Future Competitiveness of the Malaysian PKE

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ABSTRACT

The Malaysian palm kernel expeller (PKE) competes with various oilmeals in the world market, particularly as an animal feed. It has a competitive advantage over other oilmeals due to its consistent supply and competitive price. However, increasing production and export of other oilmeals coupled with changes in meat preferences worldwide are affecting the competitiveness of Malaysian PKE. Future development in the world livestock market will play a pivotal role in spearheading the future competitiveness of the Malaysian PKE.

INTRODUCTION

Malaysian palm kernel expeller (PKE) competes with other oilmeals in the world market, such as soyabean meal (SBM), rapeseed meal (RSM), sunflower meal (SFM), copra meal (CPM), cotton meal (CTM), groundnut meal (GM) and fishmeal (FM). World production of oilmeals had increased from 138 million tonnes in 1990 to reach 227 million tonnes in 2006.

SBM dominates the oilmeal market with a production share of 66% in 2006, compared to 50% in 1990. The production shares of the other oilmeals are much smaller - RSM (11%), CTM (7.6%) and corngluten feed (6.4%). The output of PKE had increased from 1.8 million tonnes in 1990 to 5.2 million tonnes in 2006 due to increase planting of oil palm worldwide. Nevertheless, it constitutes only a small 2% share of the global oilmeal production.

Oilseed meals including PKE are used primarily as animal feed. Their demand is derived from the demand for meat and other livestock products, which in turn reflects such factors as population growth, income and preferences. Oilmeal is fed in the more intensive livestock farming – dairying, poultry, pigs and some forms of fish. The world consumption of oilmeals increased from 137 million tonnes in 1990 to 227 million tonnes in 2006. PKE registered the fastest growth of 4.2% per annum, followed by SBM at 3% and RSM at 2.5%.

Recognizing the increasing importance of the Malaysian PKE trade, investigating its competitiveness and also its position in the world oilmeals market is crucial to assess its future prospects. Competitiveness is a concept that has various definitions. It is inherent to the economic context and can be considered at three levels – the individual company, individual sector and whole economy - as well as to both the domestic and the international markets (Banterle, 2005). At the international level, it can be defined as 'the degree to which a country can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously containing and expanding the real income of the nation's people over the long-term'.

The competitiveness of an industry or firm is defined as

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'the ability to profitably gain and maintain market share in domestic and/or foreign markets' (Pitts and Lagnevik, 1998), and also as 'the ability of the firm and industry to protect and improve their market position with respect to other competitors, and to adapt market strategies to structural changes' (Drescher and Maurer, 1999).

The main theory for competitiveness is based on comparative advantage and competitive advantage, both of which are related but often mistaken for each other. The concept of comparative advantage is derived from the traditional theory of international trade that it is more profitable for a country to export goods that it produces at a relatively lower cost than other countries, and import goods that it produces at a relatively higher cost than other countries. Comparative advantage explains how trade benefits nations either through better technology, which refers to the Ricardian model, or through more efficient use of resource endowments, which refers to the Heckscher-Ohlin model, when trade is completely unrestricted.

Competitive advantage defines trading patterns, as they exist in the real world, including all the barriers to free trade ignored by comparative advantage. For trade theory, competitive advantage is a more useful concept than comparative advantage. It is argued that competitiveness includes market distortions while comparative advantage assumes undistorted markets (Hatirli *et al.*, undated).

This article analyses the competitive performance of Malaysian PKE using several competitive and comparative advantage indicators in the oilmeals market. The main competitors are other oilseed meal exporters such as Indonesia that exports PKE and CPM; Philippines (coconut meal, CM); India, Argentina and Brazil (all SBM); Ukraine and Argentina (SFM).

METHODOLOGY

Several indicators can be used to analyse competitive and comparative advantage, for instance, export market share (EMS) and revealed comparative advantage (RCA) by Mohd Arif (2004) and Banterle (2005). These indicators are briefly explained and discussed below.

