



An Overview of the Grain Corn Industry in Malaysia

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ABSTRACT

Grain corn is one of the important commodities in Malaysia as it is the main component of animal feeds. Currently Malaysia is the net importer of grain corn because the local production is unable to supply the higher demand of the livestock industry, especially the ruminants, broilers and swine. The government recognized the issues and challenges faced by this industry such as the lack of arable land and suitable weather for cultivating grain corn. Malaysia received abundant rainfall throughout the year that affected the grain corn especially during harvesting time. Low productivity and higher cost of production are the other issues that impede the development of the grain corn industry in Malaysia. Despite of these issues, the government plans to develop the industry and to find solutions that can overcome the problems that have arisen. The government creates a long term Master Plan for the development of a Grain Corn Industry. The industry's development will involve players that include collaboration with private sectors in Malaysia and industry players from other countries. It is hoped that the development of the grain industry will reduce the dependency on imported produce and finally enhance the livestock industry in Malaysia.

Keywords: Grain corn industry, Livestock industry, Issues and challenges, Master plan

INTRODUCTION

Grain corn was given higher priority in Malaysia as one of a new source of national wealth. This announcement was made by the Minister of Finance in October 2017 during the budget 2018 speech in the Parliament. This was due to its important component in the animal feed formulation where Malaysia heavily relies on imports for more than 50 years. The grain corn industry is relatively small in Malaysia. However, the development of the livestock industry, especially the ruminants, broilers and swine, requires millions of tons of grain corn as the main component of their feeds. Malaysia imports nearly 100% of grain corn from Brazil, Argentina and other countries. For example, in 2017, Malaysia imported around 3.7 million tons of grain corn valued about RM 3 billion (US\$ 737 million) (UN Comtrade, 2019). The import value of grain corn has increased rapidly as a result of the depreciation of Malaysian Ringgit due to speculative crisis of the world currency (international price volatility). In tandem with the increase in the growth of livestock industry and feedstock, the Malaysian government has emphasized the development of the grain corn industry. Malaysia plans to develop a grain corn industry and reduce the dependency on the imported produces. Several pilot studies have been conducted in several states in Malaysia in order to obtain technical data and observe the potential and profitability of the grain corn cultivation. This paper provides an overview of the grain corn industry in Malaysia and how the Malaysian government empowers this crop as a new source of Malaysian agricultural wealth.

MALAYSIA'S CORN INDUSTRY

Corn (*Zea mays L*) is the third largest agricultural crops in the world after wheat and rice. It is a cereal crop grown around the world in diverse climates. Corn has been used for human and animal consumption. There are various types of corn planted around the world, such as dent corn, flint corn, sweet corn, pop corn, flour corn, pod corn and waxy corn. In Malaysia, corn was originally brought to Melaka state during the Portuguese and Dutch colonies in the 16th century (Wong, 1992). The earliest introduced corn was the types of flint and dent. At that time, flint-type corn was widely used and more popular compared to dent-type. Nowadays, the mostly used corn variety for human consumption was from the sweet corn variety. In general, corn is cultivated in rotation with other crops such as banana, watermelon, sweet potatoes, pineapple and chilies to complement farmers' income. Corn is cultivated in small land plot between two and five hectares. Since it was introduced in this country, corn is mostly grown for fresh use. It is used in various ways as almost all parts of the crops can be utilized for food and animal feed. Corn is processed to make food and feed ingredients such as breakfast cereals, corn starch, sweeteners (high fructose corn syrup), cooking oil and lysine. Corn is also used in the production of industrial products such as ethanol and polylactic acid (PLA). The corn stems can be used to produce silage for ruminants.

In general, corn is cultivated in all area in Malaysia. However, according to Wong (1992), grain corn was cultivated by smallholder enterprises in river valleys in Kelantan, Terengganu and Pahang. Overtime, the production of grain corn is gradually decreasing, and replaced by sweet corn. At last, there is no commercial grain corn production for feeds in Malaysia. Farmers are more interested in planting sweet corn because of its lower cost of production and shorter cultivation period. In 2003, the sweet corn cultivation area was 6,591 hectares and increased to 11,713 hectares in 2018. Production also increased by 62%, an increase from 31,907 tons to 84,170 tons, respectively. Grain corn cultivation is abandoned and the country is heavily dependent on imports.

