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Exploring into the Viability of Malaysia's Corn Industry

Nik Syafiah Anis Nik Sharifulden

Introduction

As food costs continue to surge annually, it is no surprise that the government is actively looking for solutions to alleviate the economic burden on consumers. In this context, the corn industry has become a focal point for exploration due to its significance and challenges. Malaysia is vulnerable due to its heavy reliance on imported corn, making it susceptible to fluctuations in global prices. This vulnerability has been evident as a result of the post-pandemic and Russia-Ukraine conflict, during which agricultural commodities, including corn, experienced price spikes surpassing the levels observed during the 2008 global food crisis.

The consequences of elevated corn prices may have far-reaching effects, particularly because corn plays a pivotal role in livestock feed production[1]. In Malaysia, the sector that is

[1] USDA Foreign Agricultural Service (2023)

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Author's email address:
anis.sharifulden@krinstitute.org

the most affected is the poultry sector, mainly due to our status as a poultry producer as well as the nation's high per capita poultry consumption, which averages 48 kilograms (kg) per capita per year[2]. When corn prices rise, the cost automatically trickles down to the livestock prices, and if such increases are constrained by price ceilings, as is the case of Malaysia, the burden often shifts to food producers. This scenario highlights the interdependence of industries, emphasising the cascading effects from one sector to another.

The aim of this paper is to analyse the trend of Malaysia's corn industry, providing a general overview of its progress and challenges. It will explore the ripple effect of the corn industry on the livestock sector, with a focus on the poultry industry. The subsequent section will examine how Indonesia and Thailand have expanded their corn industries and implemented relevant policies, considering their established positions as corn producers. The last part of this paper will explore options to improve the local corn industry and ways to potentially minimise our vulnerability to imports.

[2] DOS (2023)

Malaysia's Corn Industry

Figure 1 illustrates Malaysia's corn production, imports, and domestic consumption from 1960 to 2023. It can be seen that both imports and domestic consumption have displayed a rising yet fluctuating trend over this period. The graph also highlights a consistently low level of production, way below the nation's consumption needs. Malaysia's average annual corn consumption has been at an average of 3.6 million metric tons (m Mt) from 2010 to 2023[3]. The majority of Malaysia's corn usage, approximately 93%, is dedicated to feed production (Figure 2)[4]. Despite high demand, Malaysia's domestic corn production has remained low, averaging only 64,000Mt annually from 2010 to 2023.

Figure 1: Malaysia corn production, imports, and domestic consumption, 1960 – 2023 ('000Mt)

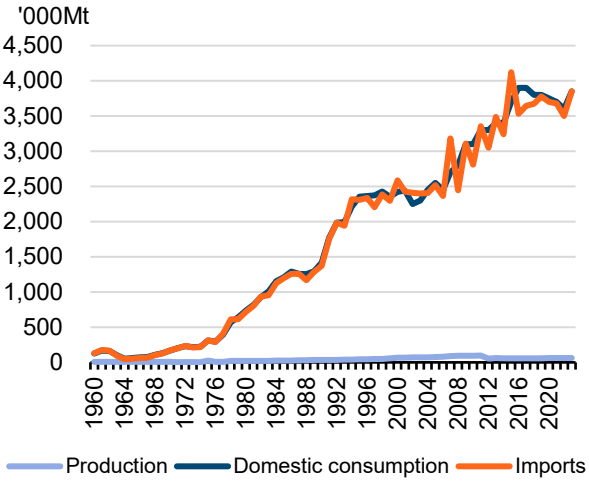
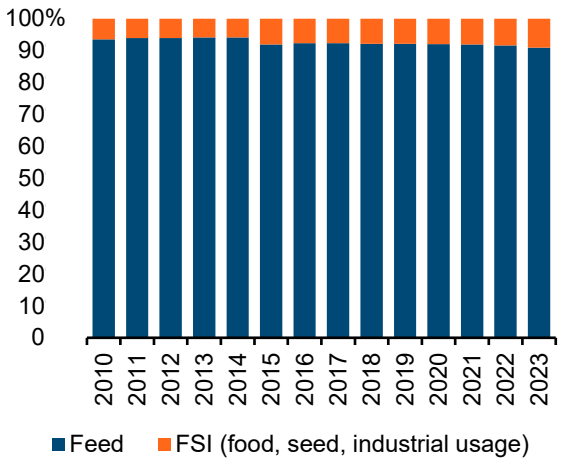


Figure 2: Malaysia corn domestic usage, 2010 – 2023 (%)