Export Market Share

The export market share (EMS) is expressed as:

$$EMS_{ijt} = \frac{X_{ijt}}{\Sigma X_{ajt}} \times 100 \quad \ldots\ldots\ldots\ldots\ldots (1)$$

where,

X_{ijt} = export of product *i* by country *j* in year *t*; and

ΣX_{ajt} = total exports of product *i* by countries in year *t*.

The EMS index assesses the export share of a country in percentages relative to the exports of a group of countries for a specific sector. The range of the index values is from zero to 100, with zero indicating that the country does not export the product and 100 indicating it to be the only exporter. The EMS outlines the competitive position of a country in the international market for a sector.

Revealed Comparative Advantage

The revealed comparative advantage (RCA) index is the most frequently employed measurement of trade specialization. The concept introduced by Balassa (1965) as a measure of the relative trade performances of individual countries in particular commodities. Basically, it measures a country's exports of a commodity relative to its total exports and corresponding to export performance of a set of countries and based on observed trade patterns.

RCA is defined as:

$$RCA_{ijt} = \frac{X_{ijt} / X_{iwt}}{\Sigma X_{ajt} / \Sigma X_{awt}} \quad \ldots\ldots\ldots\ldots\ldots (1)$$

RCA_{ijt} = revealed comparative advantage index for product *i* in country *j* year *t*;

X_{ijt} = export of product *i* by country *j* in year *t*;

X_{iwt} = total world export of product *i* in year *t*;

ΣX_{ajt} = total exports by country *j* in year *t*; and

ΣX_{awt} = total world exports in year *t*.

This index takes values from 0 to + ∞. A value greater than unity denotes that the product exported by a particular country is relatively more competitive or more specialized. Conversely, a value below unity indicates that the country does not have a competitive advantage in exporting the product.

Since this study is on oilmeals, the formula can be written more specifically as:

$$RCA_{ijt} = \frac{X_{ijt} / X_{iwt}}{\Sigma X_{ajt} / \Sigma X_{awt}} \quad \ldots\ldots\ldots\ldots\ldots (2)$$

where,

RCA_{ijt} = revealed comparative advantage index for oilmeal *i* in country *j* year *t*;

X_{ijt} = export of oilmeal i by country *j* in year *t*;

X_{iwt} = total world exports of oilmeal *i* in year *t*;

ΣX_{ajt} = total exports of all oilmeals by country *j* in year *t*; and

ΣX_{awt} = total world exports of all oilmeals in year *t*.

The RCA is bounded on its left distribution by 0, but it can be infinite to its right, thus does not conform to normal distribution. A revealed symmetric comparative advantage index (RSCA) is proposed that enables the symmetric index of RCA to range from –1 to +1 (Hatirli *et al.*, undated). The value is calculated by:

$$RSCA = (RCA - 1) / (RCA + 1) \ldots (3)$$

It can be used to measure the change in export specialization for relevant commodities. The study used annual time series data on PKE, SBM, RSM, SFM and CM over 1997-2006. Export data was taken from *Oil World* for each country (Oil World, 2006) in order to calculate the relevant indices.

RESULTS AND DISCUSSION

The total world export of oilmeals increased from 48.5 million tonnes in 1990 to 67.8 million tonnes in 2006 (*Table 1*). The major oilmeal was SBM with a market share of 77.5% in 2006, a substantial increase from 55% in 1990. In the same period, PKE doubled its market share from 3% to 6.1%, followed by SFM from 4.5% to 5.2%. All the other oilmeals either stagnated (RSM, GM) or declined (CPM, CTM).

