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## **ABSTRACT**

The livestock sector is an important and integral component of the agricultural sector in Malaysia. It provides gainful employment and animal proteins for the population. Livestock farming includes the production of poultry meat, eggs, pork, beef, mutton and milk as food items. In addition, some animal species also produce by-products, such as skin, bones and feathers. Over the last decade, Malaysia has experienced rapid economic and population growth, leading to an upsurge in demand-driven consumption of livestock products. The non-ruminant sub-sector responded to this increased demand by increasing domestic supply of poultry, eggs and pork but in the ruminant sector, however, the production system was severely strained. The beef sub-sector in particular was unable to cope with the increasing domestic demand resulting in the need for increased importation of frozen, chilled and fresh beef, along with beef cattle for slaughtering to keep up with consumer demand. While current domestic production of beef is able to meet 28% of domestic demand if no drastic measures are taken to revive the beef sub-sector it will definitely decline and Malaysia will be forced to depend on other countries to satisfy its domestic beef demand. The price elasticity of beef demand is inelastic which implies that the consumers are not sensitive to changes in its price. This is due to the availability of substitute products. Similarly the income elasticity for beef demand is also inelastic which implies that consumers are not influenced by changes in their incomes. Further, the beef sub-sector is found to be inefficient in terms of production and it also does not have comparative advantage. Comparative advantage may however be achieved with large scale beef farming. Thus beef can be considered as normal good. In order to increase the sufficiency level to 40% by 2020, Malaysia will require 250,000 heads of breeding stock over the 2010-2020. For future long term sustainable growth

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of its beef sub-sector Malaysia cannot remain dependent solely on imported breeding animals and will thus have to work on developing its own cow-calf systems or breed lots.

## **INTRODUCTION**

Agriculture is one of the major sectors in the Malaysian economy. It contributed 28.8% to the nation's Gross Domestic Product (GDP) in 1970 but then declined, contributing only 7.3% in 2010. Even though the contribution of the agriculture sector has been declining over the years in terms of percentage, it has shown an upward growth trend in terms of absolute value (Table 1). The livestock industry for example, accounted for 0.80% of total GDP contributions in 2005 and around 9.68 % to terms of value added in the agriculture sector. However, in 2010 its contribution to GDP declined to 0.71% in but it is noted that conversely, the value of the livestock sector showed an increase accounting for about 11.5% of Agriculture GDP in the same year. Although the contributions of the livestock sector to the economy appear to be rather small, the sector has grown steadily over the years, and has thus earned a place in the national economy. The added value of the sector has also grown steadily at an annual average of 4 – 6 % over the period 2005-2010.

The livestock sector's GDP contributions is dominated by the poultry subsector which accounts for almost 66% of the total livestock share of agriculture GDP, while the remainder comes from the other livestock subsectors.

**Table 1** Agricultural industry and livestock share in GDP (1990 – 2010)

Year	Total GDP (Million RM)	Share of agriculture (Million RM)	Ag. Share in GDP (%)	Share of Livestock (Million RM)	Livestock share in Ag. GDP (%)	Livestock share in Total GDP (%)
1990	92,370	14,827	16.05	604	4.07	0.65
1995	119,081	17,115	14.37	953	5.57	0.80
2000	210,557	18,662	8.86	1,520	8.14	0.72
2005	262,029	21,585	8.24	2,089	9.68	0.80
2010	351,207	27,517	7.83	2,483	11.5	0.71

Source: Government of Malaysia, Economic Reports: (1990 and 2010)

As a food provider for the country, the agriculture sector has performed poorly. Table 2 shows the Balance of Trade (BOT) of the overall food sector in Malaysia from 1990 – 2010. In 2010 the Malaysian trade balance for food registered a deficit of RM12 billion and as at July 2011 the deficit was RM5.95 billion. The beef sub sector accounts for an estimated RM750 million of the deficit in 2010 (inclusive of animals for slaughter, breeding stock and frozen, chilled and fresh beef) while approximately RM2 billion is accounted for in milk and milk products by comparison.

**Table 2** Imports, exports and BOT in the Malaysian food sector, 1990-2010

<b>Year</b>	<b>Food Export RM (Million)</b>	<b>Food Import RM (Million)</b>	<b>BOT RM (Million)</b>
1990	3,453	4,583	-1,130
1995	4,526	7,885	-3,359
2000	6,470	11,393	-4,923
2005	10,669	17,733	-7,064
2006	11,392	19,950	-8,558
2007	13,760	23,374	-9,614
2008	17,773	27,893	-10,120
2009	15,791	26,732.1	-10,941.1
2010	18,168.0	30,252.8	-12,084.8

Source: Department of Statistics, 2011

## **POLICY DEVELOPMENT: AN OVERVIEW**

Zainalabidin (2007) who reviewed the development expenditure for livestock development noted a positive correlation between government expenditure on livestock and the value share contributions of the livestock sector to agriculture GDP as a whole.

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However the percentage of expenditure allocated for the sector is considered to be rather small in view of its importance to the nation. Table 3 shows the development expenditure allocations, under various national development plans, for the agriculture sector as a whole and specifically for the livestock sector.

The early livestock development policies [1<sup>st</sup> and 2<sup>nd</sup> Five Year Plan of Malaya (1956-60 and 1961-65)] were focused primarily on animal husbandry and disease control. During this period the national level of self-sufficiency (SSL) for beef was 85%, as compared to almost 100% for poultry and pork. Under the 1<sup>st</sup> Malaysia Plan (1MP, 1966-70) the objective of the livestock development policy was to support, on an intensive and continuing basis, research into all aspects of livestock production and the Department of Veterinary Services (DVS) was responsible for all aspects of animal health, animal production and veterinary public health. The 1MP did not place much emphasis on increasing beef production.

In the Second Malaysia Plan (2MP, 1971-75) the Malaysian Government displayed more interest in developing the beef industry and the livestock sector was geared towards building an efficient ruminant sub-sector, particularly dairy and beef cattle. In order to accelerate the development of beef and milk production, the National Livestock Development Authority (MAJUTERNAK) was established in 1972. Its objectives were to promote the commercialization and rapid expansion of cattle rearing and to encourage private sector participation in the activity. Programs such as the Pawah Schemes<sup>1</sup> for buffaloes and cattle were implemented

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<sup>1</sup> Under Pawah scheme, female cattle is loaned to a smallholder who would, at a later date, return to the DVS an animal of the same sex and about the same age as that which was given originally.



