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## Patterns of Food Production and Consumption in the ASEAN Region

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### *Introduction*

The Association of Southeast Asian Nations (ASEAN) consists of the peninsular and the archipelago parts of Southeast Asia. Established on August 8, 1967, ASEAN originally comprised of Indonesia, Malaysia, the Philippines, Singapore and Thailand; Brunei Darussalam became the sixth member in 1984. ASEAN occupies a total land area of 340 million hectares, and in 1984 had a population of 280 million (table 1), which represents a great diversity of races, religions, languages and cultures. As a group, ASEAN aims for the promotion of regional collaboration in the economic, social, cultural and technical fields. In the first few years of its existence, progress was limited to laying down the framework for the member countries to work out their consensus through periodic consultation. However, since the communist takeovers in Vietnam and Cambodia (Kampuchea) in 1975, ASEAN has been transformed into a vital political grouping that has gained international recognition. The ASEAN region is located strategically, providing important ports for transoceanic routes between the Indian subcontinent and the China mainland, as well as providing key transit points for intercontinental air routes between Europe and Australia. These locational advantages have contributed much to the development of international trade of ASEAN, which has an impact especially in the global commodity markets. The ASEAN region is the world's largest producer and exporter of natural rubber, palm oil, tropical hardwood, pepper, tin, copra and coconut oil [5].

*Table 1.* Total land area, population and density of the ASEAN countries in 1984 [5, 17]

	Total land area (1,000 hectares)	Total population (1,000)	Density (person/km <sup>2</sup> )
Brunei Darussalam	527	216	38
Indonesia	181,135	159,831	83
Malaysia	32,975	15,262	46
Philippines	30,000	53,351	178
Singapore	62	2,529	4,078
Thailand	51,400	50,396	98
ASEAN (total)	296,099	281,585	

Nonetheless, a wide disparity exists among the ASEAN countries in respect of economic development. Brunei Darussalam has the highest income per capita in the region, due largely to its petroleum production, while Indonesia has the lowest. Income inequality prevails within each country, giving rise to poverty-stricken segments in the population. Impairment of nutritional status, especially among young children and women, is known to be one of the notable consequences of poverty. The aim of this paper is to discuss the trends and issues related to food production and consumption with nutritional implications drawn for the ASEAN region.

### *Food Production*

The figures on food production are depicted from the production Yearbooks published by the Food and Agriculture Organization [16, 17]. Only commodities that are considered edible are included in the computation. These include all crops and livestock products. Deductions for seed (in the case of eggs, for hatching) and for livestock and poultry feed are made for both domestically produced and imported commodities. The resulting aggregate represents disposable production for any use except as seed and feed.

### *Production of Major Food Staples*

The production of total cereals, roots and tubers, together with the main types in each category for the ASEAN countries, is shown in table II. In 1984, ASEAN produced 10% of Asia's total cereals. The percentage is increased to approximately 15% when rice, the predominant staple food of the region, is considered. Indonesia and Thailand produced 56 and 29% respectively of ASEAN's total output, which amounted to 66.7 million metric tonnes in 1984. Indonesia has transformed itself from the world's largest rice importer into a self-sufficient producer that exported its crop in 1985 for the first time in history. The focal point of Indonesia's success has been the Rice Intensification Program, which has reaped enormous gains in yields through the provision of incentives, chemical inputs, extension services, irrigation and transport facilities, as well as by the control of prices at a level acceptable to both the farmers and consumers [42]. As for Thailand, its surplus production of rice has rendered the country to be a leading exporter, and appropriately labeled the rice granary of the world. The rest of the ASEAN countries are net importers of rice.