TABLE 1. EXPORT VOLUMES (million tonnes) AND MARKET SHARES OF SELECTED OILMEALS (%)

Year	PKE	SBM	RSM	SFM	CPM	GM	CTM	Others	Total
1990	1.5 (3.09)	26.7 (55.03)	2.7 (5.48)	2.2 (4.53)	1.2 (2.58)	0.8 (1.63)	1.2 (2.47)	12.2 (25.19)	48.5
1995	1.97 (3.89)	29.0 (57.23)	2.6 (5.21)	2.4 (4.76)	0.8 (2.19)	0.6 (1.18)	0.8 (1.54)	12.1 (23.99)	50.6
2000	2.6 (4.83)	33.6 (62.40)	2.4 (4.53)	2.9 (5.43)	0.6 (1.91)	1.0 (0.46)	0.6 (1.13)	10.4 (19.29)	53.8
2005	3.8 (5.98)	48.6 (76.48)	2.4 (3.73)	3.1 (4.86)	0.6 (1.32)	0.8 (0.31)	0.6 (0.94)	0.6 (6.36)	63.5
2006	4.2 (6.13)	52.6 (77.53)	2.8 (4.11)	3.6 (5.23)	0.5 (1.09)	0.7 (0.38)	0.5 (0.78)	3.2 (4.73)	67.8

Source: Oil World, various issues.

Note: SFM - sunflower meal.
PKE - palm kernel expeller.
SBM - soyabean meal.
RSM - rapeseed meal.
CPM - copra meal.
GM - groundnut meal.
CTM - cotton meal.

TABLE 2. EXPORT VOLUMES (million tonnes) AND SHARES (%) OF OILMEALS BY SELECTED COUNTRIES (1997 – 2006)

Year	Mas PKE	Indon PKE	Indon CPM	Phi CPM	India SBM	Arg SBM	Arg SFM	Bra SBM	Ukr SFM	Total
1997	1.4 (5.3)	0.7 (2.7)	0.4 (1.5)	0.6 (2.3)	2.3 (8.7)	8.4 (31.9)	2.3 (8.7)	10.0 (38.0)	0.2 (0.8)	26.3
1998	1.4 (4.5)	0.7 (2.2)	0.3 (1.0)	0.5 (1.6)	2.8 (9.0)	12.3 (39.4)	2.2 (7.1)	10.8 (34.6)	0.2 (0.6)	31.2
1999	1.5 (4.6)	0.8 (2.5)	0.1 (0.3)	0.3 (0.9)	2.6 (8.0)	13.4 (41.4)	2.5 (7.7)	10.9 (33.6)	0.3 (0.9)	32.4
2000	1.5 (4.7)	0.8 (2.5)	0.4 (1.3)	0.5 (1.6)	2.9 (9.1)	13.5 (42.6)	2.1 (6.6)	9.5 (30.0)	0.5 (1.6)	31.7
2001	1.8 (5.3)	0.9 (2.7)	0.3 (0.9)	0.8 (2.4)	2.5 (7.4)	14.4 (42.6)	1.2 (3.6)	11.3 (33.4)	0.6 (1.8)	33.8
2002	1.6 (4.4)	1.0 (2.8)	0.4 (1.1)	0.4 (1.1)	2.0 (5.5)	16.4 (45.4)	1.2 (3.3)	12.5 (34.6)	0.6 (1.7)	36.1
2003	1.8 (4.5)	1.2 (3.0)	0.3 (0.8)	0.5 (1.3)	1.9 (4.8)	18.4 (46.2)	1.2 (3.0)	13.6 (34.2)	0.9 (2.3)	39.8
2004	1.7 (4.0)	1.5 (3.6)	0.3 (0.7)	0.4 (1.0)	2.9 (6.9)	18.8 (44.8)	0.9 (2.1)	14.5 (34.5)	1.0 (2.4)	42.0
2005	2.0 (4.5)	1.6 (3.6)	0.3 (0.7)	0.4 (0.9)	2.3 (5.2)	21.5 (48.2)	1.1 (2.5)	14.4 (32.3)	1.0 (2.2)	44.6
2006	2.1 (4.4)	1.9 (3.9)	0.2 (0.4)	0.4 (0.8)	4.0 (8.3)	24.9 (51.7)	1.0 (2.1)	12.3 (25.5)	1.4 (2.9)	48.2

Note: Export market share in brackets.
Mas - Malaysia, Indon - Indonesia, Phi - Philippines, Arg - Argentina, Bra – Brazil, Ukr - Ukraine, PKE - palm kernel expeller, CPM - copra meal, SBM - soyabean meal, SFM – sunflower meal.