**Table 3** Development Expenditure Allocated for Agriculture and Livestock under the Various Malaysian Development Plans (Million RM)

Malaysian Development Plans	Agriculture	Livestock	Livestock as % of Agriculture
First Five Year Plan of Malaya Government 1956 -1960	N.A	1.7	N.A
Second Five Year Plan of Malaya Government 1961 -1965	N.A	11.3	N.A
First Malaysia Plan, 1966 - 1970	1,700.90	29.00	2.50
Second Malaysia Plan, 1971-1975	2,279.40	61.80	2.70
Third Malaysia Plan, 1976-1980	6,448.30	168.80	2.60
Fourth Malaysia Plan, 1981-1985	8,013.60	137.77	1.70
Fifth Malaysia Plan, 1986 - 1990	7,325.00	130.90	1.79
Sixth Malaysia Plan, 1991 - 1995	8,215.20	191.40	2.33
Seventh Malaysia Plan, 1996-2000	8,139.30	176.30	2.17
Eighth Malaysia Plan, 2001-2005	6,207.90	202.80	3.27
Ninth Malaysia Plan, 2006-2010	11,435.00	519.80	4.55

Source: Government of Malaysia, (1966); (1971); (1976); (1981); (1986); (1991); (1996); (2001);(2006)

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to encourage participation by farmers and Milk Collecting Centers (MCC) were established in 1974 to provide marketing outlets as well as processing and extension services to smallholders.

While the impact of the Second Malaysia Plan had positive results with an increase in the SSL of 86.8% to approximately 90% in the early years, the average annual growth rate of livestock production over the Plan period was negative. This could be attributed partly to the outbreak of the foot and mouth disease in the livestock sector in the later part of the plan period.

Thus, under the Third Malaysia Plan (3MP, 1976-80), continued emphasis was placed on the development of the beef and dairy sub-sectors. Efforts were made to increase the local cattle population through importation of breeding stock and greater use of artificial insemination, based on exotic breeds.

The livestock policy under the Fourth Malaysia Plan (4MP, 1981-85) was an extension of the Second and Third Malaysia Plans in line with the objectives of New Economic Policy (NEP). Continued emphasis was placed on the improvement of the smallholder beef and dairy sub-sectors with increased importation of high-quality animals for breeding and distribution to farmers.

Overall the policy objectives for the livestock sector under the Fourth Malaysia Plan (4MP, 1981-85) were to increase production of all livestock products, increase the level of self-sufficiency, raise the incomes of producers as well as the nutritional status of the human population and to provide rural employment opportunities. However the SSL showed a declining trend during this period. The SSL of the beef sub-sector declined from 63.69% to 37.67%, in 1980 and 1985 respectively. This could be due to the increase in the consuming population and inability of local beef producers to cope with the increasing demand. Under the 4MP MAJUTERNAK was dissolved after only 12 years of operation, in 1983. Nevertheless,

the policy emphasis on the development of the livestock sector continued well into the second half of the 1980s with the introduction of the Fifth Malaysia Plan (5MP, 1986-90). Programs implemented under the plan included continued importation of better breeds of animals, provisions for artificial insemination and expansion of the MCC facilities (Nik Mahmood, 1986). Other programs included integration of sheep in rubber estates, oil palm estates, smallholdings and opening feedlot systems which utilised agricultural by-products such as palm kernel cake (PKC)(MOA). In the case of the pig sub-sector, emphasis was given on '0' pollution control (Ismail, 1986). The policy direction in the Sixth Malaysia Plan (6MP, 1991-1995) did not differ from the previous Plan and could be said to be a continuation of the 5MP. The establishment of WTO has created difficulties for Malaysian products destined for the export market.

The Seventh Malaysia Plan (7MP, 1996-2000) emphasized on the plantation integration system for the development of the livestock industry. Hence, all plantations were encouraged to integrate livestock into their fields, for both meat and milk production. Under 7MP the SSL for beef declined further to 17% from the 21% recorded under the 6MP, perhaps a result of the prevailing Asian Financial Crisis at that time.

The Third National Agricultural Policy (1998-2010) (NAP3) was formulated during this period. The NAP3 (1998-2010) focused on policy formulation for domestic production and on strategic sourcing of food to ensure adequate supply and access to safe, nutritious and high quality food at affordable prices for the Malaysian population. It also emphasized on enhancement of the global competitiveness of Malaysian food products. In addition to the above mentioned policies, the efforts of the Malaysian

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Government are now geared towards developing and exploiting Malaysia's potential as an International Halal Food Hub.

During the Eighth Malaysia Plan period (8MP, 2001-2005), production of beef, mutton and milk recorded high growth rates, ranging from 5.2 % to 10.5 % per annum, mainly due to the integration of livestock into palm oil and rubber plantations. At the same time the poultry industry, including production of eggs, remained resilient despite of the outbreak of the avian bird flu in 2003. This was due to the expansion in application of the closed-house system. Pork production, which recovered from the Nipah virus outbreak, also increased, at an annual growth rate of 5.5 %. However, despite the positive growth rate, the SSL for beef still remained at around 18%.

The Ninth Malaysian Plan (9MP, 2006-2010), unveiled in March 2006, included new development strategies focused on expanding the livestock industry, especially the ruminant sector. The plan was also geared towards transforming the agricultural sector into the "third engine of economic growth," after the services and manufacturing sectors. The Plan also included strategies to achieve self-sufficient food supply for Malaysia, to help the government fulfill its goal of becoming a net food exporter by 2010. The new 9MP also strongly encouraged local beef production and development by offering loans to interested entrepreneurs for cattle farming. The Malaysian Government has also designated an area in Negeri Sembilan as the *Beef Valley*, to encourage local investors to engage in cattle ranching. The Beef Valley, or better known as the National Feedlot Centre (NFC), was launched in 2007. The centre was expected to produce 15,000 mt of beef worth RM230 million annually and to meet 34% of the nation's demand for beef by 2010. However in 2010 the SSL for beef only increased to 28% from the previous 18% recorded under the 8MP. Table 4 shows the

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SSL of beef and other livestock products from 1970 – 2010. The figures show that the SSL for beef declined over the initial years and started to pick up only in 2005 albeit at a very slow rate, but as yet has not reached the 34% target stipulated in the 9MP.