The importation of grain corn has increased from 1.196 million tons in 1985 to 2.309 million tons in 1995 and continued to surge to four million tons in 2018 (Figure 1). In 2016, Malaysia imported 4.1 million tons of grain corn from Argentina, Brazil, United States, Paraguay, India, Australia and Thailand (USDA, 2017). Argentina and Brazil controlled around 93% of the total corn imported to Malaysia. Although Malaysian currency saw the depreciation in value relative to the U.S Dollar, the import of grain corn are still high. This is due to the stabilization and decline of grain corn's price as well as the increase in domestic demand for poultry meat (USDA, 2017). Corn imports are expected to grow moderately in line with population growth and stronger feed use for poultry.

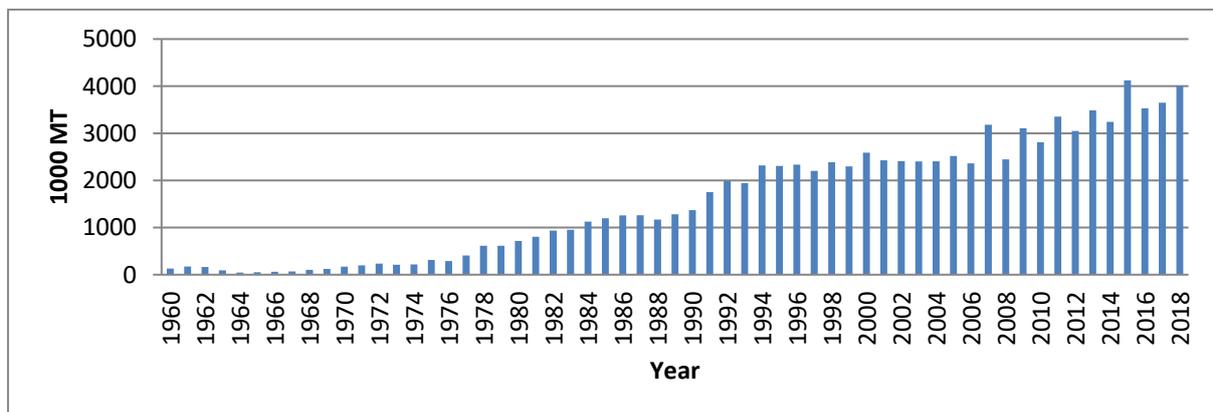


Fig. 1: Malaysia Grain Corn Imports, 1960-2018
Source: Index Mundi, 2018

Corn varieties

There are various grain corn varieties cultivated around the world. Two major classifications of varieties are composite and hybrid. The hybrid variety is now widely used all over the world because of its superior characteristics such as better yield, pest and disease resistance and better adaptation to climate. Besides those two major varieties, there are other aspects of variety that has been genetically modified through the addition of a

small amount of genetic material from other organisms through molecular techniques which is called as genetic modification (GM) or Bt-corn variety.

In Malaysia, the GM variety is not allowed to be cultivated in open areas, and should be focused on the composite or hybrid variety only. Since the 1980s, various adaptation trials have been undertaken in Malaysia. The main aim of the varietal trial is to investigate the potential yield on the geographical suitability, climate and soil condition. In 1980s, several varieties of grain corn have been tested in Kelantan, one of the states in Malaysia. The result of the trial was not very encouraging with an average yield of 3.7 to 4.5 tons per hectare as shown in Table 1. The yield was quite low due to production issues such as water logging, dense surface on paddy land, wet soil clog, climate and mechanization.

Table 1: Corn Cultivars Grown in Kelantan, 1986

Cultivar	Yield (ton/ha)
Suwan 1	4.5
Suwan 11	3.8
Hycorn	4.4
Across 7824	4.5
MARDI Composite IC5	4.4
Tocumen 7936	3.7
Caripeno	3.7
Across 7728	4.4

Source: Prosiding Bengkel Jagung Negara, 1987

From 1989 to 1992, the commercial trial was undertaken in Perak, using composite seed Suwan 1 and Suwan 3. The commercial project was not very encouraging during the developing phase (1989-90 season) with the average yield 1.3 t/ha. The yield of production during the season 1991-92 was 3.0 t/ha and was not viable for the industry to sustain (Table 2). By 1996, the government has terminated the entire grain corn project.