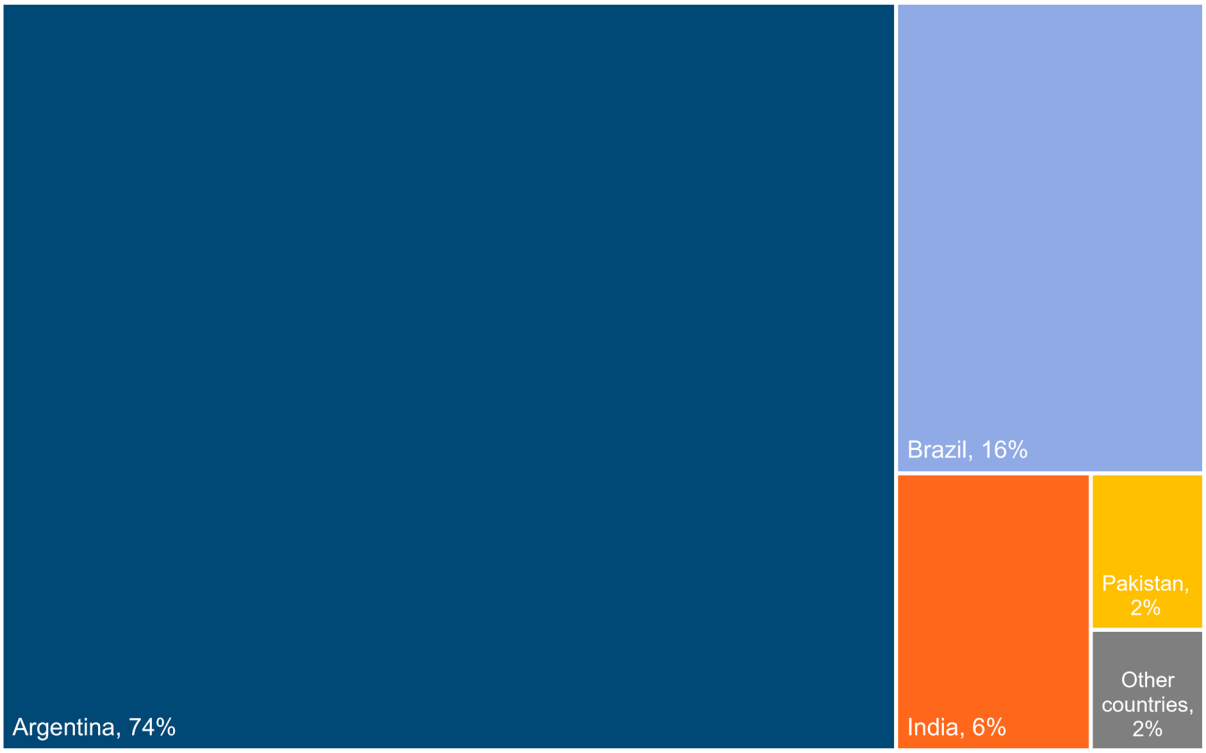


Source: USDA Production, Supply & Distribution (PSD) Database (2023)
Note: Exports are not included in Figure 1 as the numbers are too low.

In order to compensate for this shortfall, the country heavily relies on imports to meet its domestic corn demand. Over 95% of Malaysia's corn imports originate from Argentina, Brazil, and India[5] (Figure 3), which leaves the country highly vulnerable to unforeseen circumstances such as disease outbreaks, adverse weather conditions, conflicts, or sudden trade restrictions in these exporting countries[6]. Such events can potentially disrupt the corn supply chain, posing a considerable risk to Malaysia's corn availability.

[3] USDA Foreign Agricultural Service (2023)
[4] Ibid.
[5] United Nations (2023)
[6] USDA (2023b)

Figure 3: Malaysia corn import source by country, 2021 (%)



Source: UN Comtrade (2023)

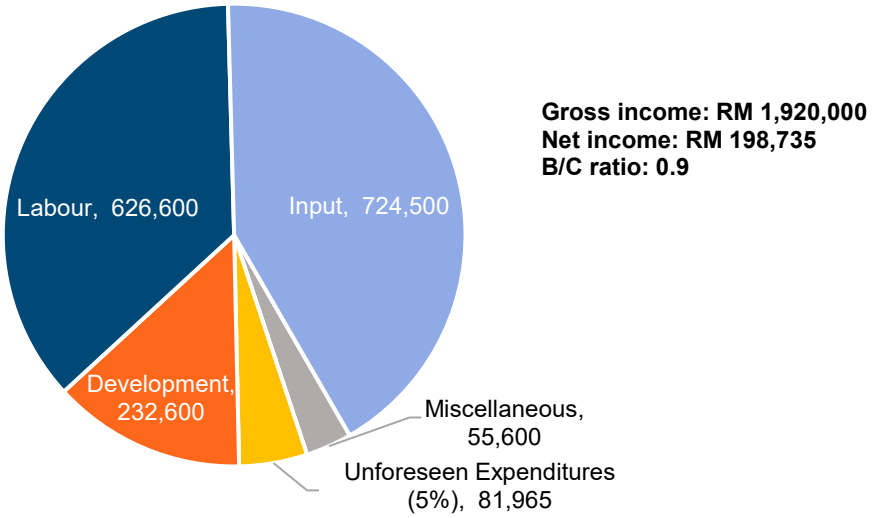
Despite the low domestic production, coupled with high levels of consumption and reliance on imports, efforts to develop the corn industry have been relatively slow. There was an initiative to develop the corn industry in the 1980s until it was suspended due to the challenges associated with high production costs, low yield, and inadequate returns[7]. However, in 2016, a renewed effort to develop this industry was announced under the Grain Corn Industry Development Plan. This strategic plan sets an ambitious target of achieving a corn production volume of 1.4m Mt across 800,000 hectares (Ha) of land, with a noteworthy objective to reduce 30% of corn imports by 2030[8].