**Table 4** Self-sufficiency Level for livestock (%), 1970-2010

<b>Year (Unit)</b>	<b>Beef (%)</b>	<b>Mutton (%)</b>	<b>Pork (%)</b>	<b>Poultry Meat (%)</b>	<b>Eggs (%)</b>	<b>Milk (%)</b>
1970	86.88	24.82	99.60	93.40	99.58	NA
1975	77.60	22.98	99.80	99.57	99.39	NA
1980	63.69	11.53	99.82	97.70	100.00	3.66
1985	37.67	9.20	103.40	104.34	104.34	4.46
1990	24.07	9.04	131.45	117.64	110.97	4.66
1995	19.73	4.84	141.77	114.32	112.11	3.69
2000	16.69	6.07	99.16	117.78	118.70	2.38
2005	21.48	8.67	102.73	131.15	110.35	3.85
2006	22.89	9.04	95.19	131.06	109.78	3.98
2007	24.51	9.60	96.54	125.99	114.01	3.95
2008	26.30	10.10	95.69	127.44	114.00	4.10
2009	27.82	9.61	95.54	127.26	118.76	4.05
2010**	28.89	10.06	96.21	127.49	117.77	4.00

Source: DVS (various issues)

## THE INPUT/PRODUCTION SIDE OF SUPPLY CHAIN

The previous sections have outlined the progress in the livestock sector in general and the beef sub-sector in particular, under the various Malaysia development plans. There appears to have been little improvement in the beef sub-sector and the country still imports up to almost 75% of its domestic requirements. So what has gone wrong in the beef sub sector? To better understand the situation we need to review the supply chain of the livestock sector in general and apply it to beef sub sector (see Figure 1). From the production side of the beef supply chain it is seen that the local beef production is insufficient to meet domestic demand. Thus importation is inevitable to ensure sufficient supply for domestic consumption. The importation of both beef and cattle for slaughter display an increasing trend over the past years. The importation can thus be considered as an *input* to the beef supply chain, particularly as Malaysia does not have its own cow-calf operations that could supply calves to the beef production sector. The importation figures also indicate that in addition to insufficient domestic supply of beef there is also increasing demand for beef from the consuming population. If there is no importation to fill the supply gap, the price of beef will increase. Table 6 and Figure 2 show the import figures for beef cattle and beef (frozen, chilled and fresh) respectively which show an alarming trend of continued increase over the years and there appears to be no immediate solution to this situation. With the importation of the beef cattle either for slaughter or breeding stock, the total production of beef is seen to increase over the years, however the SSL for beef in Malaysia is still a long way off.

Zainalabidin et. al (2009) and Fauziah, J et. al (2003) developed a simulation model for the beef sub-sector in Peninsular Malaysia using a Vintage Approach simulation matrix model (VASIMM). This model considers both biological and economic components.

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The biological components taken into consideration include the beef cattle, dairy cattle and buffalo population life cycles and their production processes while the economic components include the elements in the economic framework of supply and demand in beef production decisions as presented in the Figure 1.

The VASIMM used the following deduction method, which was adapted from Smit (1984) for a slaughter system in Equations (1) and (2).

$$r_K = r_{K-1} - (100 - \rho)/k \quad \text{for } K = 1, \dots, k \text{ (years)} \quad (1)$$

$$P_K = \delta^{\delta/K} \quad (2)$$

where,

$r_K$  = percentage of original animal population remaining after k years

$p_K$  = percentage of remaining animal population deducted in year k

$\rho$  = total remaining percentage to be reached after k years

k = number of years for constant annual decrease in percentage  
not yet deducted

$\delta$  = the rate of change of slaughter or culled or dead animals

The VASIMM system simulation model includes a cow-calf operation model which incorporates four major system components which include: I: population distribution component; II: slaughter and beef production component; III: beef production and consumption component; and IV: management decision-making component. The three physical components involved: beef population life cycle; beef production; and beef self-sufficiency level.

Table 5 shows 2 different policy scenarios on importation of female breeding stock into the country. Scenario 1, assumes that the importation of breeding stock is 10,000 heads per year, while in Scenario 2 the importation of breeding stock is 50,000 heads

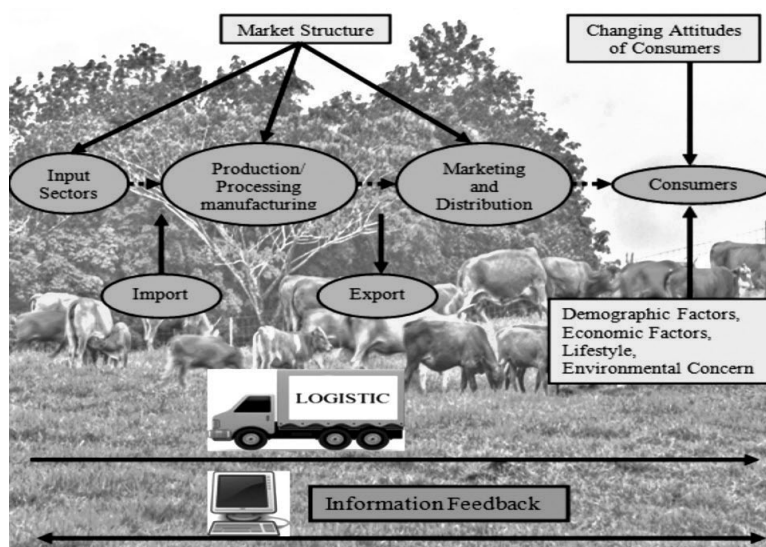


for the year 2010, 2011 and 2013. The results show that the beef SSL achieved by 2020 under the two scenarios was 20.41% under Scenario 1 and 40% under Scenario 2. In order to achieve 40% SSL the government has to import about 230,000 heads of breeding stock over 11 years. Hence it is seen that high investment in breeding cattle would be required in order to achieve a SSL of 100% in the beef sub-sector, as has been achieved in the poultry sub-sector.