Table 2. Production of cereals, roots and tubers in ASEAN in 1984 (1,000 metric tonnes) [17]

	Total cereals	Rice (milled)	Maize	Roots and tubers	Cassava	Sweet potatoes
Brunei Darussalam	6	6	—	5	4	1
Indonesia	41,505	37,500	4,000	16,521	14,000	2,050
Malaysia	1,777	1,755	22	512	360	50
Philippines	11,680	8,280	3,400	3,244	1,318	1,000
Singapore	—	—	—	4	1	1
Thailand	23,728	19,200	4,150	20,349	19,985	355
ASEAN	78,696	66,741	11,572	40,635	35,668	3,457
Percent of ASEAN to Asia production	10.2	15.4	11.6	16.7	71.3	3.4

Coarse grains also make an important contribution to the total cereal production in the region. Maize is the major coarse grain cultivated, and Thailand, Indonesia and the Philippines contributed about one third each to the total of over 11.6 million metric tonnes in 1984 (table 2). In Thailand, where maize is the second major food crop, more than two thirds is exported, whereas in Indonesia and the Philippines, the bulk of the maize produced is consumed domestically. Malaysia's production of 22,000 metric tonnes in 1984 is a fraction of the 4 million tonnes produced by Thailand and Indonesia in the same year.

ASEAN's share in the market for roots and tubers in Asia amounted to 17% in 1984. Out of over 40 million metric tonnes produced, Thailand contributed half and Indonesia 40% (table 2). Cassava is the main commodity in this category, followed by sweet potatoes to a lesser extent. ASEAN is a major producer of cassava in Asia (71% in 1984) with Thailand being responsible for more than half of the total output. Thailand exports much of her cassava as chips, pellets and flour. In 1984, cassava products constituted almost one fifth of Thailand's total exports of food and live animals [4].

The livestock industry in developing countries received considerable attention during the 1970s for the following reasons [12]: (a) livestock, in particular buffalo and cattle, have the highest domestic value added; (b) the initial promise of the Green Revolution suggested possibilities for increased supplies of grain by-products, and possible diversification of

marginal lands into feed grains and fodder crops for animal feeding; (c) livestock production was encouraged to supplement rural incomes; (d) livestock products represent quality protein. However, despite extensive support, the growth of the livestock sector in ASEAN has been very slow, with the exception of poultry and swine production. In Thailand, the poultry and swine industries experienced a remarkable growth due to an expansion of livestock-related industries, whereas in Malaysia, the Philippines and Indonesia, their poultry and swine production depended on increasing imports of coarse grains and oil-seed meals. The idea of self-sufficiency in livestock products becomes illusory when the bulk of feed-stuff requirements has to be imported [20], as in the case of Malaysia, where self-sufficiency in pork and poultry required approximately US \$150 million of feed imports in 1985.

The growth of cattle and buffalo production has remained virtually stagnant in the region. Traditionally, these animals are raised primarily for draft power and manure with meat production as a by-product at the end of their working life. The pressure on land, which characterizes most of the ASEAN countries, works against large ruminants. Farmers' access to pastures is limited to few overgrazed communal pastures and edges of secondary forests. In Thailand, the expansion of crop cultivation into the upland areas has reduced available grazing land. Large ruminants also tend not to be favored by Philippine herdsman because of higher risks involved in case of death or theft; also they avoid having to use common land grazing which can be fraught with government intervention [25].

In 1984, Thailand and Indonesia were the major producers of beef, buffalo and chicken meat in the region, while the Philippines led in pork production (table 3). Indonesia also was a leading producer of eggs. Malaysia's outputs of pork, poultry and eggs are at the self-sufficient level, but their production costs are about 20% higher than that in Thailand and Indonesia, owing to the price of feed having doubled between 1963 and 1983 [29]. ASEAN's production of beef and buffalo meat, and poultry amounted to 15 and 12.1% respectively of Asia's total in 1984, but its pork and egg production contributed to lower levels at 5 and 7.7% respectively.

