UNIVERSITI PUTRA MALAYSIA

AN ECONOMETRIC ANALYSIS OF THE PENINSULAR MALAYSIA BEEF MARKET

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By

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AN ECONOMETRIC ANALYSIS OF THE PENINSULAR MALAYSIA BEEF MARKET

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The beef industry is one of the most important industries for supplying animal protein after fish and chicken. Various studies have been conducted to improve the local contribution to the industry. But the local beef industry performance is slowing down resulting in an increasing amount of beef being imported from other countries.

In this study, an econometric model has been developed, analysed and validated to satisfy the objectives of determining and analysing the important factors and their linkages relating to beef animal development, the supply of beef animals for slaughter, and the demand for beef. The equations are estimated individually by the respective ordinary or two stage least square methods, and the whole model is solved by using a microcomputer TSP Programme.

The results of the study indicate that, for beef cattle, the previous number of females less than 3 years old and males more than 3 years old are two important animal components that determine the number of beef animals. For dairy cattle, the

current and previous number of male and female dairy cattle more than 3 years old and the previous female dairy cattle less than 3 years old are the important components determining the dairy cattle number. And for the buffalo, the previous number of females more than 3 years old is the most important determinant for buffalo number. Beef prices, import of animals and the existence of Majuternak have a positive effect on the beef animals number, while the slaughtering of animals and disease outbreak have a negative effect. The previous number of female beef cattle less than 3 years old is the most important determinant for cattle to be slaughter. For buffalo, both the current number of males and females more than 3 years old are the important determinants. The total population and the prices of beef are the important determinants for beef demand in Peninsular Malaysia.

Most of the dependent variables in the equations are explained by the explainatory variables at more than a 95% level. The estimated coefficients of the explainatory variables conform to the expected prior signs, and most of them are statistically significant. The simulated values obtained closely follow the actual values. From this analysis, therefore, the econometric model formed is able to represent the Peninsular Malaysia beef market and can be used for policy analysis and other studies.

Abstrak tesis dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan Ijazah Sarjana Sains.

ANALISIS EKONOMETRIK PASARAN DAGING LEMBU/KERBAU DI SEMENANJUNG MALAYSIA

Oleh

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Industri lembu pedaging dan kerbau adalah salah satu daripada industri terpenting dalam membekalkan protein ternakan selepas industri ikan dan poltri. Beberapa kajian telah dijalankan bagi meningkatkan sumbangan daging lembu dan kerbau tempatan dalam industri tersebut. Bagaimanapun, prestasi industri lembu pedaging dan kerbau tempatan semakin merosot. Ini menyebabkan peningkatan dalam jumlah daging lembu dan kerbau yang diimport dari luar negara.

Dalam kajian ini, satu model ekonometrik telah dibentuk, dianalisis dan divalidasikan bagi memenuhi objektif menentukan dan menganalisis faktor-faktor penting dan hubungkaitnya dalam pembangunan lembu dan kerbau pedaging, penawaran lembu dan kerbau untuk disembelih dan permintaannya. Persamaan-persamaan dianggarkan dengan menggunakan kaedah regresi biasa dan kaedah regresi dua peringkat. Keseluruhan model diselesaikan menggunakan mikrokomputer dengan program TSP.

Keputusan kajian menunjukkan bahawa bilangan lembu betina berumur kurang daripada 3 tahun dan jantan berumur lebih 3 tahun pada satu tahun lag adalah dua komponen penting yang menentukan bilangan semasa lembu pedaging. Manakala bilangan semasa dan lag satu tahun bagi lembu tenusu jantan dan betina yang berumur lebih 3 tahun, dan bilangan lembu tenusu berumur kurang daripada 3 tahun pada satu tahun lag adalah komponen penting dalam menentukan bilangan semasa lembu tenusu. Bagi kerbau, bilangan kerbau betina berumur lebih 3 tahun adalah komponen yang paling penting menentukan keseluruhan bilangan kerbau. Harga daging lembu dan kerbau, import ternakan dan ladang Majuternak memberi kesan positif terhadap bilangan semasa lembu dan kerbau, manakala penyembelihan dan penyakit kaki dan mulut pula memberi kesan yang negatif.