Table 2: Yield Performance, 1989-1992

	Development phase (1989-90 season)	Production phase (1991-92 season)
Area (ha)	11-118	24-40
Yield range (t/ha)	0.1-5.6	0.4-6.8
Average yield (t/ha)	1.3	3.0
Area producing <3 t/ha (%)	73	33
Area producing >5 t/ha (%)	2	18

Source: Special Report Large-scale Production of Grain Maize: The Ladang Lambor Maize Project

In 2016, new grain corn varieties have been introduced and tested locally. Among them are hybrid varieties of GWG 333, GWG 555, GWG 888, GWG 111 and R310 which were planted in Terengganu by Green World Genetics (GWG) (Table 3).

Table 3: Local Variety Test of Grain Corn in Terengganu, Malaysia, 2016

Variety	Yield (ton/ha)
GWG 333	8.9
GWG 555	5.1
GWG 888	9.3
GWG 111	7.6
R 310	8.2

Grain corn cultivation and varietal development was not new in some countries such as the USA, Taiwan, Thailand and India. There are a lot of seed companies in the region such as Thailand that had high yielding varieties as shown in Table 4. Each variety has their own special characteristics that are suitable for specific locations, such as drought-tolerant, downy mildew-tolerant and maturity period. Based on yield and performance in Thailand, private varieties perform better than the public varieties. However, the public varieties are more resistant to downy mildew disease (Napasintuwong, 2014).

In 2018, Thailand produced around 5.3 million tons of grain corn per annum (United State Department of Agriculture, 2018). Aside from Thailand, other neighboring countries such as Indonesia, Vietnam and the Philippines have successfully been doing corn cultivation program and can produce quite encouraging grain corn yield for a long time. Indonesia is able to produce 11.9 million tons a year, the Philippines, 8.2 million tons and Vietnam 3.95 million tons (United State Department of Agriculture, 2018).

Table 4: Corn Varieties and Yield of Pre-commercial and Commercial Hybrid Maize Tested in Thailand, 2010

Origin		Name of Variety	Yield (Kg/ha)
Private	Charoen Pokphand (CP)	TSM0704	9,292
		TSM0702	9,168
		CP-DK 888	7,350
	Fertilizer and Bioseeds Co.	Narai 5	8,224
		Narai 3-plus	7,230
	Mosanto	Big 919	7,310
	Pacific	Pac.999	9,264
		Pac.339	9,206
	Seed Asia	SH0907	8,244
		SH1001	8,030
	Syngenta	NT7328	9,222
		NT6346	8,892
		NK48	8,763
	Uniseeds Uni	H5108	8,107
		Max08	7,980
Private Varieties' Average		8,419	
Public	Department of Agriculture	Nakhon Sawan-2	7,998
		Nakhon Sawan-3	7,820
		NSX 042013	7,936
		NSK 062006	7,663
		NSX 042022	7,567
		NSX 052014	7,985
		Suwan 4452	8,274
	Kasestart University	KSX 5318	8,099
		KSX 5319	8,077
Public Varieties' Average		7,913	
Overall Average		8,229	

Source: DOA's yield trials in 4 public research centres: Nakhon Sawan Field Crop (Napasintuwong, 2014)

Animal feeds and the needs of grain corn

Feeds for livestock production is sourced from the feed milling industry, home or self-mixing and imported feeds. The feeds industry is highly dependent on poultry and swine since they consume about 85% of feeds while the rest (15%) are shared by ruminants, pets and sports animals. Malaysia's livestock industry especially poultry, eggs and swine are in a sustainable manner. Yet it has a huge challenge with regards to the dependence of raw material input sources in food formulations. The cost of production of livestock keeps increasing and almost 60-70% of the cost is contributed by the feeds cost. In poultry industry, about 50-70% of the food formulation is using grain corn and is said to be a highly dependent country on imported grain corn. Malaysia has been importing grain corn for animal feeds for more than 50 years. The practice of intensive poultry and pig farming required animals to be fed with high quality feeds to optimize growth.

