Status of beef industry of Malaysia

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Abstract

Within the livestock sector in Malaysia the beef sub-sector lags in percentage contribution to domestic supply of red meat. Many attempts in beef production in the past, from extensive ranching to intensive feedlotting, have yielded variable results in sustaining the beef industry. The targeted self sufficiency level of beef of 33% by 2020 entails the annual slaughter of 0.7 million cattle. Existing beef smallholdings are characterized by their small herd size (less than 10 head), low production inputs, lacking in husbandry innovations and poor marketing network, and adoption of KK cattle as the breed of choice. With 5.2 million hectares of oil palm of various ages Malaysia has the input endowment to maintain a sizeable population of a million breeding cows created from the existing cattle population of 0.75 million head as well as through importation of selected breeding stock assembled in an integrated beef and palm oil production system. Besides the once valuable buffalo is an important genetic resource often neglected and can be harnessed to compliment the domestic beef supply. Smallholder dairy enterprises could be promoted to generate dual produce strategy of milk and feeder cattle for fattening. Oil palm byproducts such as palm kernel cake and oil palm fronds have the potential to fully feed cattle and buffalo in semi-intensive cow-calf production and intensive feedlotting of feeder cattle and buffalo. Strengthening the value chain from breeding stock use to marketing of animals and retail products is a much needed approach to promote and expand the beef industry in this country.

Key words: Beef, buffalo, industry status, Malaysia

Introduction

Agriculture has been identified as an important component in achieving the Millennium Development Goals of the World Bank by 2015 (United Nations, 2009). The high dependence of the majority of the rural citizens for their livelihoods on agriculture is very clearly observed in many countries, including Malaysia. Many agriculture-for-development agendas are being planned and implemented which have the goals of making a difference in the economy and well being of the people living in the rural areas (The World Bank, 2008). The various economic development corridors planned for the northern and east coast regions of Peninsular Malaysia and the Sarawak and Sabah economic growth areas are examples of such a development approach.

Malaysia has attained self-sufficiency levels in poultry meat and eggs and pork since the middle of the 1990s. The achievement of both poultry and pig industries in meeting more than the domestic demand for poultry and pig products is driven principally by the efficient assembly of the two major inputs of grow-out animals and feed, both of which are available locally and competitively priced. Unfortunately the ruminant industries lack these important inputs of breeding stock and feed in

sufficient quantity and at reasonable cost for an efficient production of beef, mutton and milk.

Beef production is one of Malaysia's important agricultural industries. This is evident from the increasing trend in the total economic value of the beef industry as reflected partially in the beef consumption value. Beef consumption has been on an increasing trend especially in the post independence era when the nation experiences steady economic prosperity through the expansion of the manufacturing and oil palm plantation sectors. Greater proportion of the beef consuming communities today are including beef in their domestic budget compared to the pre independence period. Although beef demand is not directly responsive to increase in consumer income, the response for beef for some income groups is likely to be significant and positive (Hudson and Vertin, 1985). From a meta analysis it was shown than increasing family income would shift a greater budget share towards beef (Gallet, 2010).

The beef consumption in this country is made up of meat from cattle and buffalo. However domestic production of beef from cattle and buffalo has not kept pace with the ever increasing demand for fresh beef and processed beef products. Many strategies have been proposed to boost beef production but thus far these developmental initiatives have yielded small contribution to the domestic beef supply.

There has been an increase in the gross economic value of the beef industry from RM697 million in 2008 to RM2.51 billion in 2013 comprising of the value of domestic output and imported animals and meat. There is a tremendous scope of further expanding the beef cattle industry in view of the low self-sufficiency level of beef which has hovered from 24% in 1990 to 25.67% in 2013. At current demand for beef, one percent increase in self-sufficiency level would require an additional slaughtering of about 14,000 head of cattle per year. By 2020 the government has targeted to raise the self-sufficiency level of beef to 32.7% (MAO, 2015), which translates in the slaughter of more than 450,000 head of cattle each year. This review attempts to examine the shortcomings faced by the beef industry in Malaysia and identify potential areas where the commodity is most likely to improve.

Global economic outlook

Over 2013 – 2022 the Organization for Economic Co-operation and Development (OECD) and International Monetary Fund (IMF) have projected growth prospects for OECD area to be relatively slow at 1.9% per annum. For the other non-OECD countries the economic prospects in the medium term are expected to improve to average above 2.2 % p.a. Malaysia is forecast to grow above 5% p.a. in term of Gross Domestic Product (EPU, 2013), lower than those of potential main drivers of future world economy: China (7.6%) and India (6.7%).

The world population is expected to grow at a slower rate of just 1% in the next decade and this is envisaged to happen in all regions. Developing countries however are expected to continue the fastest population growth with Asia as a whole growing at over 2% p.a. Malaysia continues to see its population growing from 28 million in 2014 to above 40 million in 2020. Such population prospects and dynamics besides being major determinants to future national economic environment also affect both the supply and demand of agricultural commodities.

While many developed economies continue to experience weak demand for agricultural commodities and high unemployment, inflation is expected to remain low at an average 2.1% p.a. However inflation is expected to be of major concern

in many emerging economies, especially in high growth countries with inflation rate between 5-6% are expected for China, India and Brazil.

Competitiveness of export commodities and affordability of importing countries for agricultural produce are strongly influenced by exchange rate. Certain dynamic economies will drive down the value of their currencies, making some to be more competitive in global trade.

Domestic consumption of beef

Beef is an important source of animal protein in Malaysia and consumed by more than 60% of the population. It has enjoyed a steady demand over the years with total consumption climbing by 45% from 138,980 tonnes in 2005 to 201,556 tonnes in 2013 (Table 1) whereas mutton and chicken surged higher to 69% and 77%, respectively, over the same period. Per capita consumption of beef also saw a rise from 5.32 kg in 2005 to 6.74 kg in 2013 – an increase of 2.97% p. a. over the 9-year period (Table 1). In comparison per capita consumption of chicken meat rouse higher at 6.06% p.a. over the same period with per capita consumption of chicken meat of 46.49 kg per capita in 2013 which was about 6.9 times more than beef.