**Table 5** Level of Self-Sufficiency under Different Policy Scenarios in Peninsular Malaysia (%), 2007-2020

Year	Scenario 1	Scenario2
Importation of female breeding stock (FBS)	10,000 head FBS/yr. from 2010-2020	50,000 head FBS only in 2010, 2011, 2012 and 10,000 head FBS/yr. from 2013-2020
2007	17.97	18
2010	18.03	21.9
2015	19.4	36.04
2017	19.43	37.21
2019	20.02	38.7
2020	20.41	40.01

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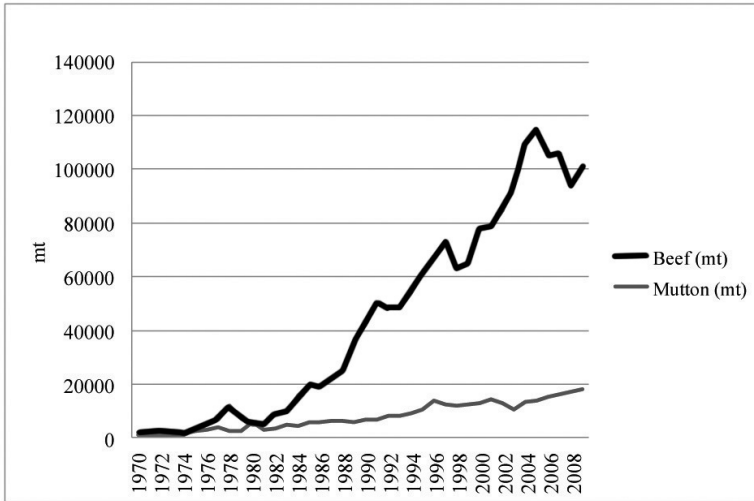


**Figure 1** Supply Chain of Beef in Malaysia

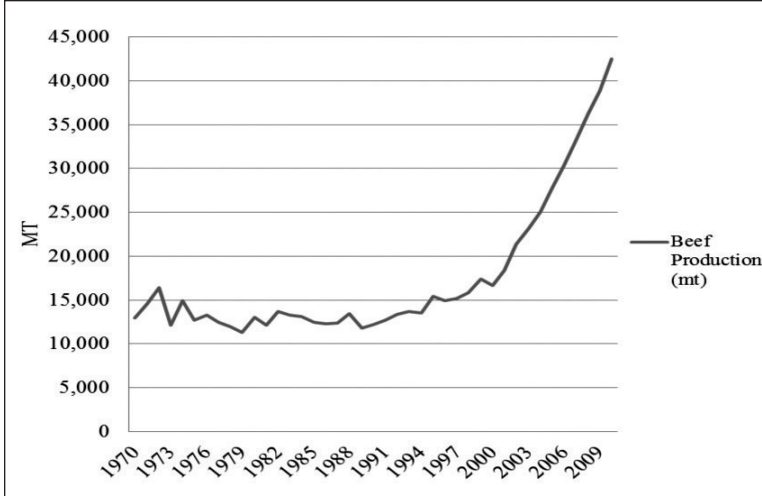
**Table 6** Import of cattle, buffalo, goat and sheep (heads) for slaughter, 1970-2009

Year (Unit)	Cattle (heads)	Buffalo (heads)	Goat (heads)	Sheep (heads)
1970	4,650	3,329	120	51,008
1975	4,999	300	0	26,654
1980	21,268	403	0	8,666
1985	4,886	790	0	4,260
1990	10,304	312	14,566	19,594
1995	35,313	3,915	19,638	2,230
2000	61,639	430	37,083	13,525
2005	29,029	793	30,769	23,783
2006	39,207	5,663	79,706	21,711
2007	37,297	597	94,638	26,966
2008	79,003	244	79,274	28,214
2009	125,059	1,808	78,471	23,088

Source: DVS various issues.



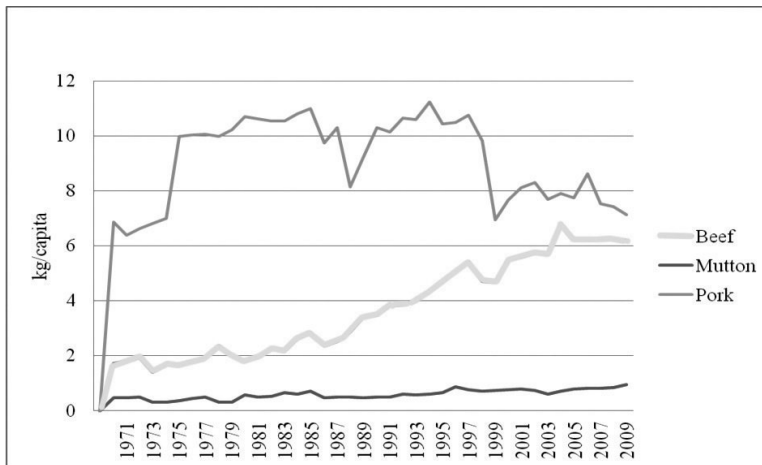
**Figure 2** Import of Beef and Mutton (MT), 1970-2009



**Figure 3** Beef Production, 1970-2010

## DEMAND/CONSUMPTION SIDE OF THE SUPPLY CHAIN

The per capita consumption of beef (consuming population) by Malaysians shows an increasing trend over the years. In 2010 the per capita consumption of beef was recorded at 6.25 kg/year which is far below the per capita consumption rate in most developing countries. The per capita consumption of beef by Malaysians is comparatively much lower than the per capita consumption of chicken which is at 39.00 kg/year. The consumption of beef by Malaysians is expected to increase in the years to come as Malaysians become more affluent and educated and subsequently demand for more nutritious foods of which beef is one. Figure 3 dan figure 4 shows the beef production and per capita consumption of beef, mutton and pork among Malaysians respectively, from 1970-2009.



**Figure 4** Per capita consumption of beef, mutton, port and poultry meat (kg/capita), 1970-2009

Thus the pressure will be on the producers or even the policy makers to determine how the beef industry can be further developed

to assure adequate supply of local beef for the Malaysian consumers as opposed to continued dependence on imports.

Studies on livestock demand in Malaysia have been conducted by several authors. Zainalabidin, M. and Roslan, G. (1989) studied the demand for chicken using the Instrumental Variable approach and Zainalabidin and Fatimah A. (1996) evaluated the swine market integration. Meanwhile, Tey et. al (2010), Zainalabidin and Abdullahi (2009), Nik Mustapha et. al (2001), Zubaidi and Zainalabidin (1993) and Zubaidi (1993) used the Almost Ideal Demand Systems (AIDS) model as a basis, with some modifications, in their studies. In general the AIDS model is derived from an underlying structure of consumer preferences via a cost or expenditures function (Deaton and Muellbauer, 1980). Using Shepard's Lemma the demand functions are obtained by simple price differentiation of the cost function and appropriate substitutions, where the AIDS model expresses  $W_i$ , the  $i$ th budget share for a good as:

1)  $W_{i,t} = a_i + \sum c_{ij,t} \log p_{j,t} + b_i \log (X/P)_t$ , for all  $i, j$  and  $t=1, \dots, T$ .  
 where,  $C'_{ij}$  and  $b_i$  are the parameters to be estimated,  $X$  is the total expenditure on all commodities in the system, and  $P$  is a price index defined by:

$$2) \log P = a_0 + \sum_j a_j \log P_j + \frac{1}{2} \sum_k \sum_j c_{kj} \log P_k \log P_j$$

The empirical estimation of the complete AIDS model involves the estimation of Equation (1). However, to avoid non-linear estimation, Equation (2) is often replaced by the Stone Index ( $P^*$ ) which is defined as:

$$3) \ln P^*_t = \sum_{k=1}^n \bar{W}_k \log P_k$$

where,  $\bar{W}_k$ , is the mean of the budget share (see, for example,

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Mergos and Donatos, 1989 and Kim, 1990). Therefore, the linear approximation of the system is:

$$4) W_{i,t} = a_i^* + \sum c_{ij,t} \log P_j + b_i \log (X/P^*)_t$$

The model expresses the average budget share as a function of prices and real income or expenditure. The demand properties (commonly known as adding up, homogeneity, and Slutsky symmetry) can be imposed on the system by the following relationships:

$$5) \sum a_i = 1; \sum c_{ij} = 0 \text{ and } \sum b_i = 0;$$

$$6) \sum c_{ij} = 0; \text{ and}$$

$$7) c_{ij} = c_{ji}$$

The first of these are the adding up conditions. Equation (6) implies that the demands are homogenous of degree zero in prices and income and finally, Equation (7) shows the Slutsky symmetry condition.

The AIDS or modified AIDS models can be used to estimate own price and income elasticity for beef. The own price elasticity of beef demand is basically a measure of the sensitivity of consumer demand for beef to changes in the price of beef. The elasticity is measured in percentage. For example, a one percent change in price will cause a certain percentage change in beef demand, where the direction of change depends on whether the price elasticity is elastic or inelastic. In this case we assume the own price elasticity of beef to be elastic because there are a few substitute products such as poultry meat, fish, mutton and pork. Hence, if the price of beef increases consumers will change their buying behavior and switch their consumption to other red meats or fish. By the same token, the income elasticity of beef is also expected to be elastic. Since

beef is one of the most expensive red meats, a luxury good, change (increase) in income is expected to result in change (increase) in the consumer's consumption of beef which will be relatively greater than the changes in income. Table 7 shows the price of selected meats in Malaysia, from 1970-2009.

The own price elasticity of beef demand is quite consistent in the reports of several authors including Zainalabidin and Abdullahi (2009), Nik Mustapha et. al (2001), Zubaidi and Zainalabidin (1993). Zubaidi (1993) reported own price elasticity of beef demand to be inelastic, indicating that consumers are not very responsive to price change. Similar findings were also reported by Zubaidi (1993) and Zubaidi and Zainalabidin (1993) using the LA static AID and Static AIDS models respectively, utilising data from 1960 -1990 period. A recent study by Zainalabidin and Abdullahi (2009), applying the LAIDS-ECM model, also found the own price elasticity of beef demand to be inelastic. The own price inelasticity indicates that the consumer is not sensitive to changes in the price of beef. Take for example the findings of Zainalabidin and Abdullahi (2009) where own price elasticity was found to be -0.871. This value indicates that as the price of beef increases (change) by 1%, the demand for beef will decline (change) by only 0.871%, assuming that other factors affecting the demand for beef remain constant. In this case we can say that consumers are not sensitive to changes in price (increase in price) as the decline in demand of beef is less than expected with the increase in its price. However other research, for example that by Fauzi et.al (1993) and Tey et. al (2010), show that demand for beef is own price elastic i.e. greater than one. Tey et. al (2010) reported that the own price elasticity of beef is -2.478, which is very elastic, and shows that consumers are very sensitive to changes in the price of beef. In this instance if the price of beef increases by 1% the demand for beef will decline by 2.478%. The percentage

decline in beef consumption is larger than the percentage of price increase. Thus a small increase in the price of beef will cause a large decline in demand.

Apart from its price, the demand for beef consumption is also sensitive to changes in income. The per capita income of Malaysians on average shows an increasing trend and is seen to be moving towards that of a high income society. Changes in income will also influence the demand for beef consumption, assuming other factors affecting demand for beef remain constant. Most studies carried out have shown the demand for beef to be income inelastic. The inelastic income indicates that on average consumers are not sensitive to changes in income levels. For example Zainalabidin and Zainalabidin and Abdullahi (2004) estimated the income elasticity for beef demand to be 0.484, indicating that 1% change in income will result in only a 0.484% change in demand for beef whereby income increases of 1% will result in demand for beef increasing by only 0.484%. Although the findings of the different authors using different estimation techniques are consistent, the magnitude of the elasticities differ, ranging from 0.061 to 0.992.

Thus our studies have however found the income elasticity of beef to be inelastic, indicating beef is not luxury food item although commanding very high prices as compared to other meat based food items.

Further, while many studies have found the own price elasticity of beef to be elastic our studies have shown that it is inelastic perhaps due to the substitutability effect among the meat based foods. Consumers can always change their consumption patterns shifting from one meat to another that gives them similar satisfaction.

Regardless of the own price and income elasticity of beef demand the next question is whether Malaysia has comparative advantage in producing beef to feed its own rising population or whether



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Malaysia needs to continue to depend on other countries for its beef supply. Comparative advantage basically measures the efficiency level of domestic resources used in order to gain or save foreign exchange. Since Malaysia has long been importing beef either in the form of live animals or frozen, chilled and fresh beef, it will be interesting to explore whether Malaysia can produce its own beef both economically and efficiently.