The dependency on importation of feed stuffs has negative implication such as being subject to higher costs of feeds and also affecting the deficit in trade balance. The balance of trade for animal feeds is shown in Figure 2. In 2012, the export value of feeds was RM 1,561 million (US\$ 380.7 Million) and then increase to RM 1,892 million (US\$ 461.46 Million) in 2018. However, Malaysia is a net importer with deficit in trade balance amounting to RM 6,032 million (US\$ 1471.2 Million) in 2012 and RM 4,231 million (US\$ 1031 Million) in 2016. The value of the imported grain corn boom hits speed bump as a result of the immediate impact of the Malaysia's weakening currency stemming from the world's currency speculative crisis. The increase in the price of imported materials such as grain corn directly affected the cost of livestock production as well as the price of chicken and eggs in the market. Any changes in the supply of grain corn as well as foreign exchange speculation can potentially affect the ability of a country to achieve food security and sovereignty. Consequently, in tandem with the increase in the growth of livestock industry and feedstock, the Malaysian government has put emphasis on developing the corn industry.

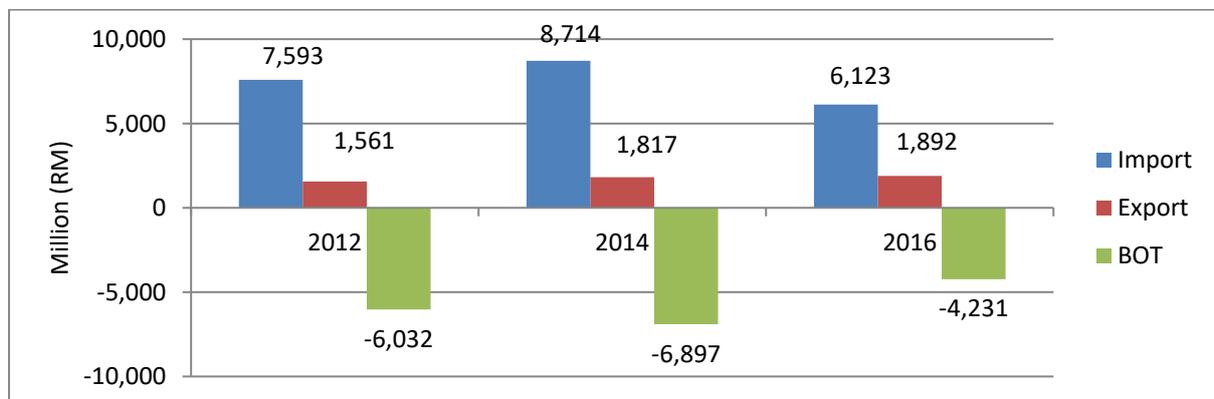


Figure 2: Balance of Trade for Animal Feed (RM million)

Source: Department of Veterinary Services, 2018

The development of a national grain corn industry

Four decades ago, the government identified the issue related to the rapid accelerated of the import bill of grain corn as it was around RM 300 million (US\$ 73.17 million) in 1980s. Hence, the policies and measures towards developing the grain corn industry were proposed through the National Grain Corn Workshop in 1987. During the opening of the workshop, the Minister had announced the National Second Crop Policy that will be implemented by the agencies under the Ministry of Agriculture. Among the agencies involved are the Malaysian Department of Agriculture (DOA), the Malaysian Agricultural Research and Development Institute (MARDI), the Farmer's Organization Authority (LPP) and the Malaysian State Governments. However, this effort was not continued due to uneconomical production, high production costs, competition to more profitable crops, lacking of grain corn market channel and competition from the cheaper grain corn from world markets.

After looking at high domestic needs and high dependency on import as well as foreign currency instability, the Malaysian government is taking a re-initiative to develop the national grain corn industry by involving the players in the entire supply chain of the industry. The overall involvement of the industrial supply chain refers to the production of grain corn, post harvest management, marketing and feed manufacturing entrepreneurs (feed millers), policies authorities and government agencies. The involvement of the entire supply chain is essential to ensure that the developed model is comprehensive and sustainable. In 2016, the ministry has developed a Grain Corn Development Master Plan from 2018 to 2032. The main goal of this development is to enable the country to produce 30% of the grain corn requirement for domestic consumption. Based on the current forecast, the country needs to produce 1.4 million tons of grain corn to fill the requirement until 2032. Pioneer plots and continuous studies have been carried out by MARDI and agencies under the Ministry of Agriculture and Agro based Industry to improve every aspect of grain corn cultivation to further improve yields-cost effective.