However there are many importers of frozen beef who are filling in the more than 70% shortfall in the domestic supply by bringing in beef of differing price and quality from India, Australia and New Zealand. In 2013 86% of the beef imported into Malaysia was sourced from India as buffalo meat owing to the relatively cheaper price and availability of buffalo meat compared to chilled and frozen beef from Australia and New Zealand. Fifteen percent of the domestic beef consumption was supplied from live cattle purchased from Australia and Thailand. Food manufacturers, either involved in the restaurant business or food processing, would often purchase beef based on customer requirement and price. Similarly homemakers who form the majority of the retail consumer block decide to purchase beef based largely on price and quality.

As Malaysia strives to realize the goal of Vision 2020 - targeting to achieve a developed nation status by 2020 - it is envisaged that the food consumption pattern of Malaysians will lean towards increased intake of animal protein, especially lean meat, in tandem with a rise in the purchasing power of the general populace. Lean beef, containing most of the essential amino acids, is an important source of protein, B vitamins and minerals, and therefore should remain as a healthy choice of meat of many consumers. This augers well for the beef industry and entrepreneurs are challenged to fulfill the supply gap by investing in new beef and dairy cum beef production enterprises.

Table 1. Malaysia: Total meat consumption for mutton, beef and chicken, beef consumption value and per capita consumption of beef, 2005 – 2013

Year	Mutton (tonnes)	Beef (tonnes)	Chicken (tonnes)	Beef consumption value (RM mill.)	Per capita consumption of beef (kg)
2005	16,973	138,980	785,660	1,286.09	5.32
2006	17,800	146,373	828,730	1,263.06	5.49
2007	17,498	144,732	1,048,590	1,391.30	5.33
2008	19,031	135,529	1,117,900	1,582.48	4.89
2009	19,309	149,256	1,146,900	1,794.79	5.35
2010	20,077	154,402	1,227,450	2,061.11	5.45
2011	20,179	167,388	1,222,040	2,145.86	5.76
2012	24,386	181,479	1,301,480	2,357.42	6.15
2013	28,768	201,556	1,390,660	2,510.57	6.74

Ref. Livestock Statistics 2013/2014, Department of Veterinary Services, Malaysia

A number of contributing factors have been suggested to explain the rise in the consumption of beef. Among them are increasing affluence of the middle class, expansion of the meat processing industry and expansionary mode of the national economy. As education becomes more accessible to the masses, more people have experienced upward economic mobility, thus have a higher purchasing power for high quality food items. Many entrepreneurs choose to meet the demand for increased animal protein consumption by opening up more dining outlets and be involved in the production of processed food products. With the national economy expected to expand further as seen in the increase of Gross Domestic Product, from RM545.42 billion in 2006 to RM1,242.357 billion in 2014 (EPU, 2015), more employment opportunities will be made available to Malaysians and thus would further boost the national economy.

Domestic production of beef

The value of domestic supply of beef has grown slightly from RM535 million in 2005 to RM1,142 million in 2013 (Table 2), at an average annual supply growth rate of 12.6%. This has translated to an improved self sufficiency level from 21.15% in 2005 to 25.67% in 2013 while taking into consideration the slaughter cattle produced locally from short term fattening of feeder cattle from Australia as local beef output. However this trend in domestic supply with self sufficiency level hovering below 30% since 2005 has not coped well with an ever increasing consumption of beef which totaled 201,556 tonnes valued at RM2.51 billion in 2013 (Table 1, Figure 1).

Table 2. Malaysia: Domestic supply pattern of beef, value of beef supplied and self-sufficiency level of beef, 2005 – 2013

Year	Domestic supply (tonnes)	Supply value (RM mill.)	Self-sufficiency (%)
2005	29,396	535	21.15
2006	31,885	581	21.78
2007	34,976	637	24.17
2008	38,250	697	28.22
2009	42,178	768	28.26
2010	46,510	847	30.12
2011	48,835	889	29.17
2012	51,277	1,032	28.26
2013	51,738	1,142	25.67

Ref. Livestock Statistics 2010/2011 and 2013/2014, Department of Veterinary Services, Malaysia

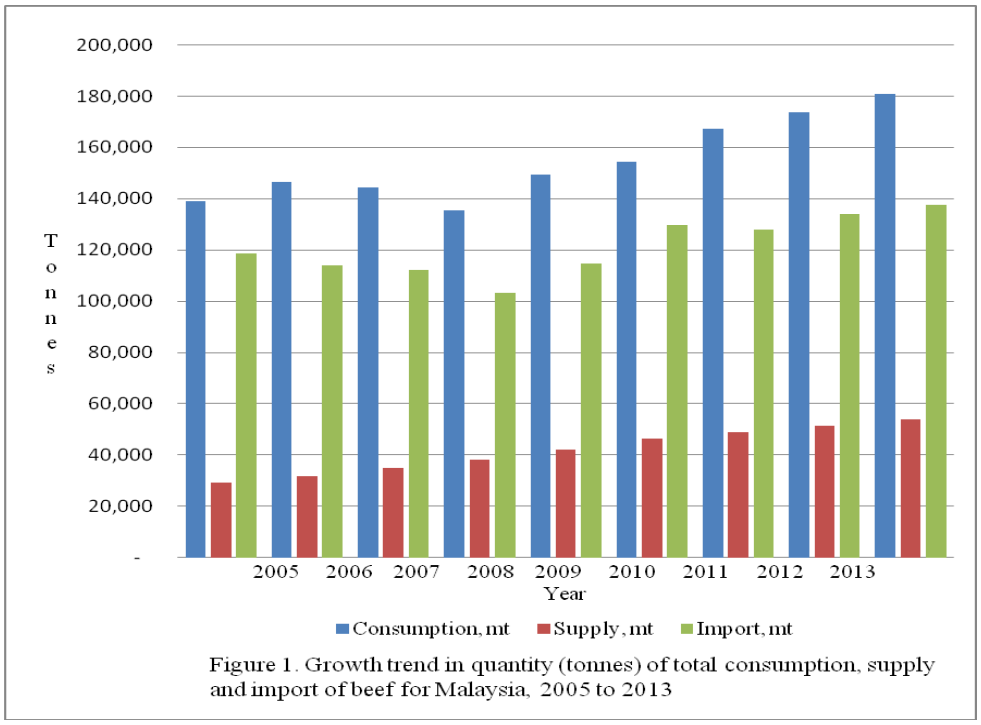

Figure 1. Growth trend in quantity (tonnes) of total consumption, supply and import of beef for Malaysia, 2005 to 2013