**Table 7** Summary of previous findings on meat demand in Malaysia

<b>Author</b>	<b>Data</b>	<b>Method</b>	<b>Type of Meat</b>	<b>Income/ Expenditure Elasticity</b>	<b>Own-price Elasticity</b>
Nik Mustapha et al. (2001)	Household Expenditures Survey( 1990)	Almost Ideal Demand System (AIDS)	Meat,	0.5168	-0.3982
			Fish,	0.4221	-0.4175
Ahmed Zubaidi and Zainalabidin (1993)	1960-1990	Static AIDS	Beef,	0.061	-0.873
			Mutton,	1.117	-0.438
			Poultry,	1.432	-3.782
			Pork,	1.520	-0.696
			Fish	1.023	-0.799
Ahmed Zubaidi (1993)	960-1990	Static LA/ AIDS	Beef	0.992	-0.903
			Mutton	1.158	-0.452
			Chicken,	1.292	-2.518
			Pork	1.184	-1.290
			Fish	0.845	-1.669

Fauzi et al.(1993)	1970-1993	Simultaneous	Beef,	0.29	-1.25
Zainalabidin and Abdullahi (2009)	1960-2001	LAIDS-ECM	Beef	0.484	-0.871
			Mutton	0.349	-0.468
			Chicken,	1.186	-0.913
			Pork	0.770	-0.820
			Fish	1.108	-0.189
Tey Yéong Sheng et al. (2010)	Household expenditure survey 2004/2005	Quadratic AIDS (QUAIDS) models	Beef	0.8819	-2.4776

## **THE EFFICIENCY AND COMPARATIVE ADVANTAGE**

With regards to the input side of the beef supply chain the questions that arise are : “how efficient is our beef production system?” and “What will it take to develop an efficient beef sub-sector in Malaysia?” Tapsir et. al (2004) studied the technical efficiency of beef cattle production in targeted areas of concentration (TAC) in Johor, using the translog and Cobb-Douglas stochastic frontier production functions. Their results indicate that beef production operations in the TACs have an increasing return to scale and that the majority of the TAC farms had 40% to 80% technical efficiency. The results imply that these beef farms are not efficient in producing beef and that improvement in technical efficiency is needed to increase production.

Similarly, studies by Zainalabidin et. al (1992), using the Domestic resource cost (DRC) methodology, show that the ruminant sector does not have comparative advantage, which is an indication that for every USD1.00 worth of beef produced, the farm used more than USD1.00 of domestic resources. In such circumstances it would be better to import beef rather than to produce it ourselves. This was shown to be true for all farm sizes. Zulheiri Adha (2010) on the other hand showed that commercial farms with 250 heads of beef cattle per year have a comparative advantage in the sense that these commercial sized farm used USD0.81 of domestic resources for every USD1.00 worth of beef produced. Thus Malaysia can achieve comparative advantage in producing beef for local consumption but only when carried out on a larger scale.

## **CONSUMERS**

Although Malaysia is working towards increasing domestic beef production in the years to come, to achieve at least 35% SSL, changes in consumer life styles and concerns should also be taken into account in developing the livestock sector. Food safety issues, animal welfare and environmental concerns and outbreaks of foot and mouth and mad cow diseases have made consumers more careful and selective in the food they consume. Studies by Zainalabidin et. al (2011) have shown that most consumers are now more aware of food scandals and food safety issues. They are also aware of environmental degradation issues and that going green may be one way to save the world. Similarly studies by Golnaz, R. et. al (2011a), Phuah et. al (2011d) and Golnaz, R. et. al (2012) have shown that most consumers are aware of animal welfare issues and are thus now demanding for different kinds of products which reflect these concerns and are also more willing to go green. These developments will further increase the pressure on the supply chain, especially on the input and production sides. Complying with standards such as the Veterinary Health Mark (VHM), Good Manufacturing Practices (GMP), Good Animal Husbandry (GAH) and animal welfare are new issues and topics for local producers. While going green may not be cheap the local producers should be aware of the increasing demands for food safety and 'green' food.

## **CONCLUSIONS**

Given the increasing rates of per capita consumption, the increasing quotas on importation of beef and beef cattle for slaughter and the widening BOT, what would be the most viable path to follow? The National Feedlot Centre (NFC) perhaps ? The answer is both yes and no. As a short term measure, yes, NFC could be the answer.

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However the NFC depends heavily on imported feeder cattle and such practice will not contribute to enhancement of the local beef sub sector. In the long run the government should develop its own breeding operations as part of its beef development programs. Should we go back to the MAJUTERNAK era? The answer: why not ?. Studies by Zainalabidin et. al (2009), using the Vintage approach in forecasting the requirements to achieve SSL, show that Malaysia would require 150,000 breeding cattle over the 2010-2012 period and subsequently, 10,000 imported breeding animals per year, from 2013 to 2020, in order to achieve at least 40% SSL by the year 2020. This will require a lot of effort and development of local breeding systems [cow-calf systems] to enhance the development of the beef cattle industry. Thus it would be more practical for policy makers to initiate the Cow-Calf systems or the **BREEDLOT**, rather than the feedlot system, in order to ensure the long term sustainability of the beef sub-sector in Malaysia.

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## **BIOGRAPHY**

**Dr. Zainal Abidin bin Mohamed** was born and raised in Johor Baharu in the state of Johor, Malaysia.

Dr. Zainal Abidin Bin Mohamed's academic pursuits include enrollment at Universiti Teknologi Mara (UiTM), Shah Alam in 1973 to pursue a Diploma in Animal Health and Production. In 1978 he went on to further his studies at University of Wyoming, Laramie, USA in the field of Animal Science, having been awarded the Sultan Ismail Scholarship by the Johor State Government. In 1979, Dr. Zainal Abidin graduated with a Bachelor of Science degree, majoring in Animal Science, from the university. He extended his studies at the same university graduating with a Master of Science in Agricultural Economics degree in 1981.

In 1981, while still studying at the University of Wyoming, Laramie, USA, Dr. Zainal Abidin Bin Mohamed was recruited as a tutor by Universiti Pertanian Malaysia (UPM). Upon his return home he was awarded the Public Service Department (PSD) scholarship to pursue his Ph.D and so in 1982, Dr. Zainal Abidin enrolled at the Oklahoma State University, Stillwater, USA where he successfully completed his Ph.D. in Agricultural Economics. Dr. Zainal Abidin then returned to Malaysia in late 1985 to join the Department of Agricultural Economics, Faculty of Economics and Management at Universiti Putra Malaysia, as a lecturer

Dr. Zainal Abidin has been active in teaching, research, providing advisory services and carrying out administrative duties. As a specialist in agricultural marketing, agribusiness management and livestock economics, he has taught both undergraduate and postgraduate students. To date he has supervised and co-supervised 45 Ph.D. candidates, 43 Master candidates and 92 undergraduates. Apart from being a lecturer, Dr. Zainal Abidin has also been called upon to undertake administrative duties of either an academic

or advisory nature. He was involved in the restructuring of the Bachelor of Science (Agribusiness) curriculum, was a member of the postgraduate committee, a committee member of extension services, committee member on the Farmer's day celebrations organizing committee and other extracurricular activities at UPM.