Kajian juga menunjukkan bahawa lembu betina berumur kurang 3 tahun pada satu tahun lag adalah komponen utama bagi lembu yang ditawarkan untuk disembelih. Manakala kerbau jantan dan betina berumur lebih 3 tahun merupakan komponen utama bagi kerbau yang ditawarkan untuk disembelih. Bagi permintaan daging lembu kerbau di Semenanjung Malaysia, bilangan populasi dan harga lembu daging adalah penentu utama.

Secara keseluruhannya, kebanyakan variabel bergantung pada persamaan-persamaan, dijelaskan oleh variabel penjelas pada tahap lebih 95%. Koefisyen yang dianggarkan mempunyai tanda ekonomik yang dijangkakan, dan kebanyakan daripadanya menunjukkan taraf signifikan terhadap ujian statistik. Nilai simulasi yang diperolehi menunjukkan nilai tersebut mengikut secara dekat nilai sebenar. Daripada analysis-analysis tersebut maka model ekonometrik yang dibentuk boleh mewakili pasaran pedaging lembu dan kerbau Semenanjung Malaysia dan analsis yang dibuat boleh digunakan untuk membuat analisis polisi dan lain-lain kajian.

CHAPTER I

INTRODUCTION

The Malaysian economy has been developing steadily since its independence in 1957. The gross domestic product (GDP) rose from the average of RM9,679 million in the period of 1966–70 to RM101,971 million in the period of 1991–95 the average annual growth rate in that period was 10.99% and 8.69% respectively. However the highest growth rate of 23.61% was achieved during the period of 1976–80.

Agriculture has been playing a very important role in contributing to the GDP, however in terms of percentage contribution, it shows a declining trend, and in absolute terms the contribution of agriculture to the GDP is rising. It was the main contributor in the early period of the Malaysian Plans; however, the contribution decreased from 33% in the period of 1966–70 to 15% for the period of 1991–95. The decreasing contribution to the GDP was mainly due to the increased contribution from the manufacturing and service sectors.

Nevertheless in terms of value added, the agricultural sector has shown an increasing trend. Table 1 shows the average GDP, agriculture production (AGR), its growth and percentage contribution of agriculture to GDP for the period of 1961–65 to 1991–95.

Table 1. The average GDP, AGR, its growth and percentage of AGR/GDP for the periods 1966–70 to 1991–95

Years	GDP (million) RM	Growth rates %	AGR (million) RM	Growth rates %	AGR/GDP %
1966–70	9,679	10.99	3,166	11.03	33
1971–75	14,478	10.42	4,226	7.26	29
1976–80	32,852	23.61	8,135	18.80	25
1981–85	53,336	4.97	11,368	3.10	21
1986–90	67,308	6.85	13,490	4.61	20
1991–95	101,971	8.69	15,768	1.85	15
1966–95	–	10.91	–	7.41	–

Source: Economic Reports (from various issues)

The livestock sub-sector has also contributed at an average of RM284 million to the GDP in the period of 1961–65. The amount increased to RM3,017 million in the period of 1991–95. The growth rate for livestock production for that period is at an average of 7% per year. In percentage terms, the contribution of the livestock sub-sector to total agriculture production has increased from 15% in the period of 1976–80 to 19% for the period of 1991–95 due to the increased contribution from the poultry industry.

For the local beef industry, the contribution toward the GDP is very small. However, its contribution has increased from RM72 million in the period of 1976–80 to RM140 million in the period of 1991–95, at an average growth rate of 7% per annum. Nevertheless, in percentage terms, the contribution of beef to the livestock sector has decreased from 6% in the period of 1976–80 to 5% in the period of 1991–95 due to the increase percentage contribution from the poultry sector which dominates 90% of the livestock contribution to the GDP. Table 2 shows the contribution of livestock and beef, its growth rates and percentages for the period of 1961–65 to 1991–95.