Since the late 1970's a number of large commercial scale beef farms have been set-up in the country - FIMA feedlot in Johor Bharu, Majuternak beef and dairy farms in several states in the country, and Pahangbif, Darabif, Makmur and First Dairy farms in Pahang. Many of these farms were involved in the breeding and fattening of beef cattle and milk production from dairy cattle. However many of these farms suffered from recurring negative cash flows which led to their eventual closure.

The current Malaysian beef industry is largely based on semi-intensive production system as practiced by many smallholders in the villages and extensive production system of integrating cattle with oil palms by producers in the oil palm settlements of FELDA, RISDA, FELCRA, Lembaga Kemajuan Pertanian Pahang (LKPP), Persatuan Peladang Negeri Pahang (PASPA) and private sector oil palm plantations of Chin Teck in Pahang, Sawit Kinabalu in Sabah and JCorp in Johor. Beef cattle herds owned by smallholders are characterized by small herd size with an average of 10 cows, lack of investment in quality breeding stock and low output. Felda Farm Products managed about 40,000 head of Brahman crossbred and Bali cattle in Felda oil palm settlements in Pahang, Negri Sembilan and Johor prior to the bourse listing of the oil palm division of Felda, but unfortunately these herds have now been disbanded.

Although there have been a number of joint venture investments in the last few years by various entities in both public and private sectors to further develop the beef cattle industry, their contribution to domestic output would not be realized in the near term. Many of these new ventures are in the various stages of implementation and would take sometime before they could begin to produce cattle for the slaughter markets. These investments cover the importation of cattle breeding stock and slaughter cattle from Indonesia, Myanmar, China, Cambodia and Australia, setting up of National Beef Feedlot Centre in Gemas, Negeri Sembilan and expansion of National Beef Cattle Breeding Centre in Muadzam Shah, Pahang. Some of the stated benefits arising from these initiatives are dissemination of quality breeding stock from the breeding centres to participating farmers, higher efficiency in the production of inputs, mainly feed, cattle breeding stock and feeder cattle and better marketing network for cattle destined for the breeding, fattening and slaughter markets.

Domestic production of beef showed an increase of 9.3% p. a. from 29,396 tonnes in 2005 to 51,738 tonnes in 2013. This improvement in domestic output of beef was generated from the slaughtering of local cattle and buffalo as well as imported feeder and slaughter cattle. The output increase occurred in spite of the decline in cattle population by 4.06% and the buffalo population by 13.73% over 2005 to 2013 period, with the 2013 population of cattle and buffalo stood at 751,497 and 123,646 head, respectively (Table 3). It is estimated that only 30% of these cattle and buffalo are breeding cows.

Several factors have been cited as the probable constraints in the low output from local beef producers. Among them is inadequacy of land suitable for grazing to maintain a large population of breeding cows, low supply of quality breeding stock and irregular supply of feed of high nutritive value and absence of an efficient marketing system in the value chain from the supply of production inputs to the consumption of final produce. Taking cue from the poultry industry, the beef industry has to facilitate the ready supply of production stock for breeding and fattening, ensure the sustained supply of reasonably priced cattle feed and set up an efficient marketing network.

Table 3: Population trend and percentage change in cattle and buffalo population in Malaysia, 2005-2013

Year	Cattle	% change cattle	Buffalo	% change buffalo
2005	781,316	-0.77	133,232	-3.52
2006	806,057	3.17	128,938	-3.22
2007	842,186	4.48	130,775	-1.45
2008	851,227	1.07	131,229	0.35
2009	860,491	1.09	127,152	-3.11
2010	836,859	-2.75	129,878	2.14
2011	768,710	-8.14	128,205	-1.29
2012	744,377	-3.17	124,985	-2.56
2013	751,497	0.96	123,646	-1.07

Ref. Livestock Statistics, Department of Veterinary Services, Malaysia 2007/2008 and 2013/2014

Traditionally rearing of beef cattle has been carried out in the villages, often accompanying rice farming activity, but today the practice of mechanized farming and double cropping in rice production has left less grazing area for cattle and buffalo. However, cattle continues to be reared by villagers in fallowed fields, road reserves, irrigation bunds and river banks. There are still many cattle owners having between 1-5 head of cattle on farms of less than 2 ha in size in many villages of Kelantan, Trengganu, Pahang, Kedah and Johor. The efficiency of beef production from smallholders has vast potential for further improvement, especially in breed improvement, feeding strategies and assistance in marketing of the produce. Development efforts should address the constraints faced by this producer sector and encourage more participation by new producers through innovative financial programmes.

On the rise is cattle ownership exceeding 10 head per smallholding, as found in many oil palm holdings owned by settlers in Felda- and Risda- and Felcra-managed estates (Plate 1). As of 2006 Department of Veterinary Services Malaysia has identified 1,279 smallholders raising 159,473 head of cattle in 422,581 ha of oil palm area in 26 districts in Peninsular Malaysia (Table 4). Some 21% of the cattle population in this country are raised in smallholders' herds in oil palm plantations. Cattle destined for the slaughter market are sourced from feedlots of varying capacity located in many localities throughout the country and also from smallholders' herds in the villages and oil palm plantations. Buffalo are however left unattended to survive in abandoned farms and river banks (Plate 2).