[7] Mohd Supaat (2017)
[8] DOA (2020)

Challenges

Reflecting upon the persisting issue encountered by the industry since the 1980s, where high production costs posed a significant challenge, it remains a present-day concern that the costs involved continue to be high. A substantial 78% of the total expenses are allocated solely to input and labour expenditures (Figure 4). The benefit-to-cost (B/C) ratio of 0.9 indicates that farmers are unlikely to reap considerable profits compared to the initial expenses they have to bear[9].

Figure 4: Cost breakdown of corn production, 2021 (RM)



Source: DOA (2022)

Notes: 1) The financial flow is based on the production of 10 hectares over the period of 10 years

2) The B/C ratio is the comparison value of the benefit generated from a project to its costs. A B/C ratio of less than 1 indicates that the project costs outweigh the benefits, hence making it not profitable.

Besides production costs, corn cultivation also faces a substantial challenge in terms of yield. Local yield range can vary from 2.9 tonnes per hectare (t/Ha) to 6.5t/Ha, with the possibility of two annual planting seasons[10]. Although the Malaysian Agricultural Research and Development Institute (MARDI) has developed a few hybrid varieties such as Sungai Buluh Hybrid 11, Sungai Buluh Hybrid 12, and Putra J – 58, which are considered high-yielding varieties, production still depends on several factors such as planting location, surrounding temperature, and humidity[11]. Grain corn cultivation requires an optimal temperature ranging from 27 – 32°C, with sufficient rainfall ranging from 500 to 800 millimetres (mm) per planting season[12]. The maturity period for grain corn typically spans 80 to 120 days, and it is crucial for grain corn to be dried up to 20 –

[9] DOA (2022)
[10] DOA (2020)
[11] Ibid.
[12] Ibid.

25% in order to ensure its suitability as an animal feed ingredient and prevent the growth of aflatoxin, which could lead to food safety issues[13].

However, the progress in the development of hybrid corn seeds has slowed down over the years due to farmers' lack of interest in cultivating grain corn, particularly when compared to sweet corn[14]. A comparison between the two reveals that sweet corn boasts a more favourable B/C ratio of 1.33 (over a financial flow period of three years), along with a shorter maturity period (70 days)[15]. Furthermore, sweet corn has 3 planting seasons per year and requires no drying process[16]. Consequently, sweet corn emerges as a more lucrative and sustainable option for farmers to pursue, hence slowing down progress for grain corn.

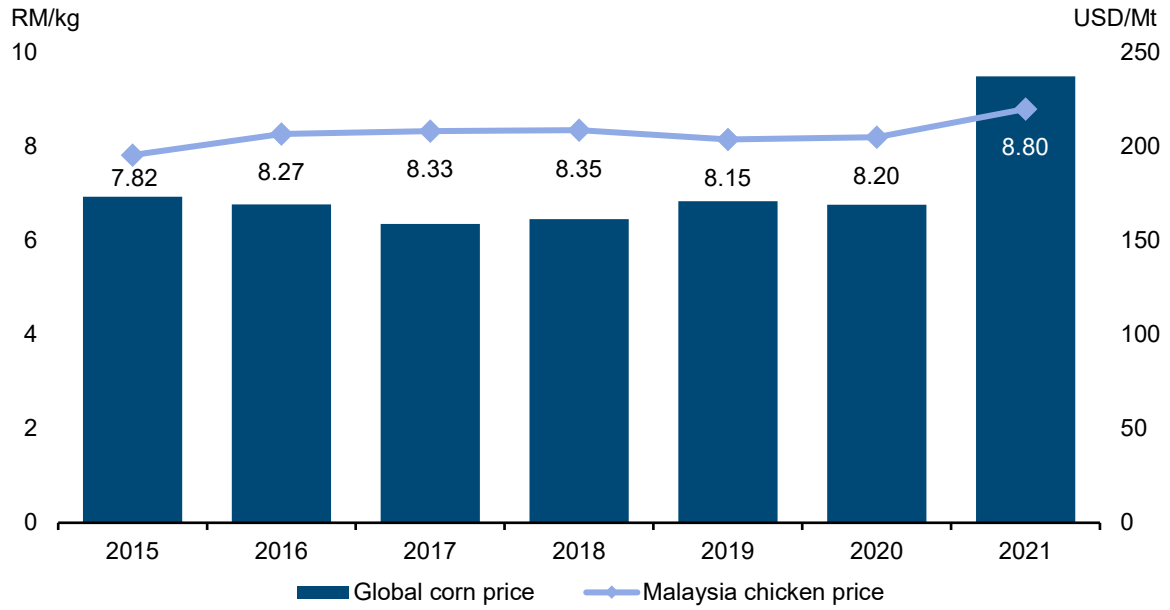
Cascading Effect on the Livestock Industry

Since the majority of the corn consumption in Malaysia is utilised as animal feed, the cost of grain corn will also affect livestock prices, particularly in the poultry industry. Figure 5 illustrates the chicken prices in Malaysia and the global corn prices. From 2020 to 2021, chicken prices experienced a 7% increase, which is the highest year-on-year percentage increase since 2015[17]. Simultaneously, global corn prices also witnessed the highest increase since 2015 during the same time period.