Table 2 shows the export volumes and export shares of selected oilmeals by selected countries, in total comprising two-thirds of the world volume. The total export volume increased steadily by 2 – 3 million tonnes annually since 2000, mostly due to SBM. Malaysian PKE exports had risen from 1.5 million tonnes in 2000 to 2.1 million tonnes in 2006, but its market share had declined slightly over the same period. On the other hand, the export of Indonesian PKE had inched up steadily both in terms of volume and market share. It commanded nearly 4% of the market share in 2005 compared to 4.5% by Malaysian PKE. Therefore, the big proportion of increase in world export of PKE was mainly contributed by Indonesia.

The export market share of CPM declined gradually to less than 1% due to falling amounts by Indonesia and Philippines. Meanwhile, SFM maintained its growth due to increasing exports by Ukraine, overcoming the substantial reduction by Argentina, with more SBM instead and became a bigger exporter than Brazil. *Table 3* shows the export values of oilmeals and their shares in previous years. CPM exporters and SFM by Argentina decreased in both value and share, while the others improved.

The export value share of SBM from any country is bigger than its volume share, while the converse is true for the other oilmeals. The higher export value share of SBM reflects that its value is more appreciated than the others. On the other hand, the export value share of Malaysian PKE declined from 2.2% in 1999 to 1.7% in 2005, despite its export volume share moving down only slightly from 4.6% to 4.5%. Obviously, the quality and price payable for PKE was not viewed as favourably as SBM. The depreciating value of PKE indicates its eroding competitiveness in the world market.

Table 4 shows the RCA value for each country with their respective oilmeals products from 1997 to 2005. Philippines has the highest competitive advantage in the CPM export, followed by Ukraine with SFM, then Malaysia and Indonesia with PKE. The RCA value of Malaysia decreased from 22.10 in 1997 to 16.87 in 2006. Overall, each country had a competitive advantage in their oilmeal exported with RCA > 1. The only exception was Argentina that had disadvantage in exporting SFM in 2005 and 2006.

Overall, most of the countries showed either a consistently decreasing trend or slight

TABLE 3. EXPORT VALUES (USD million) AND SHARES (%) OF OILMEALS BY SELECTED COUNTRIES (1997 – 2006)

Year	Mas PKE	Indon PKE	Indon CPM	Phi CPM	India SBM	Arg SBM	Arg SFM	Bra SBM	Ukr SFM	Total
1997	127 (2.0)	64 (1.0)	51 (0.8)	77 (1.2)	635 (10.0)	2 318 (36.4)	308 (4.8)	2 760 (43.3)	27 (0.4)	6 367
1998	102 (2.1)	51 (1.1)	31 (0.6)	51 (1.1)	476 (9.8)	2 091 (43.1)	196 (4.0)	1 836 (37.8)	18 (0.4)	4 852
1999	107 (2.2)	57 (1.2)	11 (0.2)	32 (0.7)	429 (8.8)	2 211 (45.3)	205 (4.2)	1 799 (36.9)	25 (0.5)	4 876
2000	95 (1.7)	50 (0.9)	35 (0.6)	44 (0.8)	580 (10.2)	2 700 (47.5)	223 (3.9)	1 900 (33.5)	53 (0.9)	5 680
2001	110 (1.8)	55 (0.9)	28 (0.5)	75 (1.2)	495 (8.2)	2 851 (47.0)	139 (2.3)	2 237 (36.9)	70 (1.2)	6 060
2002	112 (1.8)	70 (1.1)	40 (0.6)	40 (0.6)	382 (6.0)	3 132 (49.3)	128 (2.0)	2 387 (37.6)	64 (1.0)	6 355
2003	153 (1.9)	102 (1.2)	27 (0.3)	45 (0.6)	426 (5.2)	4 122 (50.4)	148 (1.8)	3 046 (37.2)	111 (1.4)	8 180
2004	163 (1.6)	144 (1.4)	34 (0.3)	45 (0.5)	745 (7.5)	4 832 (48.6)	122 (1.2)	3 727 (37.5)	135 (1.4)	9 947
2005	164 (1.7)	131 (1.4)	24 (0.3)	32 (0.3)	536 (5.6)	5 010 (52.7)	135 (1.4)	3 355 (35.3)	123 (1.3)	9 510
2006	200 (2.0)	181 (1.8)	23 (0.2)	45 (0.5)	880 (9.0)	5 478 (55.8)	128 (1.3)	2 706 (27.6)	179 (1.8)	9 819