Plate 1: Cattle rearing under young oil palms with the use of electric fence in managing grazing intensity of the undergrowths (Photograph courtesy of Mohd Hafidz Wahab)

Plate 2: Buffalo rearing along the river bank of Pahang River, Pahang (Photograph courtesy of Mohd Hafidz Wahab)

Table 4: Distribution of areas of cattle concentration in integrated beef and oil palm production system in Peninsular Malaysia, 2006

Area	No. of rearers	Land area (ha)	No. of cattle
Gua Musang, Kelantan	65	25,950	6,597
Kemahang, Kelantan	14	4,854	2,816
Machang, Kelantan	101	99	1,863
Besut Setiu, Trengganu	24	7,176	1,901
Hulu Trengganu, Trengganu	31	6,369	3,673
Ketengah, Trengganu	29	19,920	9,235
Muadzam, Pahang	48	38,345	15,669
Lipis, Pahang	81	15,646	10,823
Cini, Pahang	23	11,483	7,017
Bera, Pahang	19	18,369	5,697
Jengka, Pahang	19	18,035	5,526
Kuantan, Pahang	10	13,858	6,120
Bentong, Pahang	16	2,010	2,126
Raub, Pahang	7	2,830	1,126
Muar, Johor	174	21,165	12,117
Mersing, Johor	190	25,091	11,426
Segamat, Johor	49	46,389	11,080
Kota Tinggi, Johor	28	26,864	7,877
Kluang, Johor	22	24,160	6,919
Manjung, Perak	36	30,149	9,552
Batang Padang, Perak	17	8,964	2,696
Hulu Perak, Perak	26	4,980	1,832
Taiping, Perak	59	2,463	3,221
Jempol, Negri Sembilan	164	37,581	8,747
Kuala Selngor, Slangor	11	5,930	2,283
Kuala Muda, Kedah	16	3,901	1,538
Total	1,273	422,581	159,473

Source: Department of Veterinary Services Malaysia: Livestock Statistics 2006

In 2013 there were 751,497 head of cattle in the country, with 58% of the cattle distributed in the states of Pahang (16.1%), Kelantan (14.6%), Johor (14.3%) and Trengganu (13.0%) (Figure 2). One reason for the high concentration of cattle in these states is the propensity of many villagers in the states of Pahang, Kelantan and Trengganu, where cattle rearing has long been a traditional practice in the villages, to rear cattle as an additional economic activity among smallholders and recent investment in cattle breeding stock by JCorp in Johor.

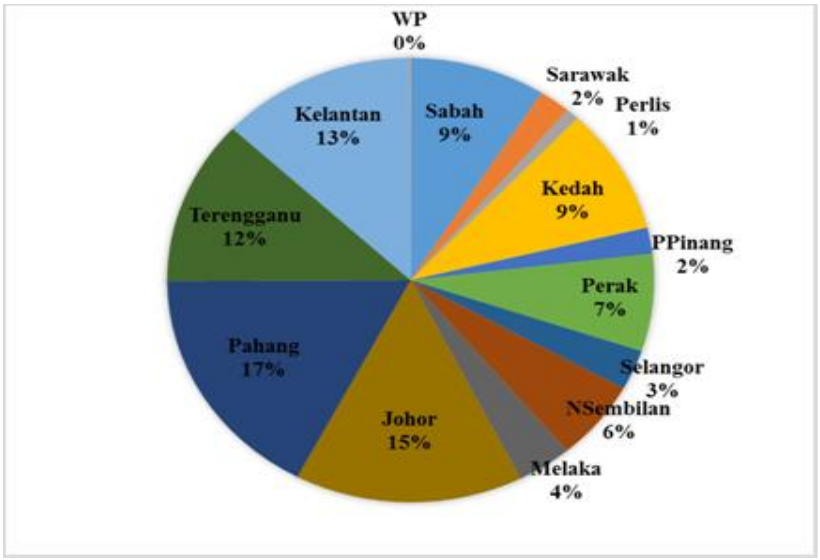

Figure 2. Distribution of beef cattle population by states of Malaysia, 2013 (Total population of beef cattle 751,497)

The buffalo population is mainly centred in the states of Sabah (38%), Perak (12%) and Pahang (11%) with Negeri Sembilan only contributing 3% from its traditional large population of buffalo prior to the 1970s (Figure 3).

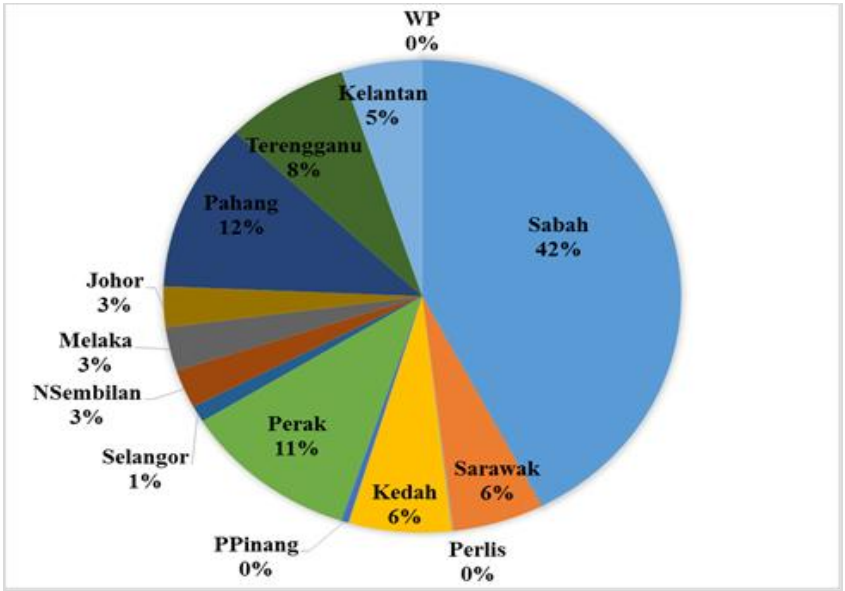

Figure 3. Distribution of buffalo population by states of Malaysia, 2013 (Total population of buffalo 123,646)

Production systems

In many countries where beef industry is a major economic sector, large tracts of marginal land of poor quality soil naturally populated with native grasses or large areas of cultivated pasture converted from jungle, are made available to cattle producers for extensive beef production. Such native grasslands are found abundantly in the United States, Australia, Argentina and Canada. In contrast Brazil has opened up large tracts of jungle and converted them into pasture for cattle rearing. In both cases feeds are found in abundance during most seasons of the year. Supplementary feed and minerals are given to cattle during times of drought when feed supply often reaches critically low quantity.