An agricultural economist with unique specialization in agribusiness, marketing and livestock economics, Dr. Zainal Abidin was given the task of leading a research project entitled 'Government Incentives and Comparative Advantage in the Livestock and Feedstuff Sector in Malaysia', sponsored by the Asian Development Bank (ADB) and coordinated by the Pacific Economic Cooperation Conference (PECC), in 1986. This was his first major assignment on the very day he joined the Department of Agricultural Economics at the university. This was a first of its kind project in Malaysia and so Dr. Zainal and his team were proud to not only be able to contribute to the Malaysian livestock sector and also be pioneers in conducting such studies.

Since then Dr. Zainal Abidin, has been awarded research grants by various institutions, local as well as international. His research focus is mainly in the area of agricultural marketing, which includes agricultural price analysis and livestock economics. His research has contributed significantly to the knowledge, understanding and insights into agricultural marketing issues as well as livestock economics in Malaysia. To date he has published 5 books (co-author), 8 book chapters, 60 journal articles and 89 articles, either in conference proceedings or as occasional papers. Other than local journals, his articles have also been published in international journals such as the *American Journal of Alternative Agriculture*, *Journal of Sustainable Agriculture*, *Journal of International Food and Agribusiness Marketing*, *Asian Food Journal*, *The Icfai*

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*University Journal of Agricultural Economics and Agricultural Economics- Czech.*

In addition to research and teaching, Dr. Zainal Abidin has also been invited to deliver seminars / workshops / conference papers in both the local and international arena. To date he has written and delivered 145 seminar / workshop / conference papers at both local and international levels (either as speaker or co-author). He has also been appointed to be a member of various advisory committees on agriculture and livestock at the University and Ministry levels.

In addition to being active in teaching, research and extension work, Dr. Zainal Abidin was also an active member of the Malaysian Agricultural Economics Association. He was elected Honorary Secretary and Assistant Honorary Secretary of the association. He was also an active member of the Management Science/Operational Research Society of Malaysia, and was elected as a Committee Member and auditor of the Society.

Dr. Zainal Abidin was seconded to the National Accreditation Board ( Lembaga Akreditasi Negara (LAN) – now known as the Malaysian Qualifying Agency (MQA)) in July 1997 as a senior accreditation officer. He was one of the pioneer officers in LAN who formulated the policies and strategies governing the standards, criteria and quality of courses of study for Private Higher Educational Institutions (PHEI). With his 12 years of experience in the education sector, he was able to help develop guidelines on the procedure, criteria, standards and quality for courses of study for PHEIs in Malaysia. He also helped develop an instrument for the evaluation and assessment of courses of study. While in LAN, he was also elected as Deputy Management Representative for developing procedure for the MS ISO 9002 and later appointed to lead the policy unit. His contributions in LAN led to him receiving the Excellent Service Award in 1997, 1998 1999, 2000 and 2001.

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At the end of his tenure at LAN, in November 2001, he returned to the university to join a newly created department in the Faculty of Agriculture, the Department of Agribusiness and Information Systems. Here, he resumed his career as a lecturer and continued to teach agricultural and agribusiness- marketing courses, supervised both Master and Ph D students and continued his research in the fields of agricultural economics and agribusiness. In March 2002, he was appointed as the Head of the Rural Advancement Laboratory of the newly established university research center of excellence known as the Institute for Community and Peace Studies (PEKKA). He was given the task of sourcing for research grants and conducting research on rural development and advancement in the agricultural community and other related activities. He managed to secure two research funds from the Intensified Research in Priority Areas (IRPA-EA) grant, under the auspices of the Ministry of Science and Technology. However, his stay in PEKKA was short as he was appointed the Head of the Department of Agribusiness and Information Systems in the Faculty of Agriculture on January 2004.

Dr. Zainal Abidin was awarded the Excellent Service Award for the year 2002 and in 2007 he was awarded the excellent researcher award in the Faculty of Agriculture, UPM.

Dr. Zainal Abidin's role as lecturer, researcher, extension worker and quality assurance officer has been most productive and his contributions to the world of education deserves great recognition.

## LIST OF INAUGURAL LECTURES

1. Prof. Dr. Sulaiman M. Yassin  
*The Challenge to Communication Research in Extension*  
22 July 1989
2. Prof. Ir. Abang Abdullah Abang Ali  
*Indigenous Materials and Technology for Low Cost Housing*  
30 August 1990
3. Prof. Dr. Abdul Rahman Abdul Razak  
*Plant Parasitic Nematodes, Lesser Known Pests of Agricultural Crops*  
30 January 1993
4. Prof. Dr. Mohamed Suleiman  
*Numerical Solution of Ordinary Differential Equations: A Historical Perspective*  
11 December 1993
5. Prof. Dr. Mohd. Ariff Hussein  
*Changing Roles of Agricultural Economics*  
5 March 1994
6. Prof. Dr. Mohd. Ismail Ahmad  
*Marketing Management: Prospects and Challenges for Agriculture*  
6 April 1994
7. Prof. Dr. Mohamed Mahyuddin Mohd. Dahan  
*The Changing Demand for Livestock Products*  
20 April 1994
8. Prof. Dr. Ruth Kiew  
*Plant Taxonomy, Biodiversity and Conservation*  
11 May 1994
9. Prof. Ir. Dr. Mohd. Zohadie Bardaie  
*Engineering Technological Developments Propelling Agriculture into the 21st Century*  
28 May 1994
10. Prof. Dr. Shamsuddin Jusop  
*Rock, Mineral and Soil*  
18 June 1994

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11. Prof. Dr. Abdul Salam Abdullah  
*Natural Toxicants Affecting Animal Health and Production*  
29 June 1994
12. Prof. Dr. Mohd. Yusof Hussein  
*Pest Control: A Challenge in Applied Ecology*  
9 July 1994
13. Prof. Dr. Kapt. Mohd. Ibrahim Haji Mohamed  
*Managing Challenges in Fisheries Development through Science and Technology*  
23 July 1994
14. Prof. Dr. Hj. Amat Juhari Moain  
*Sejarah Keagungan Bahasa Melayu*  
6 Ogos 1994
15. Prof. Dr. Law Ah Theem  
*Oil Pollution in the Malaysian Seas*  
24 September 1994
16. Prof. Dr. Md. Nordin Hj. Lajis  
*Fine Chemicals from Biological Resources: The Wealth from Nature*  
21 January 1995
17. Prof. Dr. Sheikh Omar Abdul Rahman  
*Health, Disease and Death in Creatures Great and Small*  
25 February 1995
18. Prof. Dr. Mohamed Shariff Mohamed Din  
*Fish Health: An Odyssey through the Asia - Pacific Region*  
25 March 1995
19. Prof. Dr. Tengku Azmi Tengku Ibrahim  
*Chromosome Distribution and Production Performance of Water Buffaloes*  
6 May 1995
20. Prof. Dr. Abdul Hamid Mahmood  
*Bahasa Melayu sebagai Bahasa Ilmu- Cabaran dan Harapan*  
10 Jun 1995



