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Sustainable Development of Malaysian Rice Industry in the Context of Asian Countries: An Assessment

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ABSTRACT

The sustainability of rice industry is associated with many factors including the environmental degradation, shortage of good arable land, population pressure and the loss in the competitive edge of this commodity. The ultimate effect of these variables is implicitly shown in production and consumption declines. This article attempts to estimate per capita rice production and consumption trends for Malaysia that will shed some light on the seriousness of food problem in this country. With some degrees of variation, the estimated forecasting models predict a declining trend both for rice production and consumption. These results suggest that Malaysia will have to continue import rice indefinitely into the future. This means current food policy appears to trade-off sustainability with rice imports as it is considered to be cost saving. Nevertheless, this is risky and should be viewed in relation to the existing efforts to modernise rice industry as well as the changing pattern of rice consumption of the current and future population.

ABSTRAK

Kelestarian industri beras bertalian dengan banyak faktor termasuk kerosakan alam sekitar, kekurangan tanah pertanian, tekanan penduduk dan kehilangan daya saing komoditi ini. Kesan pembolehubah tersebut ditrampilkan dalam kejatuhan pengeluaran dan penggunaan per kapita untuk memberi gambaran sejauhmanakah wujud keseriusan masalah makanan di negara ini. Dengan sedikit kelainan, model unjuran yang dianggar meramalkan kejatuhan arah aliran pengeluaran dna penggunaan beras. Hasil kajian mencadangkan bahawa Malaysia akan terus mengimport beras ke masa hadapan. Ini bererti dasar makanan semasa bertujuan menukar gantian kelestarian dengan import beras kerana langkah ini mengurangkan

kos. Walau bagaimanapun, perolehan faedah ekonomi sedemikian menanggung risiko dan sepatutnya ditinjau dengan mengambilkira usaha semasa dalam memodenkan industri beras serta perubahan pola penggunaan beras penduduk masa kini dan akan datang.

INTRODUCTION

Rice like other food crops is a renewable private-property resource which, in principle, is not subject to the common property problems of depletion, exhaustion, market failure or enforcement difficulty. However, sustainment of the rice industry is associated with the rate of population growth and the limited supply of arable land. This causal relationship is well documented in the Limits to Growth study which foresaw that the demand for food will outstrip the supply thereby causing famine and societal collapse (Meadows et al. 1972). Yet if population growth can be checked and the application of new technologies can help boost food supplies, the problem is expected to diminish (Kahn et al. 1976). These policy variables will be used as a premise in the analysis of sustainable development of the Malaysian rice industry.

Development of rice industry in the past had been driven by the need to attain self-sufficiency, especially during the outbreak of the world food crisis of 1973. Later, with stability in rice production in the region, the self-sufficiency target was revised to that of near-sufficiency which in 1986 settled at 55-60 per cent (Goh 1986). In reality, the self-sufficiency level achieved was higher than the target (73 per cent in 1989) as food security had always been given special attention by the government.

Today, the focus of agricultural planning has changed from food security to that of sustainable development, which is very relevant to the Malaysian rice industry. Past footprints of economic development in Malaysia have left profound effects on the progress of agricultural sector, more specifically the food subsector. The national agricultural policy apparently gives priority to crops with commercial prospects such as horticulture, fruits, vegetables and primary commodities like oil palm, rubber and cocoa. Furthermore, only essential areas with infrastructural facilities are encouraged to produce because Malaysia is a high cost producer. Marginal farmers are encouraged to look for job opportunities outside farming. This

is in consonant with the policy of near-sufficiency and eradication of poverty. Meanwhile, Malaysia's Vision 2020 has emphasised industrialization and urbanization which in turn have gradually usurped agricultural and forest land for industrial sites and housing estates. In addition, not only land but agricultural labour has also been attracted to work in the construction and service sectors. This resulted in an exodus of labour from agriculture with rural-urban migration becoming a reality.

