The Malaysian Agricultural Seed Industry – Seed Policy and Development

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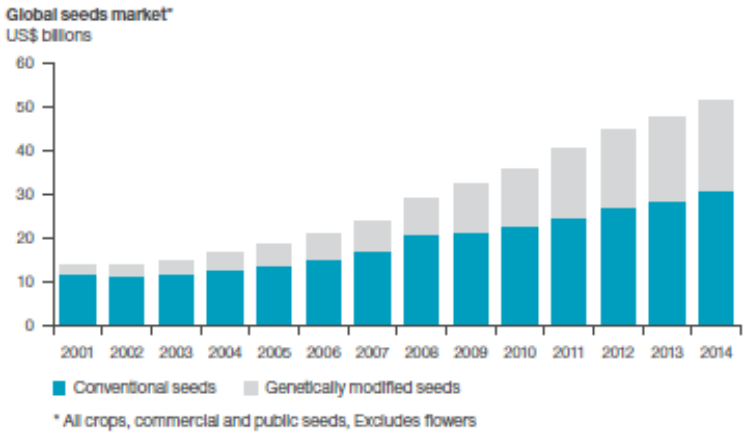
INTRODUCTION

Seed is a small hard part produced by plants which is capable of developing into a new plant. Most plants have seeds which contain the reproduction system of a flowering plant. Generally, plant seeds are formed in a small, round or oval shapes, but they can be found in large shapes and sizes. However, for a plant that grows underground, tubers, bulbs, or corms are commonly used as its growing material. Seed is one of the main agriculture inputs. It is considered as the necessary tool and primary starting point of any agriculture activity (Wan Jusoh, 2006). Other than its importance as an agriculture input, seed can also be consumed as a source of calories and protein in human diet such as grains, legumes or beans and nuts. This paper focuses on seeds for agriculture in general, in which it consists of trade overview, policy and marketing aspects in the Malaysian context.

WORLD SEED MARKET

The last 40 years have seen a dramatic transformation of the commercial seed industry. It has shifted from a competitive sector of agribusiness, composed primarily of small, family-owned firms, to an industry dominated by a number of transnational chemical corporations (Philip, 2009). The seed business is growing rapidly every year with an increasing number of farmers trying to achieve the same quality of previous harvests. The value of the global seed market has almost tripled since 2000, reaching approximately US$51 billion in 2014 (Figure 1). Growth has occurred in both conventional and genetically modified seeds over this period for all crops (excluding flowers). The cumulative growth of both conventional and genetically modified within 14 years are 100% and 600%, respectively (Syngenta, 2016).

Fig. 1. Global seed market, 2001 -2014



Source: Syngenta (2016)

Almost 67% of the share of the commercial worldwide seed market has been dominated by ten companies which is valued at US$20.55 billion (Table 1). The largest seed company in the world is Monsanto of the United State of America, accounting for almost one-quarter (23%) of the market, followed by DuPont (USA) (15%) and Syngenta, Switzerland (9%). They have accumulated 47% of world market share valued around US$14.49 billion.

Table 1: Top ten Main Seed Companies in the World (2010)

Company Name	Seed sales (US$ billion)	% of global proprietary seed market
Monsanto (US)	7.29	23
DuPont (US)	4.64	15
Syngenta (Switzerland)	2.56	9
Groupe Limagrain (France)	1.25	6
Land O' Lakes (US)	1.10	4
KWS AG (Germany)	0.99	3
Bayer Crop Science (Germany)	0.70	2
Dow AgroSciences (USA)	0.64	<2
Sakata (Japan)	0.99 b	<2
DLF-Trifolium (Denmark)	0.39	<2
Total	20.55	67%

Source: ETC Group (2010)

The global food requirement will increase significantly by 2050, with the increase of the world population. At that time, the world requires around 70% more food (Sygenta, 2016). The global demand for grain (including rice) has increased annually and will continue to increase at an average rate of around 1.4% per year with an approximately 30% to 40% of the total dietary requirement. However, the dietary trend in the future is changing where demand for meat and dairy is growing, especially in emerging markets. Thus, more meat and dairy products will be consumed by consumers and this is also impacting significantly on the demand for feed (grain corn, soya bean, fodder, and others). Consequentially, the pressure on achieving food security becomes increasingly challenging.

MALAYSIAN SEED INDUSTRY

The modernisation of the national seed industry in Malaysia started with the implementation of the National Seed Project (NSP), which received aid in the form of loan from the World Bank in the year 1979 (Florence and Amyta, 2012). The aim of this initiative was to expand domestic food and to reduce the food import bill, of which the foodstuffs import value has currently reached almost RM13 billion. The seed industry has continuously been important in the national agenda. It has been given high priority by the government as stipulated in the National Agricultural Policies (NAPs); from NAP1 to NAP4 better known as the national Agro-food Policy; stretching over the period from 1984 to 2020. Even though they are slightly different in terms of objectives under the policies, the main goal is for increasing production; reducing import value while enhancing export activity and providing food security and safety.