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21. Prof. Dr. Rahim Md. Sail  
*Extension Education for Industrialising Malaysia: Trends, Priorities and Emerging Issues*  
22 July 1995
22. Prof. Dr. Nik Muhammad Nik Abd. Majid  
*The Diminishing Tropical Rain Forest: Causes, Symptoms and Cure*  
19 August 1995
23. Prof. Dr. Ang Kok Jee  
*The Evolution of an Environmentally Friendly Hatchery Technology for Udang Galah, the King of Freshwater Prawns and a Glimpse into the Future of Aquaculture in the 21st Century*  
14 October 1995
24. Prof. Dr. Sharifuddin Haji Abdul Hamid  
*Management of Highly Weathered Acid Soils for Sustainable Crop Production*  
28 October 1995
25. Prof. Dr. Yu Swee Yean  
*Fish Processing and Preservation: Recent Advances and Future Directions*  
9 December 1995
26. Prof. Dr. Rosli Mohamad  
*Pesticide Usage: Concern and Options*  
10 February 1996
27. Prof. Dr. Mohamed Ismail Abdul Karim  
*Microbial Fermentation and Utilization of Agricultural Bioresources and Wastes in Malaysia*  
2 March 1996
28. Prof. Dr. Wan Sulaiman Wan Harun  
*Soil Physics: From Glass Beads to Precision Agriculture*  
16 March 1996
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*Sustained Growth and Sustainable Development: Is there a Trade-Off? I or Malaysia*  
13 April 1996

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*Sharecropping in Perfectly Competitive Markets: A Contradiction in Terms*  
27 April 1996
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*Back to the Future with the Sun*  
18 May 1996
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*Enzyme Technology: The Basis for Biotechnological Development*  
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*The Fascinating Numbers*  
29 June 1996
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*Fungi: Friends or Foes*  
27 July 1996
35. Prof. Dr. Tan Soon Guan  
*Genetic Diversity of Some Southeast Asian Animals: Of Buffaloes and Goats and Fishes Too*  
10 August 1996
36. Prof. Dr. Nazaruddin Mohd. Jali  
*Will Rural Sociology Remain Relevant in the 21st Century?*  
21 September 1996
37. Prof. Dr. Abdul Rani Bahaman  
*Leptospirosis-A Model for Epidemiology, Diagnosis and Control of Infectious Diseases*  
16 November 1996
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*Plant Biotechnology - Strategies for Commercialization*  
21 December 1996
39. Prof. Dr. Ishak Hj. Omar  
*Market Relationships in the Malaysian Fish Trade: Theory and Application*  
22 March 1997

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40. Prof. Dr. Suhaila Mohamad  
*Food and Its Healing Power*  
12 April 1997
41. Prof. Dr. Malay Raj Mukerjee  
*A Distributed Collaborative Environment for Distance Learning Applications*  
17 June 1998
42. Prof. Dr. Wong Kai Choo  
*Advancing the Fruit Industry in Malaysia: A Need to Shift Research Emphasis*  
15 May 1999
43. Prof. Dr. Aini Ideris  
*Avian Respiratory and Immunosuppressive Diseases- A Fatal Attraction*  
10 July 1999
44. Prof. Dr. Sariah Meon  
*Biological Control of Plant Pathogens: Harnessing the Richness of Microbial Diversity*  
14 August 1999
45. Prof. Dr. Azizah Hashim  
*The Endomycorrhiza: A Futile Investment?*  
23 Oktober 1999
46. Prof. Dr. Noraini Abdul Samad  
*Molecular Plant Virology: The Way Forward*  
2 February 2000
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*Do We Have Enough Clean Air to Breathe?*  
7 April 2000
48. Prof. Dr. Lee Chnoong Kheng  
*Green Environment, Clean Power*  
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*Managing Change in the Agriculture Sector: The Need for Innovative Educational Initiatives*  
12 January 2002

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50. Prof. Dr. Fatimah Mohd. Arshad  
*Analisis Pemasaran Pertanian di Malaysia: Keperluan Agenda  
Pembaharuan*  
26 Januari 2002
51. Prof. Dr. Nik Mustapha R. Abdullah  
*Fisheries Co-Management: An Institutional Innovation Towards  
Sustainable Fisheries Industry*  
28 February 2002
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*Food Safety: Perspectives and Challenges*  
23 March 2002
53. Prof. Dr. Zaharah A. Rahman  
*Nutrient Management Strategies for Sustainable Crop Production in Acid  
Soils: The Role of Research Using Isotopes*  
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23 November 2002
62. Prof. Ir. Dr. Radin Umar Radin Sohadi  
*Road Safety Interventions in Malaysia: How Effective Are They?*  
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*The New Shares Market: Regulatory Intervention, Forecast Errors and Challenges*  
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*Oils and Fats Analysis - Recent Advances and Future Prospects*  
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*Microwave Aquametry: A Growing Technology*  
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*Tapping the Power of Enzymes- Greening the Food Industry*  
11 May 2004
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*The Spider Mite Saga: Quest for Biorational Management Strategies*  
22 May 2004
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*The Education of At-Risk Children: The Challenges Ahead*  
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*Agricultural Robot: A New Technology Development for Agro-Based Industry*  
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*Insect Diseases: Resources for Biopesticide Development*  
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*Challenges in Feeding Livestock: From Wastes to Feed*  
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*Helping Malaysian Youth Move Forward: Unleashing the Prime Enablers*  
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*In Search of An Early Indicator of Kidney Disease*  
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*Smart Partnership: Plant-Rhizobacteria Associations*  
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12 August 2005
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*Engineering Agricultural Water Management Towards Precision Framing*  
26 August 2005
88. Prof. Dr. Mohd Arif Syed  
*Bioremediation-A Hope Yet for the Environment?*  
9 September 2005

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89. Prof. Dr. Abdul Hamid Abdul Rashid  
*The Wonder of Our Neuromotor System and the Technological Challenges They Pose*  
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