Given that grain corn is predominantly sourced through import, its prices are heavily influenced by various external factors. Key factors include geopolitical conflicts such as the Russia-Ukraine conflict, post-COVID-19 impact, and adverse weather conditions leading to poor harvests in major corn-producing regions, which all of these events occurred simultaneously leading to high food and commodity prices in 2021[18].

[13] Mahato et al. (2019); DOA (2020); Mohammad Nor et al. (2022)
[14] The difference between sweet corn and grain corn can be examined from various angles. Firstly, their intended use varies; grain corn is primarily used for livestock feed or processed into food products such as corn starch or corn syrup, while sweet corn is typically used for human consumption, either fresh on the cob, canned, or frozen. Additionally, their physical and nutritional characteristics differ; grain corn features a thick pericarp, a hard endosperm, a smooth kernel surface, and a rounded kernel tip, whereas sweet corn exhibits wrinkled kernels and high sugar content. For the purpose of this paper, corn is referred to as grain corn which is often used for animal feed, unless stated otherwise.
[15] DOA (2022); Mohammad Nor et al. (2022)
[16] Ibid.
[17] DVS (2022)
[18] Nik Anis (2022)

Figure 5: Malaysia chicken prices (RM/kg) and global corn prices (USD/Mt), 2015 – 2021



Source: DVS (2022); World Bank Commodities Price Data (The Pink Sheet) (2022)

As food and commodities prices are expected to increase in the coming years[19], coupled with the likely occurrence of unforeseen circumstances, it is unsurprising that measures are being taken to address our country's excessive dependence on imports. **Therefore, while it is indeed a commendable endeavour to explore opportunities for expanding our corn sector to reduce import reliance, it is imperative that we first analyse the successes and setbacks experienced by other countries in the development of their corn industries. This analysis will serve as a valuable guide to shape our own efforts in developing the corn industry development.**

The next section will closely examine how two Southeast Asian countries, Indonesia and Thailand, have navigated their corn industries and delve into the key policies and strategies they have employed to foster growth within this sector.

[19] USDA (2023a)

Key Policies and Strategies in the Corn Industry: Lessons from Indonesia and Thailand

Indonesia's Race towards Self-sufficiency

Over the last two decades, Indonesia's corn industry has experienced significant growth, with average growth of 4% per year, resulting in domestic production coming close to meeting the nation's consumption demands[20]. Imports, although fluctuating, have demonstrated a decreasing trend, mostly due to the steady increase in local production (Figure 6). The majority of corn consumed domestically is allocated for animal feed, accounting for 69% of the total usage in 2023. This represents a notable 20% increase when compared to the figures from 2010 (Figure 7)[21].

Figure 6: Indonesia corn production, imports, domestic consumption, 1960 – 2023 ('000Mt)

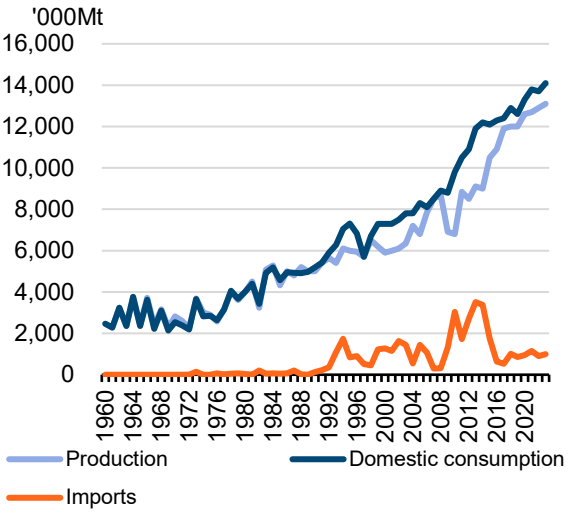
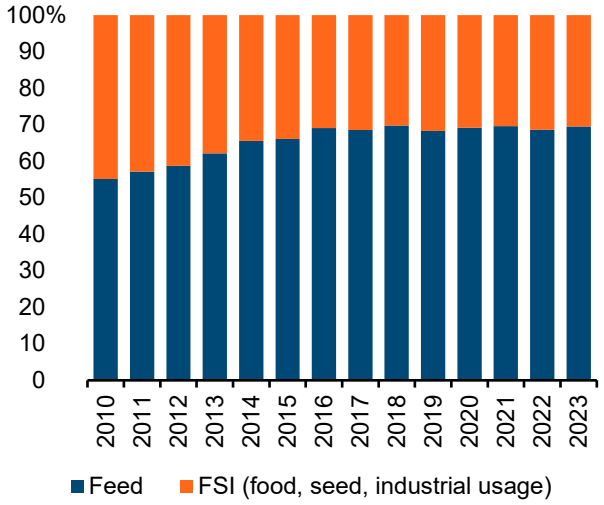


Figure 7: Indonesia corn domestic usage, 2010 – 2023 (%)



Source: USDA Production, Supply & Distribution (PSD) Database (2023)
Note: Exports are not included in Figure 6 as the numbers are too low.