The development of the Malaysia's seed industry varies due to the development of the agricultural sector. The earlier development phase of the sector focused more on the industrial crops such as rubber, oil palm and cocoa, as these crops were and still important export commodities. They have significantly contributed to the national income. Hence, the seed industry for these crops is considered well established. An increase importance of food and other horticulture crops due to food security concerns made it necessary for the seed

industry to be further developed, albeit huge challenges, such as currently, good quality seeds are mainly imported.

Fig. 2 shows the total import and export values for vegetable seeds, fruit seeds, and seeds of other crops for the year 2012 to 2016. The import values for vegetable seeds as well as for fruit seeds and others are higher than the export values, whereby in general the Balance of Trade (BOT) for the seed planting material is in deficit. The production of seeds of vegetables increased tremendously with an annual growth rate of 14%. Countries like China, Thailand, Taiwan, and Japan are the main suppliers of vegetable seeds to Malaysia. About 90% of the seeds for the national vegetable industry are imported (Ministry of Agriculture and Agro-based Industries, 2011). The import values exceeded the export values by about US$13 billion for 2012 to 2016. Partner countries of the Malaysian seed exports are Brunei, Papua New Guinea, and Indonesia. These countries account for more than 50% of the total Malaysian seed export market share.

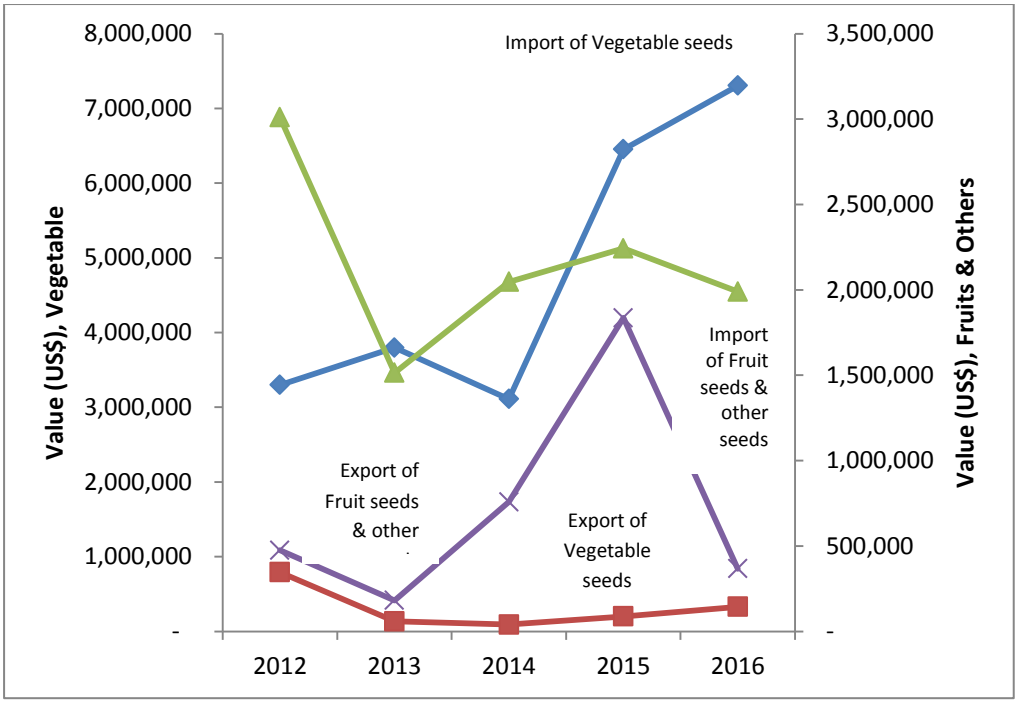


Fig. 2. Import and Export Values for the Malaysian Seed Industry, 2012 – 2016
Source: UNCOMTRADE (2017)

Seed Distribution Structure

The seed distribution structure for Malaysia is the same as in many countries across developing Asia (FAO, 2000). The physical flows of seed distribution to farmers ideally have two models, either directly through private and business networking or through government intervention as depicted in Figure 3. As shown in the figure, local seed and crop producers can either sell directly to the wholesaler or large retailers or by government tendering process which deals directly with farmer cooperatives. Since Malaysia has been categorized as a developing country and has improved so much in road networks, logistics, technologies and facilities, the seed marketing systems is becoming more efficient (FAO, 2000). In addition,

farmers are able to obtain good quality and consistent supply of agricultural seeds most of the time.