Lacking in natural grasslands has not deterred this country from pursuing a large scale beef production. In the past decades various attempts have been made to create pasture land for cattle. Department of Veterinary Services Malaysia has established grazing reserves – many were planted with grasses introduced from other countries – in many districts within the states in the Federation. These grazing reserves have served as communal grazing areas for smallholders raising cattle in the villages. Recently many of these grazing reserves have been leased to private companies for beef cattle production, including cow-calf and fattening purposes.

Attempts were also made by the former National Livestock Development Authority or Majuternak and private companies in partnership with government linked regional development authorities in large scale beef cattle farming: Pahangbif farm in Pahang had successfully raised 6,000 head of Droughtmaster cattle imported from Australia on 3,500 ha of pasture, Darabif farm in Pahang had managed to stock 7,000 head of KK cattle on 4,000 ha of pasture land and Sisek farm in Johor rearing both dairy and beef cattle. Majuternak had established 8 cattle farms totaling close to 10,000 ha. However these farms were found later to be not viable in terms of cost of operation and revenue generation and had since ceased their operation.

Among the reasons cited for the failure of large scale cattle farming in this country were poor productivity of the temperate cattle raised, heat stress suffered by the imported cattle, high pest and disease burden afflicting the cattle, poor quality feed from native grasses and high maintenance cost of improved pasture. Grasses like any other cultivated plant species require adequate amount of nutrients to grow and produce high dry matter yield. The sustainability of improved pasture is very much dependent on our ability to manage the pasture well, in terms of providing adequate fertilizer input, practicing effective grazing management and planning for pasture redevelopment.

Many local beef producers tether their brood cows or allow them to graze on native grasses and other plant species found on the road sides, river banks, irrigation bunds, fallowed rice fields and in the small holdings planted with rubber, oil palm, coconut and fruits. Cattle are seldom housed indoor and irregularly provided with feed supplements and mineral licks.

There are a number of cattle producers who adopt the feedlot system in the fattening of young calves. The number of cattle per feedlot operation ranges from less than 20 head to several thousands. Total mixed rations are formulated from a mixture of locally available feedstuffs – mostly by-products of palm oil milling such as palm kernel cake and palm oil mill effluent and chipped oil palm fronds, rice straw and rice bran. Most of the feeder cattle are of mixed breeds sourced from the smallholders' herds and Brahman commercial crosses imported from Australia.

A major shift in cattle rearing in Malaysia is seen with the introduction of cattle into oil palm plantations. This growing trend to integrate cattle with oil palm to produce beef is very much supported by the government. An extensive system of cattle management is usually practiced when cattle are grazed in oil palm plantations (Plate 1). The cattle are allowed to graze the plant undergrowths found in the inter-rows of oil palm estates in a rotational grazing pattern – herding the cattle from one section of the oil palm holding to the next section - depending on the availability of feed resources in the particular sections of the estates. The use of electric fencing has been effective in managing grazing density of the undergrowths.

Malaysia is the second largest producer of palm oil, after Indonesia. In 2014 the area under oil palm covered 5.39 million ha - an increase of 3.1% over 2013 (MPOB, 2015). Sabah is the largest oil palm cultivated state with 1.51 million ha (28%) followed by Sarawak with 1.26 million ha (23%) and Peninsular Malaysia accounted for 2.62 million ha (49%). In 2014 the highest increase in oil palm area planted was in Sarawak of 102,493 ha. It is estimated that 25% of the total area under oil palms are suitable for integration with cattle. The rest of the area under oil palms are excluded from cattle integration because of difficult terrain and steep slopes, newly cultivated palms, old stand of oil palms, poor soil conditions and close proximity to the jungle. A cow population of 1.2 million head could be stocked in a quarter of the land under oil palm. The highest potential for integrating cattle with oil palm lies in Sabah since the state has the largest total area cultivated with oil palm. Average production per ha for the Malaysian palm oil industry for 2014 was 18.6 tonnes of fresh fruit bunches.

Feed resources

In beef production, the cows and pre-weaning calves are maintained on feeds of relatively lower quality than the yearlings in the growing and fattening stage. The cost of maintaining a cow for one year may incur a substantial expenditure and this has to be compensated by the sale of a calf from the cow. On the other hand, yearling calves are targeted to reach a certain slaughter weight within a specific period of time. Hence feed quality dictates what feeds to be fed to these animals of the two production phases.

Feeds for cattle comes from a number of sources; grasses, either naturally grown or cultivated, legumes, agricultural by-products, concentrates compounded from grains and agricultural by-products, crop residues and plant materials from cultivated forages and food crops and by-products of food processing industry. Generally cattle are fed a mixture of these feedstuffs in amount according to body size, physiological stage and purpose of feeding. There are a number of feed mills in Malaysia producing complete mixed feeds for the various livestock species. The main ingredients in many of the compounded feeds for cattle are PKC and rice bran, whose prices have remained high in the last several years.

There are numerous native grasses and broad-leaved species commonly found in the villages and tree crop plantation environment (Table 5). Predominant native grass species include carpet grass *Axonopus compressus*, buffalo grass *Paspalum conjugatum* and para grass *Brachiaria mutica*. Asystasia spp. is found in abundance in shaded areas of most tree crop environment and has relatively high crude protein content (15.8%). In most areas planted with oil palm and rubber, leguminous cover crops such as *Centrosema pubescens*, *Pueraria phaseoloides* and *Calapogonium* spp. are usually sown in the inter-rows to provide full ground cover for weed control.