Note: Mas - Malaysia, Indon - Indonesia, Phi - Philippines, Arg - Argentina, Bra – Brazil, Ukr - Ukraine, PKE - palm kernel expeller, CPM - copra meal, SBM - soyabean meal and SFM – sunflower meal.

TABLE 4. REVEALED COMPARATIVE ADVANTAGE (RCA) VALUES FOR SELECTED COUNTRIES IN THEIR EXPORTS OF OILMEALS (1997 – 2006)

Year	Mas PKE	Indon PKE	Indon CPM	Phi CPM	India SBM	Arg SBM	Arg SFM	Bra SBM	Ukr SFM
1997	22.10	14.03	17.92	49.79	1.04	1.29	3.76	1.68	18.45
1998	22.91	16.23	17.64	60.05	1.15	1.23	2.98	1.49	20.34
1999	20.99	17.95	16.15	112.39	1.43	1.24	2.64	1.51	16.62
2000	21.28	14.44	17.55	53.31	1.52	1.34	2.43	1.59	18.31
2001	19.19	14.65	12.18	50.81	1.32	1.36	1.77	1.48	23.27
2002	20.11	15.46	17.80	67.88	1.14	1.31	1.77	1.41	26.21
2003	18.50	14.99	13.50	66.44	1.08	1.32	1.36	1.41	21.90
2004	18.16	15.30	14.47	81.70	1.12	1.34	1.00	1.42	20.98
2005	17.36	14.78	13.24	80.68	1.07	1.33	0.98	1.40	20.21
2006	16.87	15.31	10.70	95.81	1.12	1.31	0.78	1.37	19.76

Note: Mas - Malaysia, Indon - Indonesia, Phi - Philippines, Arg - Argentina, Bra – Brazil, Ukr - Ukraine, PKE - palm kernel expeller, CPM - copra meal, SBM - soyabean meal and SFM – sunflower meal.

fluctuating movement due to increasing competitiveness in the world oilmeals market.

Table 5 indicates that the degree of specialization in exporting PKE by Malaysia had decreased consistently due to the increasing export of SBM in the world market as well as increasing PKE exports by Indonesia. The same situation is also experienced by Indonesia in exporting CPM, Brazil in exporting SBM and Argentina in exporting SFM.

FUTURE COMPETITIVENESS OF PKE

The competitiveness of Malaysian PKE depends on developments in both the world feed market and world livestock market. The local livestock market is small, particularly for ruminants which population has stagnated (*Figure 1*). The small domestic market for ruminant feed induces PKE to be used also for other animals, such as poultry and swine. However, monogastric animals are constrained by their ability to digest PKE with its high fibre content (Wan Zahari and Alimon, 2004).