The remarkable progress of Indonesia's corn industry can be attributed to the proactive policies implemented by the Indonesian government, as evidenced in Table 1, driven by their persistent commitment towards achieving the goal of attaining 100% self-sufficiency in corn production. Apart from its self-sufficiency policy, Indonesia also has a few seed–related programmes dedicated to providing farmers with high-quality, hybrid seeds at subsidised prices or for free. These initiatives have contributed to increased production across the country[22].

[20] USDA Foreign Agricultural Service (2023)
[21] Ibid.
[22] Freddy and Gupta (2018); Bappenas (2020)

Table 1: Corn-related policies/programmes in Indonesia

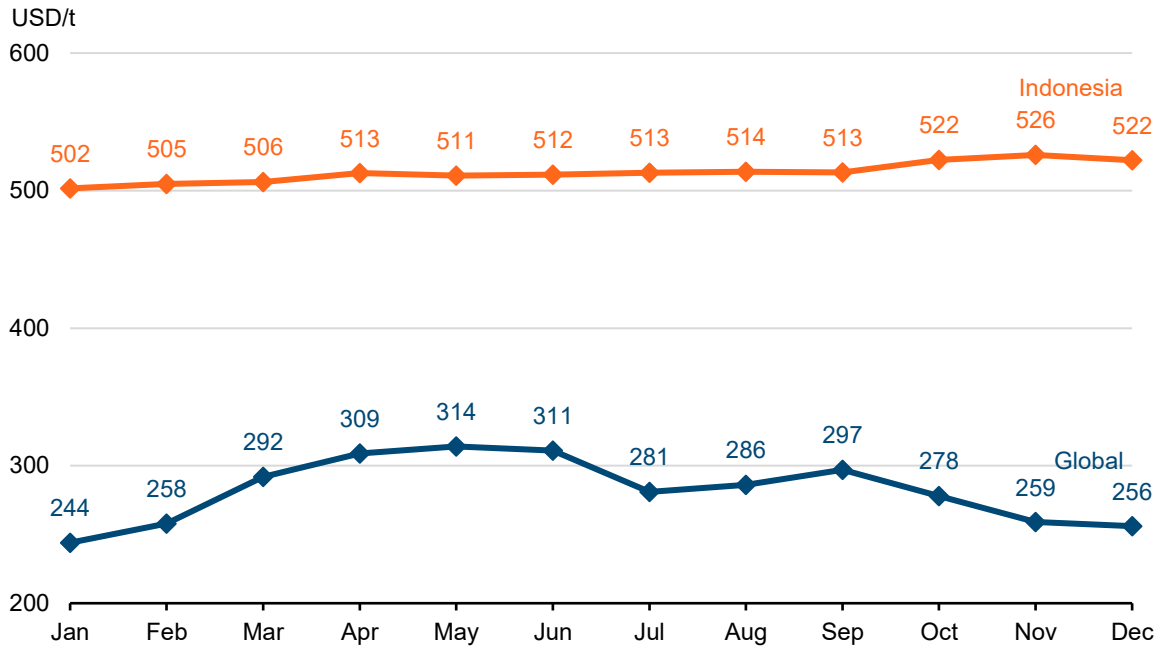
Years	Policy	Details
1979 – Present	Floor Price Scheme	Introduction of country-wide floor price scheme which remains until now. The government also set different price references for corn with different moisture content.
2005 – 2017	Seed Price Subsidy	Provided farmers with corn seed at a subsidised price.
2006 – 2017	National Seed Reserve	This programme offers free certified seeds, including rice, corn, and soybean seeds, to farmers in villages. The programme targets farmers affected by natural disasters and those interested in trying new seed varieties.
2012	Nawacita (Nine Development Agenda)	To achieve self-sufficiency for strategic commodities (corn included) within three years (2015 – 2017).
2015 – Present	Special Efforts Programme	This programme provides free hybrid corn seeds to farmers and includes several other components such as improving irrigation networks, optimizing land usage, and providing fertilisers, agricultural machines, and tools.
2016	Import restriction	The government restricts corn import for use as poultry and livestock feed in order to boost local production. The Indonesian Logistics Bureau (BULOG) became the sole importer of feed corn.
2020	MOA's Strategic Plan 2024	Another effort to push self-sufficiency of corn and halt import altogether. One effort under this vision is to develop 'corn estates', a large-scale corn farming area in several regions across Indonesia.

Source: Freddy and Gupta (2018); Bappenas (2020)

While increased production of corn is indeed a noteworthy aspect of Indonesia's corn industry, another dimension that needs to be carefully analysed is the price of Indonesian corn against the global price. Figure 8 shows the market price of corn in Indonesia compared to the global price. **It is clear that from a period of January to December 2022, the price of corn in Indonesia more than doubled compared to the global price despite increased production[23].**

[23] Ministry of Trade, Republic of Indonesia (2022)

Figure 8: Comparison of corn prices, Indonesia and global, January – December 2022 (USD/t)



Source: Ministry of Trade, Republic of Indonesia (2022)

Elevated corn prices in Indonesia are partly driven by lowered import volume, which has led to a supply shortage[24]. In order to encourage livestock farmers to purchase corn from local suppliers rather than opting for cheaper imported corn, the country's government imposed trade regulations which led to the corn import volume experiencing a significant decline of 86% between 2015 and 2017. The regulatory measures include[25]:

i. The exclusive authority to import corn for feed purposes lies with the state-owned trading company, BULOG. This regulation restricts the importation of corn for animal feed by other entities, and
ii. The Ministry of Agriculture mandates a recommendation, along with approval from the Ministry of Trade, for any corn import activities. These strict prerequisites further control the inflow of corn into the country.