Dairying in ASEAN remains an insignificant industry because its growth is stifled by numerous problems, such as high establishment costs, limited size of market, difficulties in establishing and maintaining productive pastures, and the need to provide efficient and hygienic transport, processing and distribution of a highly perishable product. Girardot-Berg [20] pointed out that although most Asian countries cannot engage in dairy

Table 3. Production of livestock products and total fish catch in ASEAN in 1984 [17]

	Beef and buffalo 1,000 MT	Pork 1,000 MT	Chicken 10 <sup>6</sup> units	Hen eggs MT	Milk <sup>a</sup> 1,000 MT	Total fish catch 1,000 MT
Brunei Darussalam	—	—	1	2,320	—	2
Indonesia	170	93	133	220,000	153	2,259
Malaysia	14	74	55	133,800	32	679
Philippines	118	483	55	220,000	10	2,080
Singapore	—	52	14	26,138	1	25
Thailand	223	255	75	124,000	38	2,249
ASEAN	525	957	333	726,258	234	7,294
Percent of ASEAN to Asia production	15.0	5.0	12.1	7.7	0.6	—

MT = Metric tonnes.

<sup>a</sup> Whole, fresh cow's milk.

production as competitively as the New Zealand or Australian industries, they still choose to boost domestic production to satisfy their country's growing needs in order to save foreign exchange. The total amount of milk produced by the ASEAN countries amounted to less than 1 % of Asia's production (table 3).

The littoral area of the ASEAN region is large compared to its land area. Fishing activities range from ocean fishing to aquaculture of fresh water fish and prawns. Fish, crustaceans, mollusks and other seafoods are popular among the people in the region. Indonesia, Thailand and the Philippines produced 90 % of the total fish catch of ASEAN in 1984 (table 3). In Malaysia, there was a gradual decline in marine fish landings between 1980 and 1985 from 733,700 metric tonnes to 577,900, due to an overexploitation of the in-shore fishing zones coupled with the reluctance of the fishermen to engage in deep-sea fishing [41]. In Singapore, the local catch of marine fish supplies about 25 % of the nation's requirement. In 1984, 25,000 metric tonnes were landed, which was an improvement from the level of about 16,000 tonnes that had remained stagnant during the 1970s.

The alternative means of obtaining fish protein is from aquaculture, although aquaculture operations are usually assessed in terms of their economic benefits and less for their nutritional effects. In the Philippines,

Table 4. Aquaculture production in ASEAN in 1983 [35]

	Indonesia	Malaysia	Philippines	Thailand
Total production (1,000 metric tonnes):				
1973	143	35	125	127
1983	199	64	441	102
Production by commodity groups, 1983 (1,000 metric tonnes):				
Crustaceans	22	—	—	15
Finfish	178	14	298	48
Mollusks	—	49	29	40
Seaweeds	—	—	132	—

culturing of milkfish (*Chanos chanos*, or known locally as *bangus*), which is favored by the poor, is very widespread. Culture of the African bream (*tilapia*) (*Tilapia mossambica*) is also popular, together with higher valued varieties such as sea bass. Besides these finfish, the aquaculture of seaweed and mollusks has also contributed to the increase in total aquaculture production by over 250% between 1973 and 1983 (table 4). Thailand looks to aquaculture to provide more fish and shrimp for the population. The Fifth National Economic and Social Development Plan (1982–1986) envisaged that by the end of 1986, over 500 ponds would have been established. Aquaculture production of fish, crustaceans (prawns) and mollusks (cockles) is on the increase in Malaysia, which has a vast potential from its extensive mangrove forests (for cockle farming), ex-mining pools and other freshwater bodies. An ASEAN aquaculture coordination and development project has been implemented together with other fisheries projects aimed at improving the stock and availability of fish in the region [9].

In terms of average annual growth rates of the major food items, Thailand and Indonesia recorded positive growth for such staples as rice, maize, cassava, pork, chicken meat and fish catch between 1980 and 1984 (table 5). Rice production expanded the fastest in Indonesia among the ASEAN countries at a 6.1% increase annually, exceeding the average for Asia during the same period (4.6%) [17]. The other ASEAN countries showed slower rates of growth for rice, with Thailand managing 2.8% per year and the Philippines at 1.5%. Malaysia registered a negative trend (minus 7.3% yearly), not only during 1980–1984, but since 1974 [41]. As a high-cost producer and in the light of the current world surplus in rice, Malaysia has been increasingly relying on imports to meet demand.