In addition, the abundant availability of cheaper alternative feeds, such as pineapple waste, copra cake, tapioca refuse, fish meal, rice bran, soyabean waste,

TABLE 5. REVEALED SYMMETRIC COMPARATIVE ADVANTAGE (RSCA) VALUES OF SELECTED COUNTRIES IN THEIR EXPORTS OF OILMEALS (1997 – 2006)

Year	Mas PKE	Indon PKE	Indon CPM	Phi CPM	India SBM	Arg SBM	Arg SFM	Bra SBM	Ukr SFM
1997	0.91	0.87	0.89	0.96	0.02	0.12	0.58	0.25	0.90
1998	0.92	0.88	0.89	0.97	0.07	0.10	0.50	0.20	0.91
1999	0.91	0.89	0.88	0.98	0.18	0.11	0.45	0.20	0.89
2000	0.91	0.87	0.89	0.96	0.20	0.14	0.42	0.23	0.90
2001	0.90	0.87	0.85	0.96	0.14	0.15	0.28	0.19	0.92
2002	0.91	0.88	0.89	0.97	0.07	0.13	0.28	0.17	0.93
2003	0.90	0.87	0.86	0.97	0.04	0.14	0.15	0.17	0.91
2004	0.90	0.88	0.87	0.98	0.06	0.15	0.00	0.17	0.91
2005	0.89	0.87	0.86	0.98	0.04	0.14	-0.01	0.17	0.91
2006	0.89	0.88	0.83	0.98	0.06	0.13	-0.12	0.15	0.90

Note: Mas - Malaysia, Indon - Indonesia, Phi - Philippines, Arg - Argentina, Bra – Brazil, Ukr - Ukraine, PKE - palm kernel expeller, CPM - copra meal, SBM - soyabean meal and SFM – sunflower meal.

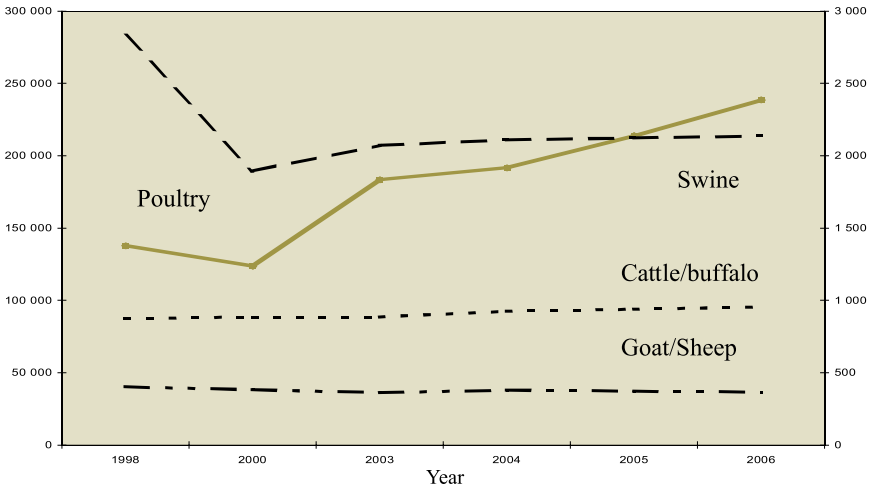

Figure 1. Livestock population in Malaysia ('000).

Note: Vertical axis for poultry on the left hand side.
Vertical axis for cattle/buffalo, goat/sheep and swine on the right hand side.
Source: Department of Veterinary Services, Malaysia.

wheat pollard, brewer's grain, sago waste and soyabean hull detracts from using more PKC in swine and poultry feed locally.

The production of compound/ finished feeds in Malaysia has increased steadily by 5% per annum from 4.28 million tonnes in 1998 to 4.50 million tonnes in 2006, and is projected to reach 6.55 million tonnes in 2010 (Kooi ET, 2007). The demand for finished feeds is 80% for poultry, 15%-17% for swine and 3%-5% for others (ruminants, rabbit, quail, fish, *etc*.). The commercial feed mills mainly produce poultry feed as poultry is by far the largest livestock reared. The low ruminant population creates a small demand for ruminant feed, and thus low demand for PKE, causing it to be mainly exported.

The world market for protein meal is expected to grow steadily at 2.4% yearly until 2015 as demand supports the expansion in output, stimulated by higher meat and vegetable oil consumption. Geographically, the demand for protein meal has increased in Asia, particularly China, while the growth in production is occurring in South America and Asia. Trade in protein meal has increased slowly with Argentina remaining the world's largest exporter and the European Union (EU) the world's largest importer.