Table 2. The contribution of livestock (LVS) to agriculture for the periods 1961–65 to 1991–95

Years	LVS (millions) RM	Growth rates %	LVS/AGRI %	Beef (million)	Growth rates RM	Beef/LVS %
1961–65	284	19	NA	26	4	11
1966–70	408	NA	NA	37	NA	9
1971–75	643	13	NA	48	8	7
1976–80	1047	8	15	72	6	6
1981–85	1429	8	13	90	11	6
1986–90	2309	10	17	120	6	5
1991–95	3017	7	19	140	10	5
1961–95	1305	NA	NA	76	NA	6

Source: Livestock Statistics (from various issues)
Livestock Reports (from various issues)
Note: NA Not Available

Beef Industry

The local beef industry has been growing steadily since the periods of 1961–65 to 1991–95, even though there have been efforts made by the government to improve the local beef industry through various Malaysian Plans. The local beef industry is not well developed as in the poultry and swine industries which have grown tremendously over the last two decades, and it is unable to compete for the available resources and funds. The rapid development in the industrial sector, and the available cheaper source of beef, further worsened the growth in the beef industry as less priority was put on this by the government and the private sectors. The general low performance of the industry has resulted in dependency on beef supplied from other countries in order to meet the demand. Conversely, the consumption of beef has developed parallel to the growth in income which has increased demand for more healthy and wholesome food. Beef, which was once considered to be a luxury good and was traditionally consumed during festive seasons, now is consumed on a regular basis. The slow growth for the local beef industry as compared to the growth

in consumption, has encouraged faster growth in cheaper types of beef from other parts of the world.

Cattle and Buffalo Producers

There are four types of producers involved in the production of local beef cattle and buffalo. They are the smallholders, large farms, plantation integrators and commercial feedlots. These procuders are differentiated by their number of animals, farm sizes and management types.

The smallholders are the main beef cattle and buffalo producers in the country, owning 90% of the cattle and 99% of the buffalo population. The number of animals varies from a few to a few hundred, with the majority of farmers keeping between 1 to 5 heads of beef animals, each. These animals are kept in stallfed, tethering, free grazing and mixed conditions, depending upon the availability of fodder, labour, grazing areas and the value of the animals. Smallholders are the main target of the government development programs. The Pawah and Repawah scheme is an important breeding program for developing the smallholders' performances because this program has helped to maintain and enhance the beef industry.

Under the Pawah and Repawah Scheme, a farmer is given a pregnant heifer. A female calf born had to be returned to the government, in which it is bred to pregnant. Later, this heifer is given to another farmer waiting in the scheme. This programme has been terminated in the 7th Malaysia Plan due to the changes in the agricultural policy from subsidized to competitive agriculture. The changes are made as to complement with the government policy towards trade liberalization.

Large farms were established during the 1970's by the government or its subsidiaries for the purpose of improving the local beef industry. The number of animals kept in the farms varies with hectarage from 1000 to few thousand. The management systems used are either free or controlled grazing. Under the government programme, there are 13 large farms for cattle and 2 for buffalo, which are used for production, training, educational and research purposes. The farms under the Department of Veterinary Services (DVS) which was formerly owned by MAJUTERNAK are used for breeding, multiplication and training purposes. The animals produced are channeled to various government development programs to improve the local beef industry. The farm owned by UPM is for educational and research, and the one owned by MARDI is for research purposes. There are two privately run cattle farms, which are owned by a government subsidiary. These are the Pahangbif and Darabif.

Plantation integrators employ the new system of rearing beef cattle under oil palm and rubber trees. This system has been encouraged by the government due to the abundant availability of forages for livestock under the trees, limited land for grazing purposes, and in order to increase competitiveness of the plantation sectors. Today, ESPEK, which is owned by RISDA, is the only plantation sector that successfully integrates cattle in palm oil plantations on a large scale. Thus, the integration of livestock under plantation crops has a greater prospect in the future. Under the 7th Malaysia Plan, emphasis was given to developing the livestock industry under this system. Hence, all plantations have been encouraged to integrate animals for both meat and milk production.