Table 5. Average annual growth rates of major food staples in ASEAN between 1980 and 1984 [5, 17]

	Rice (milled), %	Maize %	Cassava %	Pork %	Chicken meat, %	Total fish catch, %
Brunei Darussalam	0.7	—	—	—	—	—
Indonesia	6.1	5.2	1.5	1.4	12.5	5.2
Malaysia	-7.3	24.9	-17.4 <sup>a</sup>	2.3	2.0	-2.2
Philippines	1.5	1.9	-12.5	4.4	1.3	5.9
Singapore	—	—	—	-0.9	0.2	12.6
Thailand	2.8	9.3	4.9	2.6	5.9	5.9

<sup>a</sup> 1980–1983.

With regards to the growth of maize production in the ASEAN region, Thailand and Indonesia, as the major producing countries, accounted for an annual growth rate of 9.3 and 5.2% respectively. These rates were higher than the average for Asia in 1980–1984 (3.8%) [17]. The Philippines managed a much smaller increase of 1.9% annually, and Malaysia's rate of output has to be considered in the light of its relatively very small production base value.

The growth rate for cassava in the region is less encouraging in that production rate declined by 17.4% per year in Malaysia and 12.5% in the Philippines, as shown in table 5. The increase rate was marginal for Indonesia and only Thailand recorded a notable yearly growth of 4.9%.

Among the livestock products, chicken production growth in Indonesia and Thailand was promising at 12.5 and 5.9% respectively between 1980 and 1984. During the same period, the highest growth rate for pork in the region was 4.4% in the Philippines (table 5). In respect of fish catch, Indonesia, the Philippines and Thailand experienced approximately the same growth of between 5 and 6% annually. Singapore's small catch increased rapidly at 12.6% per year, while in the case of Malaysia, her catch has been diminishing as mentioned previously.

#### *Trends in Crop Production Increases*

Paulino [33] reported that increases in output per hectare at an average rate of 2.9% a year accounted for 85% of production growth in Asia during 1961–1980. Expansion of area harvested averaged only 0.5% annually. In 1980–1984, a similar trend prevailed with respect to rice and



Table 6. Contribution of area and yield to production increases of rice and maize in ASEAN, 1980–1984 [17]

	Average annual growth rate, %		Contribution to production increases, %	
	area harvested	yield per hectare	area harvested	yield per hectare
<i>Rice</i>				
Brunei Darussalam	-8.3	4.7	a	100.0
Indonesia	2.0	4.5	30.8	69.2
Malaysia	-2.0	-2.0	b	b
Philippines	-2.1	3.7	a	100.0
Singapore	—	—	—	—
Thailand	1.6	1.0	61.5	38.5
ASEAN	-1.8	2.4	a	100.0
Asia	0.7	3.9	15.2	84.8
<i>Maize</i>				
Brunei Darussalam	—	—	—	—
Indonesia	1.7	11.0	13.4	86.6
Malaysia	22.3	8.8	71.7	28.3
Philippines	-2.5	1.1	a	100.0
Singapore	—	—	—	—
Thailand	6.2	2.9	68.1	31.9
ASEAN	6.9	6.0	53.5	46.5
Asia	0.03	4.4	0.7	99.3

<sup>a</sup> Contribution to production increase is assigned totally to yield because of negative growth in area harvested.