Basically, the growth in the protein meal market has been driven by expansion of the world economy, which has grown by over 4% annually since 2002. Its use is also expected to rise due to population increase, although the rate of growth is expected to decline over the next 10 years to 1.1% annually. The world population is expected to reach 7.2 billion by 2015 according to the Food and Agricultural Organization (FAO).

Figure 2 shows the increasing world production of compound feed from 575 million tonnes in 1998 to 626 million tonnes in 2005. The growth mainly occurred in Asia Pacific and the Americas that comprised about 25% and 46% of world production, respectively. Meanwhile, the European region that made up about 28% stagnated over the period.

The demand of meat has increased over the years chiefly caused by dietary changes in many developing countries, resulting from increased per capita income and urbanization, thus, driving the demand for feed ingredients. When combined with population growth, which is nearly twice that of developed countries, developing countries are the new drivers for the rising demand for protein meals. Although the pace of growth is slower in developed countries, they still use about 60% of the world's oilseed meal. The global beef consumption is expected to rise gradually at 1% and 1.7% a year in the OECD and FAPRI, respectively.

In many developed countries, per capita consumption is expected to stagnate or fall, as consumers move towards white meat. This development is particularly marked in the EU countries and Japan that have been affected by animal health crises. *Table 6* shows the growth in livestock products consumption in developed countries, which is projected to grow at below 1% a year with the sole exception of poultry over 1993 – 2020. In contrast, developing countries are

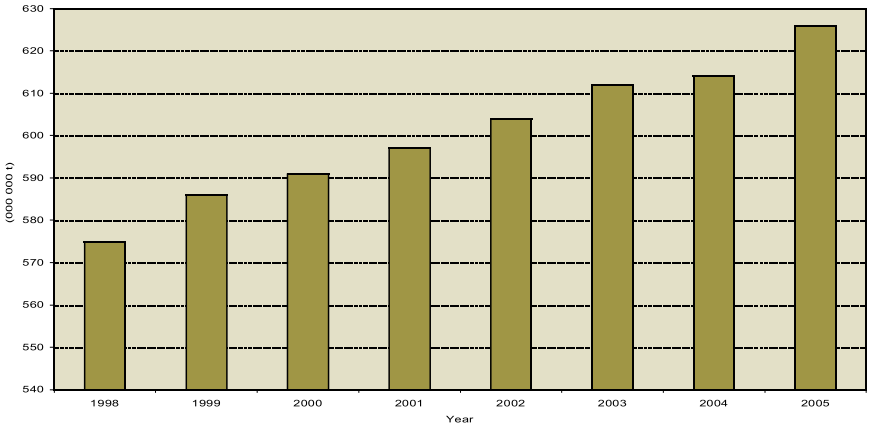

Figure 2. Global industrial compound feed production (1998 – 2005).

Source: FEFAC/IFIF/Feed International.

TABLE 6. PROJECTED CONSUMPTION OF VARIOUS LIVESTOCK PRODUCTS IN DEVELOPED AND DEVELOPING COUNTRIES (1993 – 2020)

Region/product	Annual growth in total consumption (%)	Total consumption (million tonnes)		Per capita consumption (kg)	
		1993	2020	1993	2020
Developed world					
Beef	0.4	32	36	25	26
Pork	0.3	36	41	28	29
Poultry	1.0	26	34	20	25
Other meat	0.6	97	115	76	83
Milk	0.2	245	263	192	189
Developing world					
Beef	2.8	22	47	5	7
Pork	2.8	38	81	9	13
Poultry	3.1	21	49	5	8
Other meat	2.8	88	188	21	30
Milk	3.3	168	391	40	62

Note: MnT-million tonnes.

Source: International Food Policy Research Institute (IFPRI) (1999).

expected to perform better due to their population growth, economic development and rising disposable income at faster rate.