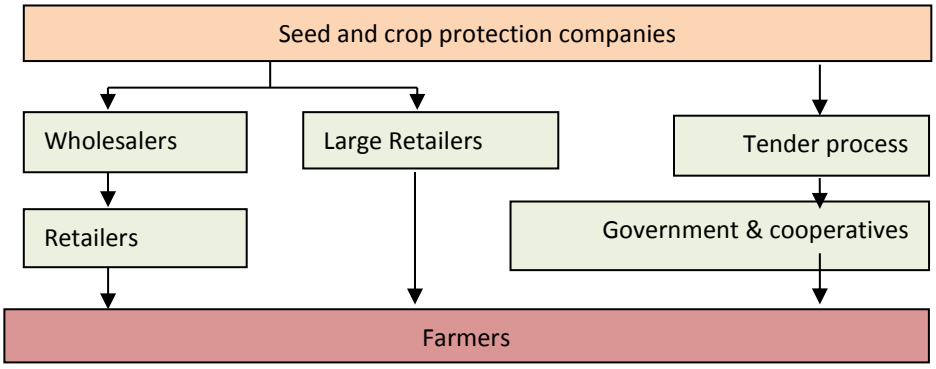


Fig. 3. Malaysian Seed Distribution Structure
Source: Syngenta (2016)

STRATEGIES TO ENHANCE SEED INDUSTRY

The National Seed Council (NSC) was established in 2011. The roles of this council are to oversee the development of the local seed industry and to reduce Malaysia's dependence on imported seeds (including seeds, seed clones, vegetative propagation, and tissue culture) and breeding materials (including semen and embryo). The NSC has enforced its importance as one of the Entry Point Projects (EPP-14) under the Agriculture Sector of National Key Economic Areas (NKEAs) for the seed industry. It is targeted to contribute RM466.6 million in the Gross National Income (GNI) and to create 5,390 jobs by 2020. One of the main focuses of this policy is to produce high-quality seeds and genetic material by using the Marker-Assisted Selection (MAS) technology.

The Malaysian Bioeconomy Development Corp (Bioeconomy Corp) formerly known as the Malaysian Biotechnology Corp (Biotech Corp) acquired the MAS technology from DNA Landmark, Canada in the 9th Malaysia Plan and appointed MARDI as the custodian and main beneficiary of this technology. The Centre for Marker Discovery and Validation (CMDV) was formed through collaboration between MARDI and BiotechCorp. Later in the 10th Malaysia Plan, CMDV became one of the components under the Entry Point Project 14 (EPP 14) Seed Industry Development.

CMDV started its operation in 2011. As a one-stop centre for high-throughput agricultural genotyping solutions, CMDV played a role in providing rapid and cost-effective genotyping services for crop, livestock, and aquaculture. The services offered by CMDV enable scientists and breeders to reduce the number of breeding years which would have otherwise taken six to eight years using conventional strategies. Thus, the MAS technology has been introduced by scientists to improve the efficiency of breeding programs by providing significant savings in terms of cost and time. The principles of MAS technology involve the application of molecular markers in the selection of a trait of interest (Benno Vogel, 2009).

The CMDV also acts in developing markers for agricultural commodities including crops, livestock, and fisheries. As such, CMDV and DNA Landmark have taken the initiative to

develop the 1536 SNP panel that is very useful for rice breeding. The 1536 SNP panel can be applied by breeders to produce high quality crop varieties that are resistant to diseases. It will speed up the breeding process and develop more efficient selection systems (Jiang, 2013). In realizing the government aspiration in achieving self-sufficiency level, breeders should make use of the 1536 SNP panel in order to support the production of quality rice in Malaysia.

CMDV has also completed the genome sequencing of durian which is scientifically known as *Durio zibethinus*. This draft sequence of the durian genome provides new insight to gain deeper understanding of the genetic characteristics as well as to harness the genetic diversity of the durian germplasm. This DNA blueprint is an invaluable resource for fruit breeding improvement, production and conservation of durian. Combinations of the genome sequencing, genotyping with the molecular markers will enhance the genetic diversity studies and will enable researchers to identify important traits such as tolerance to canker diseases, high yield, cheesy texture, unique flavours and pleasant aroma of durian (Bernado, 2008).

These markers will help the seed industry for the selection of seeds as well as of planting and breeding material. Through the same initiative, an incentive scheme is also provided to aid local seed players as an anchor company to further develop high-quality seeds locally.

Long term action plans are also created to enforce the national seed industry. Three acts or regulations for each sector (crop, livestock, and fishery) will be developed separately in the future (Ministry of Agriculture and Agro-based Industries, 2011). Coordination and networking with international organizations like the Consultative Group on International Agricultural Research (CGIAR) and the International Rice Research Institute (IRRI) are being strengthened as a way to share technology in seed industry.

CONCLUSION

The seed industry is expected to be economically viable in the long term through proper management and strategies. Malaysia is bestowed with an agro-climatic condition that is conducive for research and the development of seeds and planting materials for tropical crops (Wan Jusoh, 2006). Government agencies including research institutes and private companies are ready to build strategic alliances and effective collaborations in producing new seeds. The setting up of infrastructure and facilities has also been established by the respective entities. In the aspect of legislation, the updates for current policies have also been undertaken by the government through its National Seed Council. However, a lot of improvement and work need to be further taken to firmly establish the seed industry. It has a potential for contributing to the transformation of agriculture in our economic growth.

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