<sup>b</sup> Neither area nor yield contributed to production increase.

maize production growth in Asia (table 6). Yield per hectare contributed to 84.8 and 99.3% of production increase for rice and maize respectively. In the case of ASEAN, the region in general relied upon crop yields for increasing the production of rice. However, the major producers, namely Thailand and Indonesia, also depended substantially on area expansion for production increases; between 1980 and 1984, area expansion provided for 61.5 and 30.8% respectively of the annual growth of their rice production. Thailand, as a major world exporter of rice, responded cautiously to the new rice varieties introduced by Asia's Green Revolution embarked in the mid-1960s. In 1979, only 9% of the rice area in Thailand had been planted with the high yielding varieties compared to 78% in the Philippines and 60% in Indonesia in 1980 [22]. Most of the rice holdings in

Thailand are less than 5 hectares and belonging to farmers with limited funds to purchase those chemical inputs that constituted the basis of the Green Revolution. The result is that production growth in Thailand has been accomplished mainly through expansion into new lands, sometimes causing destruction of the watersheds [32]. In the case of the Philippines, the pioneer of the Green Revolution, increase in rice yield has been the chief source of growth as compared to the 1950s when 80% of the increase in agricultural output was accounted for by area expansion [43].

Although the ASEAN countries have improved their rice yields over the years, they still lag behind the yields shown by other countries in Asia (table 7). Indonesia's yield of 3,866 kg/ha in 1984 was the highest for ASEAN but it was barely 60% that of Asia's best yield recorded by the Republic of Korea. Thailand's yield of 1979 kg/ha was the lowest in the ASEAN region, and it remains a matter of concern to the Thai food policy makers [32].

The production increase of maize between 1980 and 1984 was due to expansion of area harvested in Malaysia and Thailand and to improvement in the yield per hectare in Indonesia and the Philippines (table 6). Maize yields are low according to Asian standards with none of the ASEAN countries at level with the average yield for Asia (2,771 kg/ha) (table 7). Thailand achieved the highest yield in ASEAN at 2,500 kg/ha, followed by Indonesia and Malaysia at approximately 1,600 kg/ha.

Cassava, sugar cane, oil palm and coconut are the other major food crops cultivated in the ASEAN region. Between 1980 and 1984, there was a reduction in the area planted with cassava in the member countries, with the exception of Thailand, which expanded at 5.9% annually (table 8). Yield improvement for cassava has been limited to 3 and 1.5% per annum for Indonesia and Thailand respectively. In contrast, cassava yield declined at 12.9% yearly in the Philippines, whilst in Malaysia, the yield per hectare has remained stagnant. Nonetheless, cassava yield of Malaysia, at 12,000 kg/ha, was the second highest in the region, next to Thailand's yield of almost 15,000 kg/ha (table 7).

Sugar cane is an important economic food crop, especially in Thailand, the Philippines and Indonesia. Area expansion was the major contributor to production increase in these countries during 1980-1984 (table 8). Yield improvement was just as significant in improving production in Indonesia. Her sugar cane plantations were developed by the Dutch, who introduced the policy of obligating farmers to rent their land to sugar mills operating large estates [30]. This system was reversed by the govern-

Table 7. Yields (kg/ha) of some major food crops in 1984 [17]

	Rice	Maize	Cassava	Sugar cane
Indonesia	3,866	1,600	9,859	85,345
Malaysia	2,659	1,571	12,000	45,455
Philippines	2,486	999	8,000	42,336
Thailand	1,979	2,500	14,970	43,140
ASEAN (average)	2,748	1,668	11,207	54,069
China	5,271	3,846	16,139	62,001
Japan	6,414	3,000	—	64,167
Korea Republic	6,475	4,441	—	—
Asia (average)	3,268	2,771	11,988	52,871

Table 8. Contribution of area harvested and yield towards production increase of cassava, sugarcane, oil palm and coconut in ASEAN, 1980–1984 [5]

	Average annual growth rate, %		Contribution to production increases, %	
	area harvested	yield per hectare	area harvested	yield per hectare
<i>Cassava</i>				
Indonesia	– 1.0	3.0	c	100.0
Malaysia	– 17.2 <sup>a</sup>	0	c	0
Philippines	– 1.2	– 12.9	d	d
Thailand	5.9	1.5	79.7	20.3
<i>Sugar cane</i>				
Indonesia	4.9	5.0	49.5	50.5
Philippines	3.5	1.0	77.8	22.2
Thailand	4.9	2.6	66.2	33.8
<i>Oil palm</i>				
Indonesia	10.9	0.4	96.5	3.5
Malaysia	7.0 <sup>a</sup>	13.0	35.0	65.0
Thailand	47.5 <sup>b</sup>	0.2	99.6	0.4
<i>Coconuts</i>				
Indonesia	3.0	– 3.6	100.0	c
Philippines	0.7	– 10.3	100.0	c
Thailand	6.5	7.6	46.1	53.9