The consumption of beef in developing countries will surpass that in developed countries in 2020 (47 million tonnes *vs.* 36 million tonnes) from 22 million tonnes *vs.* 32 million tonnes in 1993. However, the per capita consumption in developed countries is expected to remain higher at 26 kg *vs.* 7 kg of developing countries.

Table 7 shows the projected production for livestock products to 2020, which closely followed the projected consumption. In the developed countries, poultry is expected to grow the most at 1.2% with beef and other types of meat only expected to increase slower by 0.6% and 0.7% a year, respectively.

Similarly, in the developing countries, the projected annual rates are 2.6% for beef and 2.7% for other meat, while poultry at 3%. Most of the livestock production will take place in the developing countries, although the per capita production will be much higher in the developed countries. Essentially, the growing production and consumption of beef in both the developed and developing countries will ensure that the demand of PKE remains. Hence, the future of Malaysian PKE is still

TABLE 7. PROJECTED TRENDS IN PRODUCTION OF LIVESTOCK PRODUCTS (1993 – 2020)

Region/product	Projected annual growth of production (%), 1993 – 2020	Total production (million tonnes)		Per capita production (kg)	
		1993	2020	1993	2020
Developed world					
Beef	0.6	35	38	26	28
Pork	0.4	37	41	29	29
Poultry	1.2	27	36	21	26
Other meat	0.7	100	121	78	87
Milk	0.4	348	371	272	267
Developing world					
Beef	2.6	22	44	5	7
Pork	2.7	39	81	9	13
Poultry	3.0	21	47	5	7
Other meat	2.7	88	183	21	29
Milk	3.2	164	401	39	63

Note: MnT-million tonnes.

Source: International Food Policy Research Institute (IFPRI) (1999).

encouraging, provided its market is broadened and its quality conform to the requirement by consumers.

In term of quality, Malaysian PKE has improved over the years but can still be improved with better technology in the production of palm kernel as well as processing practices (Ahmad Borhan *et al.,* 2005). More kernel crushers adhere to the buyers' requirement by obtaining HAACP accreditation to enter the markets in developed countries, particularly the European countries. Continuous demand from the EU and East Asia, and also the new markets for PKE since 2000 - Iran, USA, New Zealand and Vietnam - are positive signs for Malaysian PKE.

Another development that may threaten PKE in the world feed market is the emergence of dried distiller's grain with solubles (DDGS), a by-product from ethanol production. In the US, the product is corn-based, and in Europe wheat-based. Both forms of DDGS are excellent feed for all livestock. It has higher protein (about 30% *vs*. 17% for PKE) and higher energy as well. Previously, DDGS was mostly fed to ruminants, but with improved technology in its production, high quality DDGS can also be fed to monogastric animals. The expanding bio-ethanol production in the US has increased the production of DDGS from 3 million tonnes in 1995 to 3.5 million tonnes in 2000, and then more than doubled to 7.8 million tonnes in 2005 (Goodman and Hall, 2005). Its export volume has hitherto increased slowly, being largely consumed domestically. But further expansion in US bio-ethanol production and a projected big rise in DDGS availability in Europe (from 0.5 million tonnes in 2004 to 2005 to 7.2 million tonnes in 2010) (Ziggers, 2007) will threaten the competitiveness of PKE in the world feed market.

The future for Malaysian PKE will be difficult due to the slower growth in the production of beef because PKE is basically ruminant feed (mainly for cattle) and world meat consumption is inclining to poultry in both the developed or developing countries. In addition, the emergence of DDGS in US and Europe may further erode the market for PKE, particularly in Europe, and the competitiveness of PKE worldwide.

Therefore, new markets must be found, the uses for PKE widened and its quality improved so as to ensure that Malaysian PKE can withstand the stiff competition in the world oilmeals market in the future.

CONCLUSION

Malaysian PKE still has a competitive advantage over other oilmeals exported due to its competitive price and reliable supply. However, its advantage has declined over the years caused by increasing SBM exports from South America and also PKE from Indonesia.

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