and constant re-evaluation of each policy measure is needed to ensure effectiveness and more importantly, making sure both producers and consumers are protected.

On the other hand, long-term solutions are equally important to improve resilience of our food systems. These long-term solutions are able to reduce import dependency, particularly by localising production and through food and feed alternatives. Agricultural technology plays an important role in localising food production whereby technologies such as vertical farming, greenhouse, or precision agriculture has the ability to improve productivity, efficiency, resolve land scarcity issue and at the same time improving farmers' profitability. There is, however, a need for nationwide adoption of technology, especially for smallholder farmers as they make up a majority of agricultural industry. Currently, initiative such as Smart Large-Scale Field Programme (Smart SBB) is a form of nationwide technological adoption within the paddy industry where farmers are able to utilise technology such as Internet of Things (IoT), artificial intelligence (AI), and big data in daily farm operation through investment from anchor companies such as BERNAS. The main aim of this programme is to increase paddy yield and subsequently improve farmers' income. While the programme is a good start for a more modernised agricultural industry, it is equally important to ensure reachability of such programmes especially to smallholder, elderly, and rural farmers due to the importance of their collective role in building a resilient food system in Malaysia.

Although it is important to reduce import dependency, striking the right balance between local production and import is also crucial as being 100% self-sufficient for a certain food product may not necessarily guarantee lower food prices. For example, imported food may be cheaper than when it is locally produced as these exporting countries may have lower input and production costs, and are able to produce their food in a larger scale. Comparatively, locally produced food may need to import farming inputs such as fertilisers and feed at high costs and might also be lacking in other factors such as farming infrastructure which subsequently reduce efficiency, hence increasing food prices. Further information on how being 100% self-sufficient is not the

[53] Demeke, Pangrazio, and Maetz (2009)

answer to food insecurity may be found in KRI's Views paper titled "Deconstructing Malaysia's 2021 Food Import Bill: Self-sufficiency is Not the Only Measure of Food Security Status" by Sarena Che Omar.

Another long-term strategy that may be useful as a way of moving forward in strengthening and building a self-reliant food system is through ramping up agricultural research and development (R&D). In order to address some of the factors affecting food production such as climate change, high input costs, and low productivity, R&D could potentially provide some of solutions to these issues. For example, development of feed alternatives for livestock that is high in protein will not only solve problems such as high imported feed costs, but an improved and high-quality feed may also improve farm productivity, hence lowering total costs of production. Similarly, development of improved varieties such as climate-resilient crop through R&D may potentially address some of the recurring issues already faced by the agricultural industry such as climate disasters and water scarcity issues. The existence of these new improved varieties will then help the food system to be more resilient even in unprecedented situations and subsequently stabilise prices.

Throughout the years, Malaysia's expenditure towards agriculture R&D as a share of agricultural GDP has been decreasing, from 1.5% in 2000 to 0.9% in 2017[54]. Nevertheless, Malaysia's expenditure for agricultural R&D still remains the highest compared to other developing countries. It is worth noting that a large portion of these agriculture R&D budget is spent on commodity-based research agencies due to the lucrative nature of these export crops as well as commodity-based resources such as taxes, making these agencies better funded for the purpose of agricultural research. Therefore, there is an importance for financial resources to be equally distributed for other staple food crops in order for the food industry to be sustainable as a whole.

In conclusion, looking at the past and current food crises, there is a high likelihood that future food crises will be unprecedented and might even be larger in terms of its scale. Countries, not just Malaysia, should focus on finding agreements and solutions as a way of moving forward.

[54] CGIAR

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