Given the above scenario, the problem of sustainable development of rice industry has emerged amidst structural change of the Malaysian economy. This notion is further supported by the fact that population is ever-growing in Malaysia. Thus, the purpose of this paper is to estimate rice production and consumption trends that could shed light on the seriousness of inter-generation food problems in Malaysia. It is also the objective of this paper to find explanations to the existing food situation and the importance of mutual food trade within the region, especially for the rice-importing countries.

INEQUALITY IN RICE PRODUCTION AMONG ASIAN COUNTRIES

Besides technology, land is perhaps one of the essential inputs that governed production and sustainable development of Asian rice economy. Distribution of land resources devoted to rice farming differs between and within countries depending on supply conditions such as the existing land availability, climatic and soil suitability and the extent of urbanization. Since rice is a staple food, population is an important variable on the demand side, in particular the influence of per capita income and its impact on consumption habits. Rice production in the Asian countries is primarily geared for domestic consumption because of food needs and security. As such, rice trades between Asian countries normally exist when there are surpluses and the need to fill-in the shortages. The diversity of Asian countries in physical (lowland area, water regime and inherent soil fertility), economic (stages of development, policy and extent of government intervention and assistance) and social as well as demographic factors (education, human resource development and population) contributes to the variations in rice

production. These variations in turn create rice surpluses and shortages among Asian countries. Table 1 shows the summary of rice area and productivity of Asian countries for 1979-81 and 1991.

TABLE 1. Rice Area and Productivity of Asian Countries, 1979-81 and 1991

Country	Area ('000 ha)		Yield (kg/ha)	
	1979-81	1991	1979-81	1991
Southeast Asia				
Cambodia	1262	1800	1062	1333
Indonesia	9063	10187	3257	4351
Laos	722	640	1415	2188
Malaysia	722	635	2844	2441
Philippines	3513	3423	2249	2825
Thailand	8986	10000	1887	2004
Vietnam	5579	6295	2117	3086
Total / Average (A)	29847	32980	2119	2604
Other Asian Countries				
Afghanistan	190	173	2182	1936
Bangladesh	10310	10940	1952	2612
Bhutan	28	26	2017	1654
China	34322	33100	4244	5663
India	40091	42200	1858	2629
Iran IR	430	585	3357	3590
Iraq	56	83	2891	1506
Japan	2384	2049	5581	5859
Korea D P RP	635	680	7453	7500
Korea Rep	1230	1209	5513	6185
Myanmar	4684	4830	2689	2733
Nepal	1275	1432	1850	2514
Pakistan	1981	2060	2466	2380
Sri Lanka	819	860	2555	2787
Total/Average (B)	98435	100227	3329	3539
Per cent of (A) to (B)	30.3	32.9	63.7	73.6

Source: Food and Agriculture Organisation (FAO) of the United Nations, *Quarterly Bulletin of Statistics*, Vol. 5, 1992.

At a glance one should notice the vast diversity of areas devoted to rice farming across the Asian countries. Malaysia which operated some 635 thousand hectares of rice land in 1991 constituted only 0.48 per cent of the total rice area of the region. Similarly, Malaysia's total rice production of 1550 thousand metric tons for the year accounted for only 0.32 per cent of the total regional production (FAO 1992). Thus, in the context of Asian countries, the scenario of the food sustainability problem, especially for Malaysia, is far from disastrous, assuming that no trade barriers exist in the region. Perhaps, the analysis of the problem at hand would be more meaningful if confined to a smaller region such as the South-east Asian countries. Before doing so it would be interesting to find out which of the two factors, area or yield that contributes to the variation in the Asian rice production.

Based on data in Table 1, Lorenz curves were constructed and the Gini ratios estimated for the area and yield. The results are shown in Figure 1. As noted, in 1991 the distribution of rice land among Asian countries was extremely unequal with the estimated Gini ratio of 0.688. This figure was not far different from that of 1979-81 estimates. However, variations in the attainment of yield among countries in the region was much smaller as the estimated Gini ratio amounted to 0.261 only. Since rice production is the product of rice area and yield, the inter-country variations in rice production was mainly attributed to the unequal distribution of rice land. Technology application as represented by the productivity figures was rather evenly distributed. With the exception of Korea, Japan, China and Indonesia, the variations of yield attained by most countries of Asia were not too pronounced.