These cover crops will thrive, though at a declining rate of biomass production with advancing age of the main crops of oil palm and rubber, for many more years after the initial sowing date. With less light reaching the ground level when the canopy starts to shade the inter-rows, dry matter production of plant species under the main crops reduces by as much as 60% from the first year to the eighth year of oil palm cultivation (Figure 4). Most plant species are characterized by declining soluble carbohydrate content and an increasing cellulose and lignin proportions with advancing age. As the oil palm advances in age, the composition of inter-row plant species changes with grasses, edible dicots and leguminous cover crops declining in population density whereas ferns and non-edible dicots dominating the inter-row space (Figure 4). Ferns such as *Nephrolipis bisserata* and non-edible dicots such as Rhododendron spp. and Chlymedia spp. are hardy plants thriving well under low light situation.

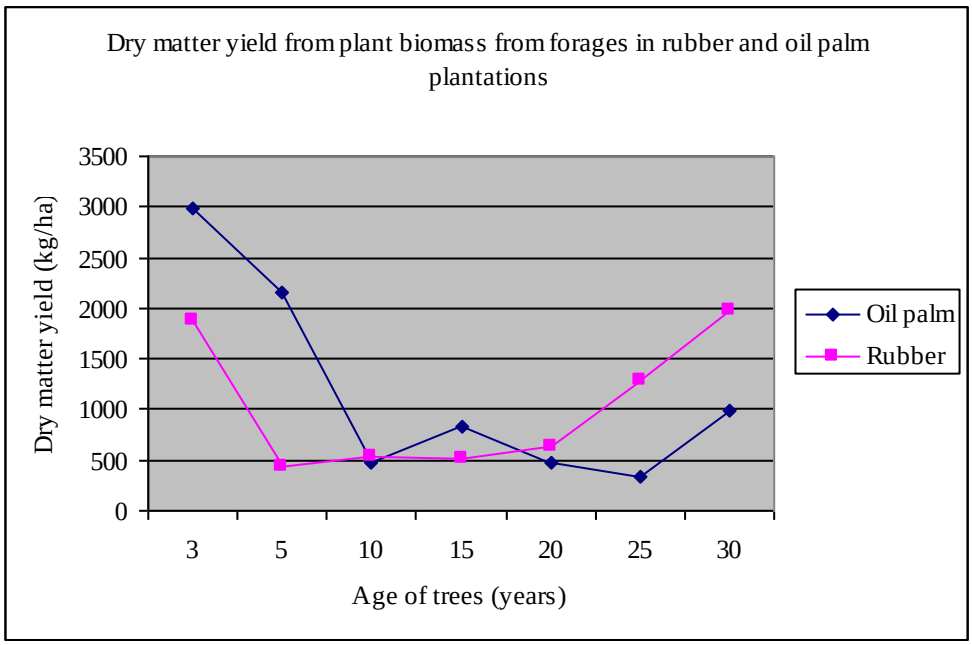

Figure 4: Pattern of dry matter production from plant species in the inter-rows of oil palms and rubber. Source: Chen *et al*. (1991)

Table 5: Forages of native and introduced species of Malaysia

Forage types	Species	Location	Crude protein (%)	ME (MJ/kg)
Grasses	*Axonopus compressus*	Rubber, oil palm, open field	13.0	9.0
	Paspalum conjugatum	Rubber, oil palm, open field	15.8	9.8
	Brachiaria mutica	Open field	12.9	9.2
	Othocloa nodosa	Oil palm, rubber	16.8	10.1
	Imperata cylindrica	Rubber, oil palm, open field	11.7	9.0
Broad leaved and legumes	*Asystasia intrusa*	Rubber, oil palm, open field	15.8	8.9
	Pueraria phaseoloides	Young rubber, oil palm	22.8	9.6
	Centrosema pubescens	Young rubber, oil palm	25.4	6.5
Ferns	*Nephrolipis biserrata*	Oil palm	18.2	10.5

Sources: Lane and Mustapha (1983) and Chin (1991)

A number of agricultural by-products are available to be utilized as animal feeds. Some of these by-products are characterized by their higher crude fiber content and low feeding value. But if processed well they could form a valuable source of roughage for ruminant animals. Palm kernel cake (PKC) is a by-product of palm kernel oil milling and it is an important feedstuff available to the local beef producers, especially as feed supplement for breeding cows and weaners as well as forming a major proportion of beef cattle fattening ration. In 2014 2.518 million tonnes of PKC were produced by the local oil palm plantations. The major importers of palm kernel cake were New Zealand with 1.07 million tonnes (41.4%), European Union (EU) with 0.77 million tonnes (30.0%), South Korea with 0.34 million tonnes (13.3%) and China with 0.14 million tonnes (5.4%) – making up 90% of the Malaysian PKC markets. Export value of PKC totaled RM1.263 billion for 2014. The price of PKC is closely related to the price of crude palm kernel oil.

PKC has good nutritional value and can be fed to cattle with little addition of minerals and vitamins (Table 6). A total mixed ration combining PKC, agricultural by-products such as rice straw, palm oil mill effluent (POME), oil palm frond (OPF), pineapple bran and brewery waste and rice bran could be formulated to meet the daily nutrient requirements of most cows and calves.

Table 6: Feed value of major oil palm by-products used as cattle feed

By-product	Chemical composition			
	Crude protein	Crude fiber	Ether extract	ME (MJ/kg)
PKC-solvent	17.3	13.6	5.2	11.5
PKC-expeller	15.3	15.0	8.9	9.8
Palm oil mill effluent	11.1	17.0	12.0	6.5
Palm press fibre	5.8	48.6	5.8	4.0
Oil palm fronds	4.70	38.5	2.1	5.7
Oil palm trunks	2.80	37.6	1.1	6.0