<sup>a</sup> 1980–1983.<sup>b</sup> 1981–1984.<sup>c</sup> Contribution to production increase is assigned totally to yield because of negative growth in area harvested.<sup>d</sup> Neither area nor yield contributed to production increase.

ment in 1975, and by 1984, smallholder cane farming had improved the yield to be approximately twice that of Thailand, Malaysia and the Philippines (table 7).

The palm oil industry is burgeoning in Malaysia, providing employment for more than 300,000 people and contributing about 10% to the country's export earnings (US\$ 2,000 million in 1984) [31]. Malaysia is the world's largest producer and exporter of palm oil, accounting for 60 and 67.4% of world production and export respectively in 1984. Its production increase between 1980 and 1983 was due partly to an expansion of planted hectareage (7% increase per annum), and twice as much to yield improvement (table 8). Thailand and Indonesia relied on area expansion solely towards their production increase of oil palm. The total area under oil palm in these two countries is relatively small, amounting to under one third of that in Malaysia.

Coconut is an important food crop in the ASEAN region, with Indonesia as the leading producer, followed by the Philippines. In 1984, Indonesia produced 35.8% of the coconuts in Asia-Pacific, and the Philippines production accounted for 24.5% [35]. Together with Malaysia and Thailand, these ASEAN countries contributed to nearly 71% of the coconuts in Asia-Pacific region. As shown in table 8, coconut production increase during 1980-1984 was due to area expansion, with the exception of Thailand, which owed its increase almost equally to area expansion and yield improvement. In fact, the yield of coconuts in Thailand in 1984 far exceeded those in Indonesia and the Philippines [17].

### *Food Availability*

The food balance sheet is a useful management tool, developed for disclosing trends in national food supply and estimating the availability of food items, which can be translated into calories and other nutrients on a per capita per day basis. Data on a country's agriculture production, food imports and exports, changes in stock, amounts used as a feed, seeds and losses due to wastage and spoilage are calculated to represent national supply. The per capita supply, representing food availability, is obtained by dividing the national supply by the total population during the same period. The main weakness of the food balance sheet is that it does not indicate the differences that may exist in the diet consumed due to socio-economic, cultural, ecological and seasonal variations. Nonetheless, com-

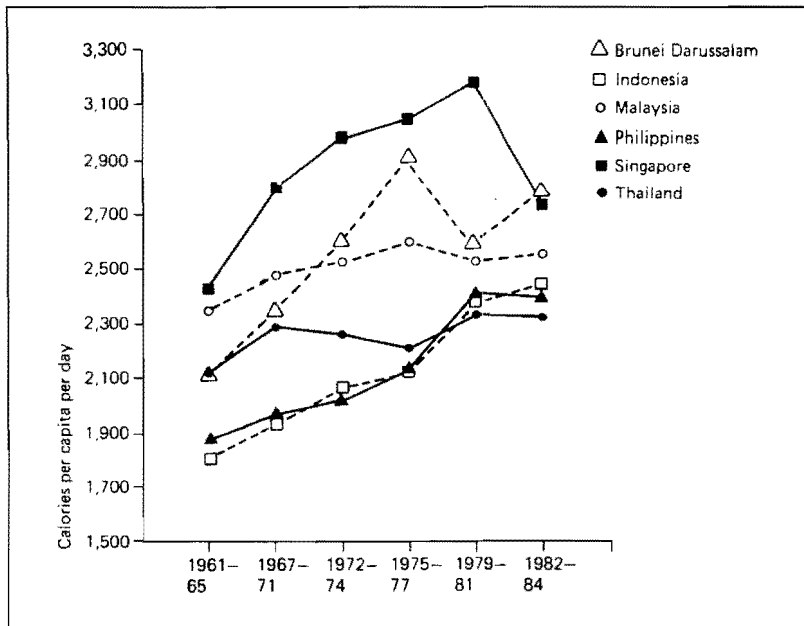


Fig. 1. Changes in availability of calories between 1961 and 1984. Plotted from data in ref. [43-15].

paring the food availability among the countries in ASEAN can provide an insight into the patterns of food supply and availability of nutrients in the region.