The estimates of Gini ratio derived from rice area and yield data of 1979-81 and 1991 explain the fact that there has been little change in the distributional pattern of these economic parameters since the last decade. India still leads in the total rice hectarage which in 1991 accounted for 30.1 per cent, and together with China 55.9 per cent of total rice land in the region. In contrast, Korea had registered the highest productivity which was about 2.3 times higher than the Asian average.

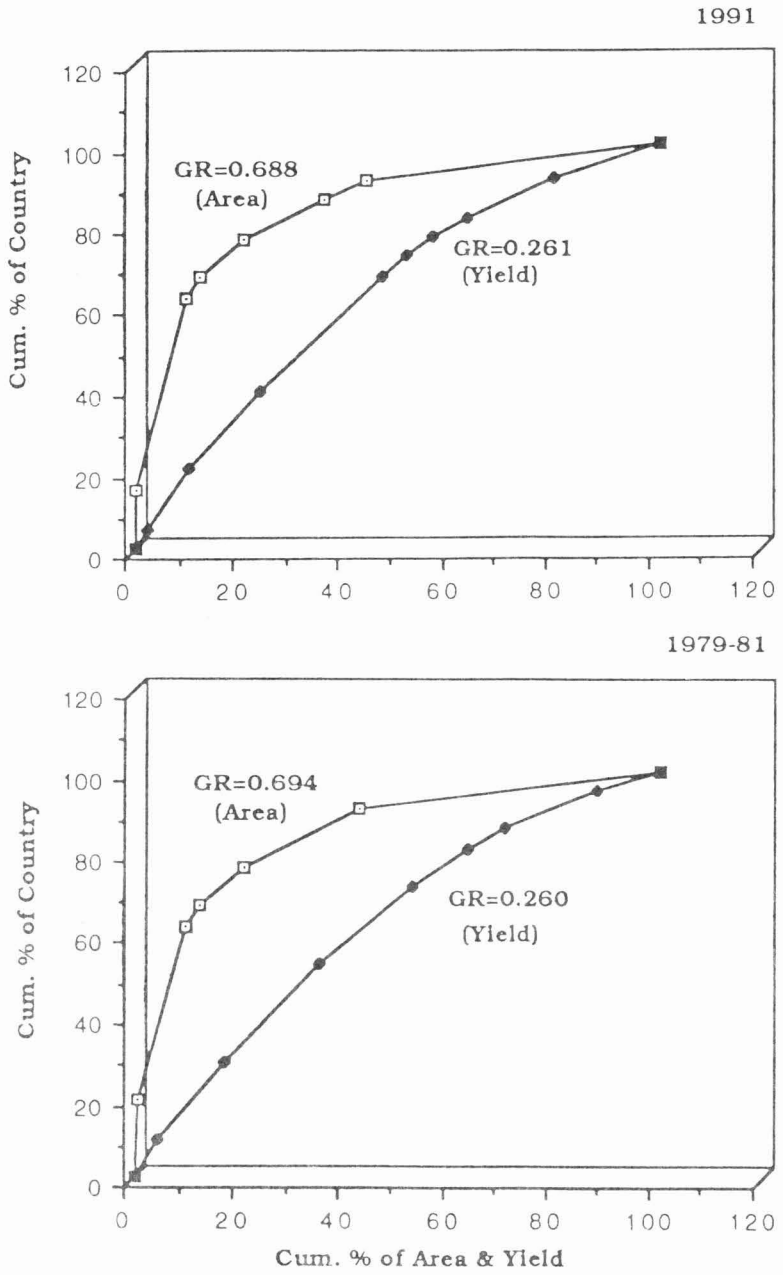

FIGURE 1. Distribution of area and yield for Asian countries

BASIC RICE STATISTICS OF SOUTHEAST ASIAN COUNTRIES

Even within the region of Southeast Asia some disparities in the distribution of rice land and productivity are observed (see Table 2). Malaysia only constituted about 2 per cent of the total rice area and production of the Southeast Asian countries. Of the total 31355 thousand hectares of regional rice land, only 38.2 per cent was equipped with irrigation in 1989. Malaysia was rather fortunate to have 66 per cent irrigated rice land which was the highest in the region. However, productivity level in Malaysia was still low. In 1989 the average yield was 2591 kg per hectare, slightly below the regional average of 2630 kg per hectare. These statistics do not give us a sufficient indication of food security problem in this country until we consider them with the population figures.