This observation highlights a crucial aspect of the agricultural industry, whereby the implementation of protectionist policies can have both positive and negative effects on food producers in various sectors. In this case, while the corn producers benefit from higher prices and increased production, the situation may be less favourable for livestock producers, as their production costs rise due to increased feed ingredient costs. Consequently, these increased costs may be passed on to consumers through higher chicken prices. It is therefore essential to strike a balance between pushing for higher production and ensuring that domestic prices remain competitive with global prices. This equilibrium not only

[24] Freddy and Gupta (2018)
[25] Ibid.

supports local producers by providing them with a fair market, but it also benefits consumers by offering affordable access to essential goods.

Thailand's Strong Seed Industry Leading to High Production

The growth of Thailand's corn industry began in the 1950s when the government introduced corn cultivation as a viable alternative crop[26]. The government provided subsidies to facilitate the opening of new land for corn production, improved corn seeds for farmers, and introduced a price guarantee scheme.

In 1961, the National Economic and Social Plan was implemented, further solidifying corn's status as an important export crop[27]. The government continued to promote crop diversification and invested in improving the transportation network around the planting areas, ensuring greater accessibility. Additionally, the expansion of upland farming contributed to the industry's growth.

The advancement of Thailand's seed industry began in 1966 and is successful due to several factors such as good infrastructure for research and heavy investment in research and development (R&D). International organisations such as the Rockefeller Foundation and the U.S. Agency for International Development (USAID) have played a pivotal role in establishing notable research centres in Thailand, including the headquarters of the Inter -Asian Corn Program and the National Corn and Sorghum Research Center (Suwan Farm)[28]. **Furthermore, the success of Thailand's seed industry can be attributed to a strong collaboration between the public and private sectors**. Initially, the public sector led the initiative to produce and distribute hybrid seeds, but private sector companies later joined the efforts, providing seeds nationwide and exporting them to other countries[29].

Thailand's groundbreaking achievement in this industry is exemplified by the development of the first improved variety, "Suwan-1" in 1975. This high-yielding variety not only improved corn production but also resisted the destructive downy mildew disease, which previously accounted for the loss of up to 80% of corn crops[30].

Fast forward to the current situation of the corn industry in Thailand, where the country is now producing nearly 80% of its domestic consumption needs. Import and export activities have been kept at a low level (Figure 9). The decline in exports can be attributed to the growing local demand for corn as a fundamental component in animal feed production, with almost 100% of Thailand's domestic corn consumption being channelled into the sector (Figure 10)[31].

[26] Napasintuwong (2015)
[27] Ekasingh (2004)
[28] Napasintuwong (2015)
[29] Ibid.
[30] Ibid.
[31] USDA Foreign Agricultural Service (2023)

Figure 9: Thailand corn production, imports, exports, domestic consumption, 1960 – 2023 ('000Mt)

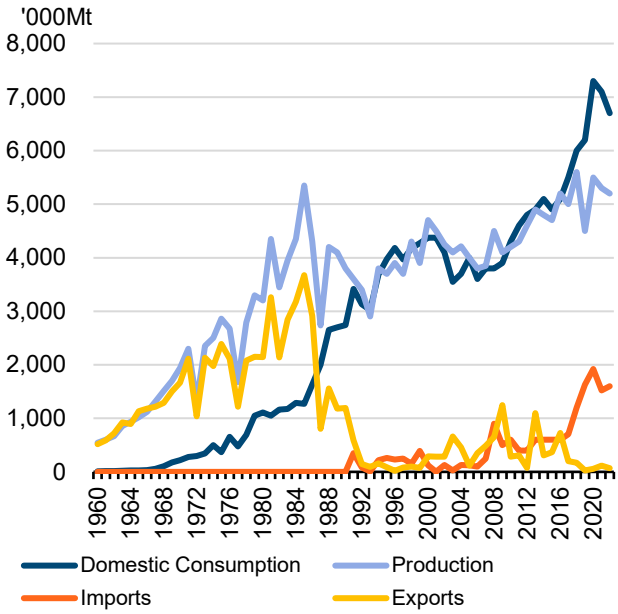
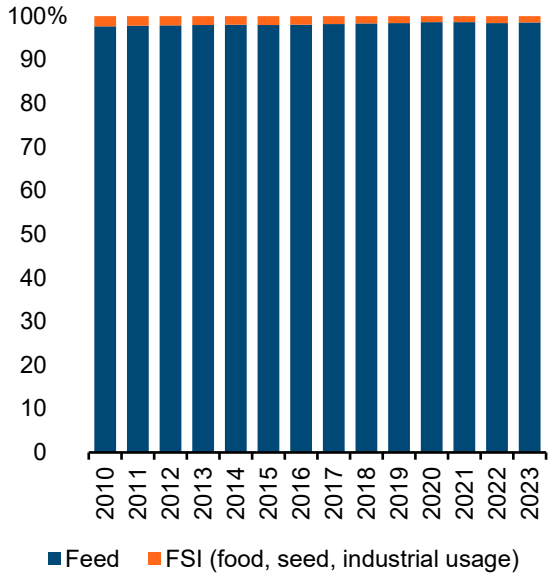