MARDI, which serves as an agricultural research agency in Malaysia, plays an important role in implementing grain corn research. Among the research focuses are the development of high yield varieties according to the suitability of land and weather in Malaysia, good agronomic practices, post-harvest management, pest and disease monitoring, agricultural technology utilization, management and value-added corn residues and market intelligence. This effort needs to be followed by developing a research network at the ASEAN level to enable sharing of research results that can be utilized together. Other agencies such as Malaysian Department of Agriculture plays a role in providing services and supply of input, extension and training services as well as quality standard control. Cooperation from anchor company, co-operatives, farmers' organizations, farmers and financial institutions also play a vital role in ensuring the implementation of the national grain corn industry development plan. In the long term, grain corn production would be geared to meet all domestic requirements.

CONCLUSION

Grain corn is an important agricultural crop which plays a major role in the food, feeds and seed industries. Taken into account its importance as a main component for animal feed formulation and as an initiative to reduce the dependency on import, it is a right decision for the government to develop a grain corn industry. Furthermore, grain corn is considered as a new source of wealth for farmers as well as new source of income for Malaysia. The future of the grain corn economy is linked with its contribution to food security in Malaysia, income growth and poverty alleviation. Corn cultivation can be implemented in Malaysia but it takes a while to grow as it is a new industry. The success of the grain corn industry in Malaysia depends on the management of the comprehensive supply chain system with the active involvement of all parties, especially the private sector and the institutional intervention such as enforcement and initial initiatives. Hence, with new strategies and great implementation from now, it is expected to drive the industry with more dynamic and rapid development.

REFERENCES

- Department of Veterinary Services (2018). Perangkaan Ternakan 2016/2017. Retrieved on 15th December 2018 from http://www.dvs.gov.my/dvs/resources/user_1/DVS%20pdf/perancangan/2018/Perangkaan%202016%202017/3.Muka_Surat_1-15.pdf
- Index Mundi (2008). Malaysia Corn Import by Year. Retrieved on 21th December 2018 from <https://www.indexmundi.com/agriculture/?country=my&commodity=corn&graph=imports>
- Napasintuwong, Orachos. 2014. Maize seed industry in Thailand: Development, current situation, and prospects. ReSAKSS Working paper 4. Washington, D.C.: International Food Policy Research Institute (IFPRI). Retrieved on 1st January 2019 from <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/128923>

- Prosiding Bengkel Jagung Negara (1987). Presented in Bengkel Jagung Nasional 21-23 Julai 1987, Pulau Pinang, Malaysia
- Special Report Large-scale Production of Grain Maize: The Ladang Lambor Maize Project (1989-1992). MARDI Special Report. Malaysia.
- United Nations Commodity Trade Statistics Database (UN Comtrade) (2019). Commodity Trade Statistics Database. Retrieved on 11th April 2019 from http://data.un.org/Data.aspx?d=ComTrade&f=_11Code%3A11
- United State Department of Agriculture (2017). Malaysia Grain and Feed Annual 2017. Global Agricultural Information Network (GAIN) Report 27 March 2017. Retrieved on 19th February 2019 from <https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Grain%20and%20Feed%20Annual%20Lumpur%20Malaysia%203-27-2017.pdf>
- United State Department of Agriculture (2018). World Agricultural Production. Circular Series WAP 12-18 December 2018. Foreign Agricultural Service, Office of Global Analysis. Retrieved on 8th January 2019 from <https://usda.library.cornell.edu/concern/publications/5q47rn72z?locale=en>
- Wong (1992). Morfologi dan variety-varieti jagung. In Zaharah, H. (Eds.), Penanaman Jagung (7-12). Kuala Lumpur, Malaysia: Institut Penyelidikan dan Kemajuan Pertanian.