The man-land ratio column in Table 2 shows the pressure supported or exerted by the number of persons on a hectare of rice land. As exhibited, the analysis appears to suggest that Malaysia has the largest number of persons, therefore, the heaviest pressure on rice land with an estimate of 27.5 persons per hectare. This is followed by Philippines, Indonesia and Vietnam with 18.0, 17.9 and 11.7 persons per hectare respectively. Surprisingly, these are the countries in Southeast Asia which continue to import rice hitherto to meet their domestic consumption. On the other hand, Thailand is the net exporter of rice, in particular to Malaysia. Thailand registered a man-land ratio of only 5.8 persons per hectare. Cambodia, Loas and Thailand are countries with relatively low level of man-land ratios whose consumption requirements are easily fulfilled by their respective domestic productions.

Even within a smaller region of Southeast Asian countries, the hypothesis of a food sustainable development problem is not quite accurate since Malaysia is able to meet her rice shortages through rice import. For similar reasons, countries like Singapore and Brunei which do not produce rice can still survive as long as there exist political stability and free trade in such a commodity. These two countries may have had patches of rice land at one time in history but now these rice fields are extinct. Thus, the analysis of rice sustainable development should be directly focused to the individual countries within the Southeast Asian region. This analysis should also contain the time variable so that the direction

TABLE 2. Rice Area, Productivity, Population and Man-Land Ratio of Southeast Asian Countries, 1989

Country	Rice Area (1000 ha)[1] Total	Irrigated	% Irrigated	Productivity[2] (kg/ha)	Total[3] Population (million)	Man-Land Ratio (persons/ha)
Combodia	1615 (5.2)	161 (1.4)	10.0	1389	8.1	5.0
Indonesia	10000 (31.9)	6300 (52.7)	63.0	4302	179.1	17.9
Laos	576 (1.8)	63 (0.01)	10.9	2337	4.1	7.1
Malaysia	633 (2.0)	418 (3.5)	66.0	2591	17.4	27.5
Philippines	3338 (10.6)	1435 (12.0)	43.0	2808	60.0	18.0
Thailand	9565 (30.5)	1339 (11.2)	14.0	1793	55.5	5.8
Vietnam	5628 (18.0)	2251 (18.8)	40.0	3189	65.8	11.7
Total/ Average	31355 (100.0)	11967 (100.0)	38.2	2630	387.5	13.6

Notes: 1. Figures of rice land are recalculated from Kazutake Kyuma, Lowland Rice Cultivation as a Sustainable System of Food Production, in *Proceedings of the International Seminar On Agricultural Change and Development in Southeast Asia*, Nodai Center For International Programmes, Tokyo University of Agriculture, May, 1992.

2. Data on productivity are obtained from Food and Agriculture Organization (FAO), Vol. 5, 1992.

3. Based on 1989 population figure compiled by the Asian Development Bank, *Key Indicators of Developing Asian and Pacific Countries*, Vol. XXII, July 1991.

Source: Kazutaka Kyuma 1992; FAO 1992; ADB 1991.

of trends in rice sustainable development can be identified in order to ascertain whether there is a decline or not.

PER CAPITA RICE PRODUCTION AND CONSUMPTION

Per capita rice production and consumption for Southeast Asian countries are presented in Table 3. As evident from the data, Malaysia, Indonesia, Philippines and Vietnam were net rice importers while Thailand was the net exporter. Cambodia and Laos were self-sufficient. Again on per capita basis, there are variations in the level of rice production and consumption.