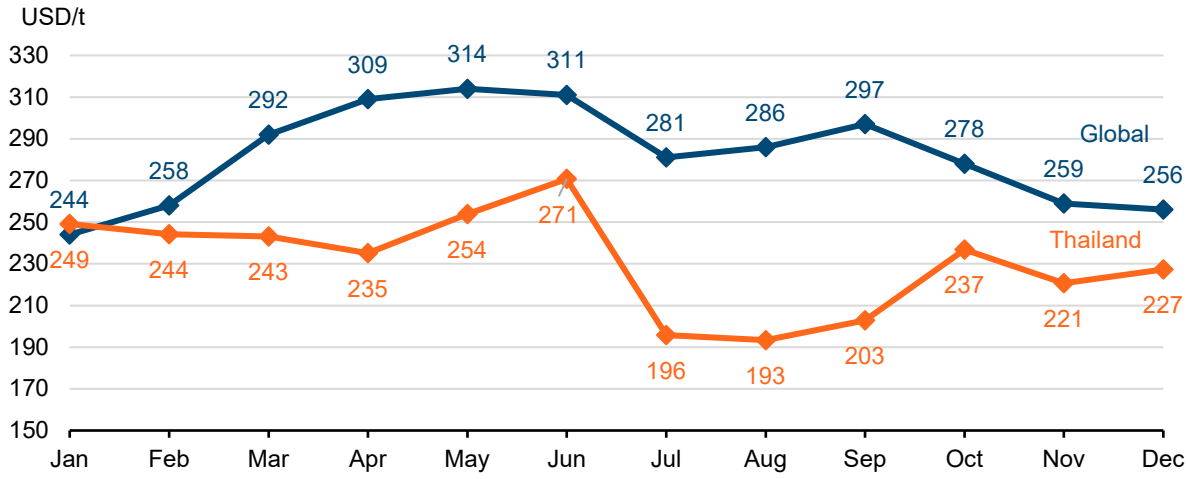
Figure 10 Thailand corn domestic usage, 2010 – 2023 (%)



Source: USDA Production, Supply & Distribution (PSD) Database (2023)

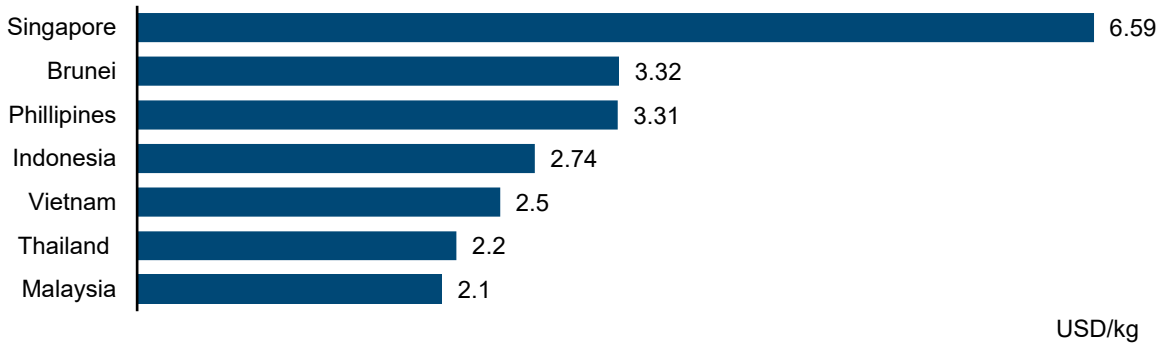
In terms of prices, Thailand is able to ensure the competitiveness of its local corn prices with the global market (Figure 11). This price advantage also extends to its poultry sector, with chicken prices remaining among the lowest in Southeast Asia (Figure 12), with the exception of Malaysia, where a price ceiling is in place to cap the chicken price.

Figure 11 Comparison of corn prices, in Thailand and globally, January – December 2022 (USD/t)



Source: Thailand Office of Agricultural Economics, 2022
Note: Thailand's corn prices are the farm-gate price and only for the average of the northern and north-eastern regions (two biggest corn-producing regions in Thailand) as average price data for all regions could not be retrieved. Therefore, there is a possibility for the average price to be higher.

Figure 12 Comparison of chicken prices in Southeast Asian (SEA) countries, December 2022 (USD/kg)



Source: CEIC, n.d.; United States Department of Agriculture, n.d.; PIHPS Nasional, n.d.; FAMA, n.d.; World Bank, n.d.
Notes: 1) Malaysia's chicken price is capped by a ceiling price.
2) Thailand's chicken price is considerably low due to the high chicken export.

Thailand's case presents a different scenario compared to Indonesia, whereby high corn production does lead to local prices being competitive. This is given that there is sufficient supply for domestic consumption, and importation can happen when it needs to without excessive restrictions. The higher corn yield in Thailand, at 4.4Mt/Ha compared to Indonesia's 3.3Mt/Ha, may also contribute to price stability[32].