Ref.: Wong and Wan Zahari, 1992; Sukri and Abdullah, 1998

Beef genetic resources

Beef is produced in this country from cattle and buffalo: of which cattle is the more predominant source. The present population of cattle in Malaysia could be categorized into three genetic groups: (1) *Bos indicus* cattle and (2) crossbred cattle from the crossing among *Bos indicus* breeds of cattle and (3) crossbred cattle resulting from the crossing of *Bos taurus* with *Bos indicus* breeds. Cattle of the *Bos indicus* breed found in this country are the Kedah-Kelantan (KK), Nellore, Brahman, Local Indian Dairy (LID), Bali and Yellow Cattle. Considered native to the region covering Indo-China, Thailand and the Peninsular Malaysia KK is a major cattle breed found in many states of Malaysia (Plates 3 and 4). Approximately 67% of the cattle population in Malaysia belongs to the Kedah-Kelantan breed. However the number of KK cattle remaining as purebred KK cattle is slowly being challenged by widespread crossbreeding with an influx of foreign cattle breeds introduced via semen and live bulls. LID is a breed characterized by the presence of hump-like appendage on the anterior part of the body and is generally grey to black in coat colour. Kept by many dairy farmers in the peri-urban areas of the states on the west coast of Peninsular Malaysia, LID have traditionally been raised for milk production.

Nellore and Brahman cattle had their origin in the Western Asia region and the Indian sub-continent. They were brought into this country by the British administration prior to the independence of the country in 1957 and by the Government of Malaysia through a series of importation to upgrade the Local Indian Dairy cattle. In the late 1970's Brahman cattle were introduced from Australia and the United States of America for upgrading purpose of the Kedah-Kelantan cattle. Nellore cattle were imported from Brazil in the early 2000s by Department of Veterinary Services Malaysia for beef improvement programme.

A small herd of Bali cattle was imported from the island of Java, Indonesia by the Government in the early 1960's and Bali cattle have not been extensively produced because of the difficulty of procuring breeding stock, especially the purebred Bali cattle from the island of Bali in Indonesia. However in the early 2000's several shipments of Bali cattle were purchased from Sulawesi, Indonesia by Felda and several government related agencies and private owners. Bali cattle are being reared commercially in Felda and JCorp oil palm plantations. A few years ago there were

successful attempts by several producers in the oil palm sector in importing Yellow Cattle from South China. Yellow Cattle is a common breed of cattle found in China; divided into three regional groups, namely Northern, Central and Southern Yellow Cattle. Major body conformation of Yellow Cattle resembles that of draught-type cattle. Most of the Yellow cattle imported into this country were of the Southern type characterized by its small body size and lighter weight at maturity and were reported to perform well when reared in oil palm plantations with high calving rate of more than 97% and low calf mortality rate of 2.1% (Kamil *et al*., 2008).

There are a number of other *Bos taurus* x *Bos indicus* crossbred cattle: some from planned crossbreeding programmes while others from indiscriminate inter mating among local cattle and cattle of imported breeds. Sahiwal-Friesian cattle were purchased from Australia and New Zealand under contract breeding programmes involving the use of Sahiwal semen on Friesian cows. For many years Sahiwal-Friesian cattle is the breed of choice among the smallholder dairy farmers in this country. Milk yield averaged 2,337 liters for 260-day lactation period (Panandam and Raymond, 2005). Surplus calves are sold as feeder cattle to be fattened in smallholder feedlots. Sahiwal-Friesian cattle lack a sustainable heifer replacement and herd improvement programme, including selection of superior bulls and high producing donor cows and widespread use of semen from top sires. Another cross of *Bos taurus* x *Bos indicus* origin is Droughtmaster, derived from the crossing of Brahman and Shorthorn cattle and developed for the sub-tropical region of northern Australia. Droughtmaster cattle were brought into this country in the 1970's for a beef cattle improvement programme under the Department of Veterinary Services Malaysia and were also found in the farms managed by the now closed entities such as Majuternak and Pahangbif. Of late a company with a farm in Kluang Johor has imported a herd of Brangus cattle from Argentina. There are also a number of other crosses between *Bos taurus* x *Bos indicus* breeds such as Charolais x KK, Limousin x KK and Friesian x KK from artificial insemination programme carried out by Department of Veterinary Services Malaysia and cattle producers, especially in Kelantan.

Cattle of the *Bos indicus* crossbred derivatives includes Brakmas, a composite breed developed by MARDI from the crossing of Brahman and KK breeds and released officially as a breed by MARDI in 1999. Through a number of mutiplier herds of Brakmas cattle in several oil palm plantations, the breed has increased in number. Brakmas cattle make good brood cows with high calving rates and the male calves have achieved relatively high growth rate when fed with high concentrate ration in the feedlots with 12.2% increase in body weight at 24-mo compared to KK cattle (Dahlan *et al*., 1981; Johari and Jasmi, 2009). KK cattle have faster rate of maturing compared to Hereford-KK and Brahman-KK cattle and consequently lower mature weight compared to the two crosses with Hereford and Brahman breeds (Omar *et al*., 1993). Mature weights of 238, 300 and 330 kg for KK, Brahman-KK and Hereford-KK cows, respectively, were derived from fitting the Gompertz growth curve. This was reflected in the range of birth weight, preweaning and post weaning gain for KK and Hereford-KK and Brahman-KK calves (Table 7).

Table 7: Means and percent advantage of crossbreds over KK cattle for growth traits

Parameter	Breedtype			
	Hereford-KK	Friesian-KK	Brahman-KK	KK
Birth wt (kg)	20.1 (31.0%)	19.9 (29.7%)	20.2 (31.7%)	15.4
6-mo wt (kg)	97.9 (28.9%)	92.9 (22.3%)	89.9 (17.1%)	76.8
12-mo wt (kg)	154.3 (58.5%)	145.2 (48.5%)	120.3 (23.3%)	97.6
24-mo wt (kg)	261.1 (35.9%)	249.6 (30.0%)	215.6 (12.2%)	192.2
Pre-weaning daily gain (kg)	432.2 (28.2%)	405.7 (20.4%)	382.1 (13.4%)	337.0
Post-weaning daily gain (kg)	313.1 (60.9%)	222.2 (85.2%)	174.1 (45.1%)	120.0

Source: Dahlan *et al*. (1985)

Rations for feedlot cattle could easily be formulated based on agricultural by-products available locally. Shukri (1990) tested the growth performance of several KK crossbred bulls fed with a ration of 50% palm kernel cake, 30% rice bran and 2% mineral mixture. Dry matter intake ranged from 3.7 kg per day for KK to 4.8 kg for Brahman-KK. Daily gain over the 90-day feeding period was highest for Brahman-KK at 0.75 kg and lowest for KK at 0.47 kg. A lower growth performance in the feedlot conducted at a smallholder farm in Muar Johor was recorded with daily gain ranging from 0.35 for KK to 0.61 kg for Brahman-KK bulls.