In comparison, Malaysia has the lowest estimates of per capita production of rice in the region, that is, 97.6 kg per year in 1989. Similarly her per capita consumption for the year was also the lowest amounting to only 134.3 kg per year. The vast gap between consumption and production explains the fact that Malaysia is dependent greatly on rice import. Malaysia and also Philippines appear to have a declining rate of annual per capita production and consumption. For Malaysia, the estimates were 4.6 per cent (production) and 2.5 per cent (consumption) per annum. A relatively high percentage of decrease in production is an indication of the existence of a rice sustainable development problem in this country.

The underlying reasons for a decrease in production have already been briefly mentioned. To recapitulate, they are:

1. it is the policy of the government to do away with marginal rice farmers in order to reduce poverty and to concentrate on major rice bowl areas so that farmers' income can be improved;
2. job opportunities and remunerations outside farming are generally more attractive, especially in the manufacturing and service sectors;
3. prospects in other agricultural sub-sectors such as rubber small-holdings, oil palm in land development schemes, cocoa, fruits and other horticultural crop are becoming highly commercialised and viable in terms of income generation;
4. traditional farming system and practices are gradually being replaced by modern techniques of farming with enlargement of rice farms as well as the integrated farming system;

TABLE 3. Estimate of Per Capita Production (Q) and Consumption (C) of Rice (kg/year) in Southeast Asian Countries, 1979-90

	Cambodia	Indonesia		Laos	Malaysia		Philippines		Thailand		Vietnam	
Year	Q=C	Q	C	Q=C	Q	C	Q	C	Q	C	Q	C
1979	133.2	183.5	187.7	238.8	155.9	173.7	166.6	166.6	354.4	291.5	204.8	204.8
1980	229.7	202.2	206.9	329.1	148.6	160.8	159.8	159.8	371.7	311.8	216.8	217.4
1981	179.6	218.9	220.3	354.3	143.0	165.4	163.9	163.9	372.3	308.8	226.0	226.0
1982	211.8	219.5	220.2	327.9	129.8	157.6	152.2	152.2	346.3	268.7	256.2	256.2
1983	249.3	225.8	228.2	321.9	116.5	140.5	150.6	150.6	393.1	323.2	257.0	257.0
1984	279.0	238.6	239.4	374.2	102.9	131.6	153.7	157.3	392.5	301.5	264.4	264.4
1985	288.5	238.2	239.4	385.4	117.9	145.2	166.4	176.2	392.1	313.5	265.2	266.1
1986	267.0	238.6	238.7	389.5	108.3	120.2	160.0	160.0	358.4	272.4	261.9	264.5
1987	241.5	235.5	235.6	315.1	102.7	114.6	148.9	148.9	343.7	260.9	241.8	243.8
1988	292.2	239.8	239.8	254.6	98.5	115.3	152.8	154.8	390.4	297.0	266.8	268.2
1989	260.5	245.6	246.1	307.3	97.6	134.3	157.7	160.9	363.9	253.1	288.2	309.8
1990	304.5	na	na	355.0	na	na	153.3	na	337.4	na	286.1	na
Annual Rate of Growth (%) 1978-89	6.9	3.0	2.7	2.6	-4.6	-2.5	-0.5	-0.3	0.3	-1.4	3.5	4.2

Note : na = not available

Source: Computed from *Statistical Year Book for Asia and Pacific*, the United Nations, 1990 and *Food and Agriculture Organization* (FAO), Vol. 5, 1992.

5. expansion of towns and their population results in an increase demand for land, therefore, pushing up the price of land surrounding the township. A large part of these lands are lowland rice fields which are gradually converted or sold for housing lots, particularly for non-irrigated marginal rice lands or lands that are left idle.

It is suffice to say at this juncture that the decline in per capita rice consumption is a result of the reduction in domestic production. People are expected to adjust their consumption pattern over time as their disposable income increases and social status changes. In such an instance, the demand for food items like rice will be adjusted downwards so that its consumption will be somewhat reduced. In the following discussion, we will develop a simple model for these policy variables to identify their future directions that can indicate the extent of the problem of sustainable development for the Malaysian rice industry.