In order to enhance livestock production, a cattle feedlotter programme was initiated in the year 1984/85 by the government for the purposes of increasing

utilization of agro-byproduct, which was abundantly available, and for overcoming the problem of land for grazing or production of fodders. There are now about 100–200 feedlots operated by smallholders, which carry between 20 to 100 heads of cattle per farm. The larger feedlots of 1000 and above are operated by private sector companies such as Fima Fidlot and Lazuli.

Cattle and Buffalo Population

The cattle and buffalo population has shown an increasing trend. The population has increased from 582,352 heads in 1961–65 period to 767,647 heads in the period of 1991–95. Table 3 shows the average population of buffalo, beef and dairy cattle for the period of 1961–65 to 1991–95.

Table 3. Average population of buffalo, beef and dairy cattle for the periods 1961–65 to 1991–95 (Figure in heads)

Years	Beef	%	Dairy	%	Buffalo	%	Total
1961–65	219602	37.7	85727	14.7	277023	47.6	582352
1966–70	231085	43.3	66272	12.4	236526	44.3	533883
1971–75	378689	58.0	66278	10.2	207391	31.8	652358
1976–80	366087	56.2	81746	12.6	203350	31.2	651183
1981–85	425020	60.9	98187	14.1	174747	25.0	697954
1986–90	482162	67.2	98536	13.7	136922	19.1	717620
1991–95	579577	74.9	73978	9.9	114093	15.2	767647

Source: Livestock Statistics (various issues).

Beef cattle is the largest population from the period 1971–75 onwards. In percentage terms, the beef cattle population has increased from 37.7% in the 1961–65 period to 74.9% in the period 1991–95. The increase is due to the positive growth rate for beef cattle, and the negative growth rate for buffalo and dairy cattle. The average growth rate for beef cattle in the period of 1961–65 to 1991–95 is 3.16% with the highest growth experienced in 1971–75.

The buffalo population has been decreasing in number from 277,023 heads in 1961–65 to 114,090 heads in 1991–95. In percentage terms, the population decreased from 47.6% in 1961–65 to 15.2% in 1991–95. The decrease in number of buffalo is due to double cropping activity in the paddy sub-sector where machinery replaced the used of buffalo, and the intensive use of land which decreased the available grazing areas for fodders. The average growth rate of buffalo is positive only in the period of 1961–65, which was at 0.42%, and negative from the period of 1966–70 to 1991–95. Table 4 shows the average growth rates for buffalo, beef and dairy cattle for the period of 1961–65 to 1991–95.

Table 4. Average growth rate of beef and dairy cattle, and buffalo

Years	Beef	Dairy	Buffalo	Average
1961–65	2.81	–5.71	0.42	0.32
1966–70	0.36	–3.29	–3.15	–1.75
1971–75	5.53	1.71	–1.71	2.11
1976–80	3.98	9.02	–3.41	2.12
1981–85	3.52	0.29	–1.30	1.76
1986–90	3.30	–1.22	–4.39	0.87
1991–95	2.63	–5.78	–4.43	0.53
1961–95	3.16	–0.71	–2.57	0.86

Source: Livestock Statistics (from various issues)

The dairy cattle population is fluctuating with a decreasing trend. The total population is 85,727 heads in 1961–65, decreasing to 66,272 heads in 1966–70. It increased to 98,536 heads in 1986–90, and in 1991–95 it decreased to 73,978 heads. In percentage terms, it decreased from 14.7% in 1961–65 to 9.9% in 1991–95. The decrease in the dairy population was contributed to the massive conversion of marginal and peri-urban areas for housing and industrial activities.

The importation of breeding animals has an important effect on the total number and performance of cattle and buffalo. Since the importation of breeding animals is costly, only small numbers are being imported. Thus, this number has no significant effect on the total population of cattle and buffalo.