Dahlan *et al*. (1985) studied the carcass performance of 91 intact bulls of KK and its crosses. At the lowest slaughter weight range of 185 to 245 kg, Brahman-KK bulls had heavier carcass weight of 124.3 kg compared to 120.5 and 117.5 kg for Hereford-KK and KK bulls, respectively. Hereford-KK bulls were heaviest at the highest slaughter weight range of 307 to 367 kg, achieving an average carcass weight of 202.5 kg. Hot dressing percentage ranged from 56.1% in Hereford-KK to 56.7% for KK and meat: bone ratio was highest for KK at 4.1 and lowest for Hereford-KK at 3.3. Loin eye area was highest at 72.3 m^2 for Hereford-KK at the highest slaughter weight range and lowest for KK at 48.6 m^2 for the lowest slaughter weight range of 185 to 245 kg.

Under an improved pasture management and natural mating using bulls, cows of KK and crosses with Hereford and Brahman had high calving percentage, ranging from 87% for Hereford-KK to 91% for KK. Hereford-KK heifers reached age at first calving at 30.1 mo and Brahman-KK at 35.7 mo which were 201 and 75 d earlier than KK, respectively.

Plate 3: KK cows with crossbred calves grazing on improved pasture

Plate 4. A scene found along the coastal road of Trengganu-Kelantan where Kedah-Kelantan cattle are left to graze on native grasses and vegetation in coconut groves close to human settlements.

Smallholder ruminant systems

A livestock production system is sustained when the inputs of production are readily available at reasonable prices and the marketing system is in place to facilitate the easy transactions between producers and buyers of the commodity. The trend of commercial poultry production in this country to develop into big enterprises is driven largely by the increased margin to be obtained through integrated management of input resources while capitalizing on centralised marketing set-up. While medium scale commercial enterprises of broiler chickens still exist but many of them work in collaboration with the big poultry integrators. However many investments in the ruminant sector to develop large scale commercial beef and dairy cattle enterprises, as well as goat farms, are faced with supply issues of breeding stock and feed and inadequate technical and marketing support resulting in low farm income and eventual closure of some of these farms. Perhaps it is timely to restrategize the commercial production of beef and milk in this country through the introduction of new husbandry practices embedded in new business models that are readily facilitated by a comprehensive supply chain. Dairy production from smallholder units such as the former Milk Collection Centres (MCCs) could be expanded through the provision of continuous herd replacement and genetic improvement programs to produce milk and feeder cattle. Beef enterprises based on smallholder units could be redeveloped in settler oil palm schemes strategizing on moderate size herds and improved feeding. Smallholder enterprises of beef and dairy cattle should optimally be of less than 100-cow units in size to allow efficient use of farm workers. Cattle smallholder units should however be assisted by ensuring readily available feed supply and extension service in many aspects of better health care, feeding and breeding. Therefore extension agencies and privately managed service providers should be encouraged to provide smallholders with the necessary production inputs and required services involving the breeding, health care and marketing of the animals. Sale outlets such as auction points for market animals and fair price milk marketing scheme would greatly facilitate the sector and instill confidence among producers to stay in their business. Such smallholder units are applicable in the production of red meat from cattle, buffalo, goat, sheep and even wildlife species such as deer, porcupine and ostrich.

Industry structure

It has been mentioned that the Malaysian beef industry lacks an efficient industry structure that clearly identifies the major players in the value chain from primary producers in the cow-calf and growing-fattening phases to retail consumers and is still considered as less developed (Ismail *et al.*, 2014). The beef farming scenario of today has remained largely unchanged as it was several decades ago. Since the time of British rule over the country when veterinary service was first introduced, the local beef industry has remained in the hands of smallholders who take up the keeping and owning of cattle as an activity to supplement their income from their primary occupation of crop farming and fishing.

In Malaysia the marketing of beef from cattle and buffalo involves the producers, buyers of live animals, butchers and consumers. Butchers seek their daily supplies of cattle for slaughter through middlemen who source their cattle from smallholders or importers of slaughter cattle. Beef is mainly sold in the retail markets such as the weekly night and farmers' markets, daily wet markets and supermarkets, with slaughtering being done in municipal abattoirs and carcass

fabrication carried out on site at the various markets. Price of beef is set according to muscle types – loin cuts fetch the highest price and shank the lowest price – and beef is included in the list of essential food items whose price is controlled by the Government. Local beef is priced at 1.9 fold increase compared to the imported buffalo meat from India. The average price of local beef has increased by 18.93% from RM22.45 per kg in 2013 to RM26.70 per kg in 2014 (MOA, 2015).

The marketing of animals for breeding and slaughter is not well organized, so also the production and sale of inputs such as breeding stock and feed. Since the public sector agencies face many challenges in securing annual development and operational budget allocation to build and maintain the infrastructure and system for an efficient marketing of animals and production inputs and breed improvement programme, thus these functions could better be handled by commercial concerns with initial grants from the government.

Conclusion

After many decades of attempted public- and private-sector initiatives in beef development involving importation of exotic breeds of cattle and setting up of extensive and intensive farms for the breeding and growing out of beef cattle and buffalo, small gain has been achieved in terms of alleviating the domestic beef supply. The way forward may lie in the integration of beef cattle with palm oil production in oil palm holdings, smallholder dairy-beef enterprises and short-term fattening of feeder cattle and buffalo using oil palm byproducts in a renewed and more efficient supply chain. Buffalo is included in the production strategy for a higher domestic supply of beef.

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