FORECASTING MODEL FOR MALAYSIAN RICE IMPORT, PRODUCTION AND CONSUMPTION

Since sustainable problem involves present and future generations, forecasting estimates of the production and consumption would be essential information that can be used as policy direction. The forecasting method uses the net import identity equation as follows;

$$(M - X)_t = C_t - Q_t \qquad (1)$$

where

$(M–X)_t$ represents the quantity of net import at time t
C_t represents the quantity of consumption at time t
and Q_t represents the quantity of production at time t

In the above identity we assume that there is no change in stock as its levels at the beginning and at the end of the year are simply not available. Since M represents quantity of import and X is the quantity of export, when $X > M$, then $(X–M)_t = Q_t - C_t$, represents the net export identity equation. In addition, rice production is always equal to the product ofharvested area (A_t) and yield (Y_t). Dividing both sides of theproduction identity equation by population $(POP)_t$ we obtain,

$$\overline{Q}_t = \overline{A}_t \cdot Y_t \tag{2}$$

where $\overline{Q}_t = Q_t/(POP)_t$ is the per capita rice production at time t and $\overline{A}_t = A_t/(POP)_t$ is per capita harvested area. If $\overline{A}_t$ and Y_t are a function of time (T) either linearly or exponentially then we have the following equations (Intriligator, 1978),

$$\overline{A}_t = A_o + a\,T \qquad \text{or} \qquad \overline{A}_t = A\,e^{bT} \tag{3}$$

$$\text{and} \qquad Y_t = Y_o + y\,T \qquad \text{or} \qquad Y_t = Y\,e^{cT} \tag{4}$$

where A_o, Y_o, A and Y are constant terms, a, y, b and c are parameters which can have positive or negative values.

By substituting equations (3) and (4) into equation (2) the respective trends for per capita rice production can be subsequently estimated or forecasted for the desired number of years ahead, depending on how reliable the estimated data could be used for projection. For the linear harvested area and yield equations the derived per capita production is in the form of a quadratic function,

$$\overline{Q}_t = q_o + q_1 T + q_2 T^2 \tag{5}$$

where q_o is a constant, $q_1 = aY_o + yA_o$ and $q_2 = ay$ are parameters which can have positive or negative values. The exponential area and yield equations after substitution into the per capita rice production identity equation gives the following result:

$$\overline{Q}_t = (AY)\,e^{(b+c)\,T} \tag{6}$$

For the purpose of estimation, equation (6) can be tansformed into natural logarithm (ln) by multiplying both sides of the equation by ln which yields equation (7) below,

$$\ln \overline{Q}_t = \ln (AY) + (b + c)\,T \tag{7}$$

The time parameter (b + c) can have a positive or negative value that will determine the direction of trends as time changes. The time variable in equations (3) and (4) represents the combined effect of economic, social and other factors on the harvested area and yield. For instance, the effect of industrial policy on rice area and the impact of new technology on rice yield. This combined effect is extended into the per capita production equation in (5).

Assuming that the per capita consumption equation is of the quadratic form as in equation (5) and the exponential form as in equation (6), one can easily derive and estimate the net import or export quantities. These estimated per capita consumption and net import/export quantities can be utilized for policy purposes on rice sustainable development for the desired planning horizon. Time variable used in the per capita consumption equation represents the relevant combined economic and other variables that influence rice consumption such as changes in taste and income of the consumers. The quadratic per capita consumption and net import equations are

$$\overline{C}_t = c_o + c_1 T + c_2 T^2 \tag{8}$$

$$(\overline{M} - \overline{X})_t = m_o + m_1 T + m_2 T^2 \tag{9}$$

where c_o and m_o are constants, c_1, c_2, m_1 and m_2 are time coefficients which can have positive or negative values. The per capita net import quantity, $(\overline{M} - \overline{X})_t$ is the difference between the estimated per capita consumption and per capita production quantities as in equation (1). Thus, $m_o = c_o\, q_o$, $m_1 = c_1 - q_1$ and $m_2 = c_2 - q_2$.