Local Production of Fresh Beef

Fresh local beef is being produced from the slaughter of local beef and dairy buffalo, and beef and dairy cattle. The number of cattle being slaughtered has increased, doubling from an average 34645 heads in the period of 1961–65 to 86,877 heads in the period of 1991–95. The extraction rate for slaughtered cattle for the period of 1961–65 to the period of 1991–95 averaged 12.25%. A high extraction rate of 13.68% was experienced in 1966–70.

The number of buffalo slaughtered has declined by half from an average 31,434 heads in 1961–65 to 16,335 in the period of 1991–95. This is due to the decreasing number of the buffalo population. The extraction rate is higher than cattle with an average of 13.48% from the period of 1961–65 to the period of 1991–95. A high extraction rate of 16.50% was experienced in the period of 1971–75. Table 5 shows the average number of cattle and buffalo slaughtered and the extraction rates for the period of 1961–65 to 1991–95.

Table 5. Average number of local cattle and buffalo slaughtered and their extraction rates.

Years	Cattle	Extraction rates (%)	Buffalo	Extraction rates (%)
1961–65	34645	11.05	31434	11.35
1966–70	40619	13.68	31705	13.41
1971–75	50608	11.37	34206	16.50
1976–80	51803	11.57	28750	14.14
1981–85	68474	13.09	22755	12.99
1986–90	73613	12.68	15979	11.68
1991–95	86877	12.29	16335	14.32
1961–95	58091	12.25	25881	13.48

Source: Livestock Statistics (from various issues)

The total production of beef has increased from 11,567 metric tones in the period of 1961–65 to 13,726 metric tones in the period of 1991–95. Table 6 shows the beef production from local cattle and buffalo and its percentage contribution from the periods 1961–65 to 1991–95.

Table 6. Beef production from local cattle and buffalo and (figures in thousand metric tonnes) and its percentage contribution.

Years	Local fresh beef		Total local beef	% Contribution	
	Cattle	Buffalo		Cattle	Buffalo
1961–65	4740	6827	11567	41	59
1966–70	5598	6956	12554	45	55
1971–75	6822	7338	14160	48	52
1976–80	6505	6342	12847	51	49
1981–85	7817	5109	12926	60	40
1986–90	8957	3488	12445	72	28
1991–95	10481	3245	13726	76	24

Source: Livestock Statistics, (from various issues).

In earlier periods, a larger proportion of local production of fresh beef came from the slaughtering of buffalo and less from cattle. But from 1976–80 onwards, the largest proportion of the local production of beef come from cattle. In percentage terms, the contribution from buffalo has declined from 59% in the 1961–65 period to

24% in the period of 1991–95, while beef production from cattle has shown an increasing trend. By 1991–95, beef cattle contributed 76% to the total beef in Malaysia.

Fresh beef production increased slowly at an average growth rate of 1.14% per annum from the period 1961–65 to 1991–95. This increasing trend is mainly the result of increased production from cattle. The average growth rate of beef from cattle was 3.16% from the periods 1961–65 to 1991–95. Table 7 shows the average growth rates of fresh beef production from local cattle and buffalo and self-sufficiency levels.

Table 7. The growth rates of fresh beef production from local cattle and buffalo and self-sufficiency level.

Years	Cattle %	Buffalo %	Average %	Self-sufficiency
1961–65	0.04	2.50	1.52	84%
1966–70	2.72	2.27	2.31	84%
1971–75	5.55	–2.49	1.06	89%
1976–80	2.18	–0.03	0.60	57%
1981–85	2.67	–5.12	–0.74	40%
1986–90	2.50	–4.89	–0.03	31%
1991–95	6.01	2.87	4.80	21%
1961–95	3.16	–0.75	1.14	56%

Sources: Livestock Statistics, (from various issues)

The self-sufficiency level in beef production decreased from 84% for the period of 1961–65 to 21% for the period of 1991–95. The sharp decrease in the self-sufficiency level is due to the faster growth in consumption and the slow growth in local production.

Under the National Livestock Program, a target was set in the Third Malaysia Plan to achieve self-sufficiency in beef by 1990. But, this target was later revised to