From the examples of Indonesia and Thailand, important insights can be drawn;

I. **Racing towards high production may be beneficial as it reduces import reliance. However, policy crafting should be done in a way that protects producers across all segments of the food industry. It is also important to maintain domestic price competitiveness in relation to global prices, thus preventing both food producers and consumers from being impacted by high domestic prices.**
II. **Enhancing agricultural research and development (R&D) capacity holds the key to the industry's growth. In the case of Thailand, where strong R&D is further fostered through effective private-public partnerships, has played an important role in propelling the industry forward. By investing in research and collaborative efforts, Thailand's agricultural sector has gained momentum, leading to advancements, increased productivity, and overall progress within the industry.**

[32] USDA Foreign Agricultural Service (2023)

Conclusion: Exploring a Multifaceted Approach

I. Strategic Expansion: Necessity of a Well-Thought-Out Plan

Overall, Malaysia is yet to establish a thriving corn industry, and achieving this goal will require addressing several challenges. In comparison to more developed corn industries like Indonesia and Thailand, Malaysia currently faces significant limitations. To transform this sector, the country must first lay a strong foundation, which involves implementing incentives and initiatives to make corn farming a profitable endeavour for farmers. **A crucial aspect to tackle is the reduction of production costs, with a particular focus on labour and input expenses, in order to enhance farmer motivation.**

Furthermore, Malaysia's limited agricultural land necessitates maximising productivity within these constraints. In this regard, Thailand's successful approach to research and development (R&D) offers valuable insights. **Investing in R&D can significantly enhance yields and breeding quality, which will lead to increased production. Malaysia should focus on strengthening its R&D capabilities before delving deeper into high-production corn farming**. Collaborative research with countries like Thailand, especially in the space of advanced corn seed studies, could prove beneficial.

However, considering the substantial challenges and the disparity between Malaysia's corn industry and global players, **diversifying trade and exploring alternative animal feed sources might be a more pragmatic approach**. Rather than attempting to catch up with established global corn producers, Malaysia could channel its efforts into areas where it has a competitive advantage. By doing so, the country can effectively manage the challenges posed by land scarcity and work towards building a sustainable agricultural future.

II. Diversifying Import Sources to Minimise Nation's Vulnerability to Global Supply Chain Disruptions

While emphasising production is undoubtedly crucial, it is equally challenging to ensure local corn prices remain competitive in comparison to the global market. Importing substantial amounts of corn for domestic consumption may become inevitable if the cost of domestic production remains significantly higher as a result of ineffective policies, as we have witnessed in the case of Indonesia.

The wide-ranging implications of such a situation could extend to the poultry industry and beyond, making it prudent to consider the option of imports. **A potential approach to address this matter is by creating a stable trade network through import diversification and creating trade relations with countries that are not only accessible but also secure. By reducing heavy reliance on just two countries for corn imports (especially when both countries are from the same region), we can mitigate vulnerabilities that may arise from unexpected disruptions to their export capabilities.**

Two conclusions that may be derived from a study by Wang et al. that examines the stability of agricultural trade networks in a few importing countries demonstrate the importance of having trade stability. Firstly, countries that import from nearby nations will have more stability. An example of this is Germany, where their import sources are mostly from countries within the

European Union, resulting in a more open, timely, and safe trading network[33]. Secondly, countries that are heavily dependent on a limited number of import sources tend to be less stable[34]. An example of this is Japan where they relied on the United States for most of their agricultural trade. This analysis highlights the importance of cultivating a stable and diversified trade network. **Recognising the potential domino effect that trade disruptions can inflict upon the entire food supply chain, it becomes evident that strategic import diversification and relationship building are indeed indispensable strategies for safeguarding our agricultural sector and to a certain extent, the nation's food security.**

III. Will Alternatives Work?

Addressing the challenge of high corn imports and high prices may be approached by exploring viable corn alternatives. Corn plays a crucial role in livestock feed due to its rich nutritional content, particularly in energy, fats, protein, vitamins, and minerals. Its low fibre and high starch content enhance energy utilisation, promoting efficient livestock growth. Finding alternatives may be complex due to these unique qualities.

Currently, there are efforts to develop alternatives for corn. An example of this is palm kernel cake (PKC), a by-product of palm kernel oil extraction. PKC contains 14 – 18% crude protein and 12 – 20% crude fibre[35]. While the high fibre content is suitable for ruminants, it may be too high for poultry and pigs[36]. However, additional processing steps such as solid-state fermentation can resolve this issue[37]. Another challenge with PKC is the inconsistency in its nutritional content among different suppliers. This inconsistency makes it difficult for farmers to use PKC in their animal feed.

PKC serves as just one example, highlighting several issues that need attention. **When developing alternatives, it is crucial to consider their impact on livestock growth, health, and costs. Central to this substitution process is the sustainable usage of these alternatives**. Additionally, fostering a collaborative effort among government agencies, private sectors, research institutes, and end users (e.g., livestock farmers) is important. **This is to ensure that substitutes are consistently high quality, utilised correctly by farmers, produced at a scale large enough to reduce corn imports, and most importantly, achieve economy of scale, making the prices economically viable.**

[33] Wang et al. (2023)
[34] Ibid.
[35] Azizi et al. (2021)
[36] Alimon (2004)
[37] Azizi et al. (2021)

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