Likewise, the exponential per capita consumption and net import equation can be estimated and they are presented below,

$$\overline{C}_t = C\, e^{dT} \tag{10}$$

$$\ln \overline{C}_t = \ln C + dT \tag{11}$$

$$(\overline{M} - \overline{X})_t = (C - AY)\, e^{(d-b-c)T} \tag{12}$$

where C is a constant, d is the coefficient of time variable and other variables are as defined earlier. The objective of analysis is to find the most appropriate estimates from the two functional forms which will be used for forecasting policy variables in the Malaysian rice industry. Some of the above equations will be estimated by OLS techniques for the analyses.

RESULTS AND DISCUSSION

Estimated regression equations of per capita rice production and consumption for selected Southeast Asian countries are shown in

Tables 4 and 5. The suggested forecasting models were found inappropriate for Thailand and Philippines, although they were satisfactory for the rest of the countries.

The forecasted quantities of per capita production and consumption differ greatly between and within countries depending on the form of model adopted. For Malaysia and most of the Southeast Asian countries, quadratic equation yields the best fit judging from the $\overline{R}^2$ criterion. Nevertheless, statistical tests for the exponential equation were generally superior perhaps because of a higher degree of freedom. Both forms of equation for Malaysia were acceptable with $\overline{R}^2$ of 0.73 and higher and t-values significally different from zero at 99% level of confidence.

The exponential regression equation predicted that per capita rice production will continue to decline to about 57 kg per year in the year 2000, indicating that the Malaysian rice industry will face difficulties in sustainability in the future (Figure 2). On the other hand, per capita consumption for the year will be as low as 97 kg per year, which means Malaysia will have to import some 40 kg per year to meet her food requirements. But if the quadratic regression equation was used, the decline in per capita quantities of these variables was not so pronounced. In fact, per capita production and consumption trends tend to bounce back after reaching the minimum quantities. It should be alerted that the inaccuracy of the estimated quantities rises with an increase in the magnitude of time and standard deviation. In the case of Malaysia, with either forms of forecasting equation, one is certain to discover that per capita production will always run short of per capita consumption quantity. Therefore, Malaysia will have to import rice indefinitely for the future.

Both forecasting models concur with the currently declining trend of per capita rice consumption which would extend into the near future. This phenomenon is expected as Malaysian society in general are economically far better off than before. The country is in the process of modernization physically and mentally. As such, people are becoming increasingly aware of the importance of health and nutritional balance. A larger portion of society's income is spent on luxuries and a smaller portion spent on food. It is also true that in many parts of the country, convenience food or fast food restaurants such as Kentucky Fried Chicken (KFC), McDonald's, Grandy's and so forth are widespread. In 1989, there were 69 KFC

TABLE 4. Regression Equations for Per Capita Rice Production of Selected Southeast Asian Countries, 1979-89

Country	Intercept	Independent Variable T	Independent Variable T^2	$\overline{R}^2$	F-value	DW
Cambodia						
$\overline{Q}_t$	115.468485 (3.819)***	37.501678 (3.238)**	-2.199534 (-2.340)**	0.681	11.689	2.609
In $\overline{Q}_t$	170.332601 (47.813)***	0.052855 (3.336)***		0.503	11.129	1.801
Indonesia						
$\overline{Q}_t$	174.901818 (31.929)***	14.564266 (6.942)***	-0.788462 (-4.630)***	0.931	68.280	1.650
In $\overline{Q}_t$	195.682804 (183.339)***	0.023448 (5.526)***		0.747	30.530	0.700
Laos						
$\overline{Q}_t$	218.243030 (5.518)***	48.414545 (3.196)**	-3.948485 (-3.211)**	0.457	5.201	1.927
Malaysia						
$\overline{Q}_t$	170.158182 (25.830)***	-12.553287 (-4.975)***	0.550350 (2.687)**	0.919	35.980	2.040
In $\overline{Q}_t$	158.543817 (130.403)***	-0.048453 (-8.459)***		0.876	71.560	1.500
Vietnam						
$\overline{Q}_t$	193.712121 (12.921)***	14.939860 (2.602)*	-0.726807 (-1.559)NS	0.699	12.627	1.415
In $\overline{Q}_t$	213.324184 (135.765)***	0.025603 (4.396)***		0.647	19.326	0.975

Notes: Figures in parentheses denote t values of the regression coefficients
*** significant at probability level of 0.005
** significant at probability level of 0.025
* significant at probability level of 0.100
NS not significant

Source: Computed by author.

There are two other socio-economic factors that can influence future trends of rice production and consumption in this country. A recent development in the rice industry is the consolidation of fragmented areas of padi land into larger holdings by private individuals and government affiliated agencies. The large scale farming system has proven benefitial to the operator especially in the adoption of modern technology and farm practices such as mechanisation, direct seeding, appropriate fertilizer and chemical applications. Consolidation and restructuring of rice farm in Mulong-Lating had resulted in a tremendous improvement in productivity averaging up to 5.8 tonnes per hectare (Nik Hashim 1990). Moreover, in 1990 an integrated agricultural development project (IADP) was initiated by the Federal Land Consolidation and Rehabilitation Authority (FELCRA) in Seberang Perak. In this IADP programme, rice farming is operated on an estate basis covering an area of 9981 hectares. As planned the project will encompass a total area of 80,000 hectares of agricultural and livestock activities when completed.

Another economic variable that will influence rice consumption pattern and trend in Malaysia is the effect of an influx of immigrant workers into the Malaysian service sector. The majority of these immigrant workers are engaged in construction work, agricultural estates and household services. Reliable statistics are not available but their number according to the Department of Immigration was 60425 persons based on the temporary work permits issued by the Malaysian government in 1992 (Zulkifly 1993). Most of these registered immigrants come from Indonesia (93.7%), Bangladesh (1.9%) and Thailand (1.9%). Their presence will increase the demand for food and thus rice consumption in this country.

SUMMARY AND CONCLUSION

This paper attempts to portray whether or not the issue of sustainable development in the Malaysian rice industry exists in the global context of Asian countries. Since the country only produces a negligible amount of the total Asian rice production which can easily be accomodated by any major producer like China or India, the focus of the analysis was diverted to Southeast Asian countries. Even within this subregion Malaysia only produces about

2 per cent of the total regional rice output compared with 5 percent of population. This explains why Malaysia is able to rely on import, given economic stability and liberal trade policies in the region.

The question of food security and sustainability begins to surface if the country is analysed in a closed economy. In this case, the analysis reveals that Malaysia has the largest number of people supported by an equivalent unit of rice land. This situation is further worsened by the national agricultural policy which favours commercialised agriculture to traditional food enterprise. While the national economic policy emphasizes industrial development, the rice industry where a higher incidence of poverty exists, should also be modernized. Thus, only granary rice areas are encouraged to operate. With the acceleration in population growth and urbanization, the areas devoted to rice crop and rice production in the country have declined. An analysis of per capita productiton and consumption using 1979-89 data shows a declining trend for these variables, at least for the couple of years ahead. With a pessimistic forecast of per capita rice production will reach a level of 57 kg per year while a consumption 97 kg per year is expected in the year 2000. As depicted by this projection the sustainable development of the Malaysian rice industry is at stake.

But a more detailed analysis of the declining trends of per capita production and consumption reveal counter arguments. The decline in per capita rice production may also be temporary as current developments in rice farming will find way to improve productivity and production. Enlargement of rice land, adoption of new farm techniques and improvement in farm management system will also boost rice production. Meanwhile, the existence of the fast food industry in the country acts as substitutes for rice consumption. The improvenment in society's income and health condition enables them to adjust to future needs in food requirement. However, two main findings emerge from this study, (1) Malaysia will continue to import rice to supplement domestic production and (2) food consumption pattern will be distorted by the influx of foreign immigrants into the Malaysian labour market. It would be wise for the Malaysian government to diversify her trade partners in rice commodity so that risk of crop failures and instabilities can be minimised. Meanwhile, capital-oriented production techniques should be employed in her vision 2020 such that reliance on foreign labour can be reduced eventually.

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