#### *Available Calories Supply*

During the past two decades (1961-1984), countries in ASEAN have experienced a general upward trend in the availability of total calories as illustrated in figure 1. On the average, the region recorded a 20.9% increase in calorie availability during the two decades (table 9). Brunei Darussalam, Indonesia and the Philippines produced higher increases (28-35%) than the region's average, whilst Singapore, Malaysia and Thailand showed 8.4-12.1% increases. Between 1982 and 1984, calories available on a per caput per day basis ranged from 2,322 cal in Thailand to 2,783 cal in Brunei Darussalam. Although all the countries in ASEAN traditionally derive the bulk of their calories from cereals especially rice, there has been a downward trend in the contribution of cereals to the total available calories supply.

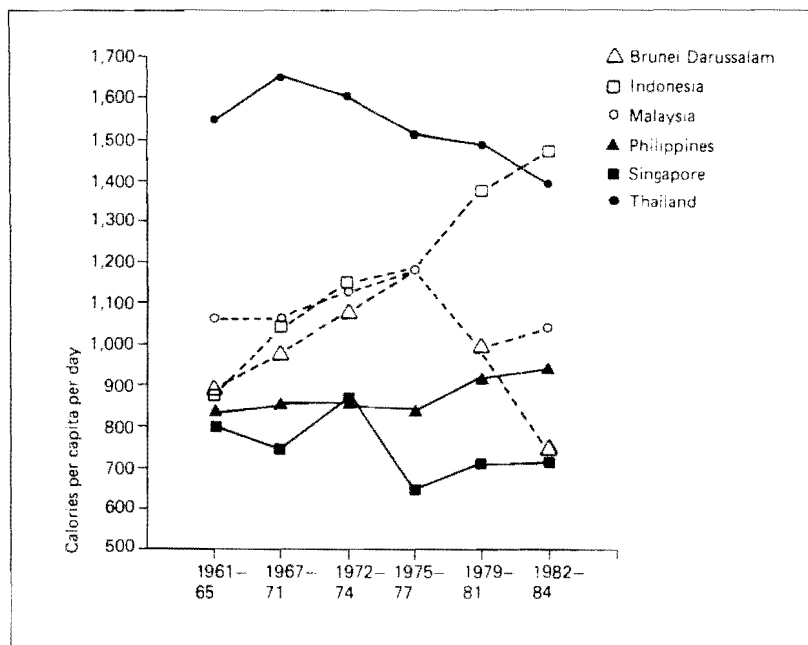


Fig. 2. Changes in available calories from rice between 1961 and 1984. Plotted from data in ref. [13-15].

Table 9. Changes in available calories supply in ASEAN [13, 15]

	Total calories available in 1982-1984 per caput per day	Change in total available calories 1961-1984 %	Animal calories ÷ total calories 1982-1984 %	Change in availability of calories from animal sources 1961-1984 %	Changes in contribution of food to calories supply 1961-1984			
					cereals %	roots and tubers %	sugar and honey %	oils and fats %
Brunei								
Darussalam	2,783	32.0	21.2	91.0	-2.9	-41.3	-21.2	8.6
Indonesia	2,433	35.0	2.4	0	12.1	-46.1	0	17.0
Malaysia	2,549	8.4	13.9	35.0	-9.9	68.8	15.4	18.2
Philippines	2,399	28.0	10.1	-5.6	-4.7	20.0	25.3	13.5
Singapore	2,725	12.1	26.2	56.0	-7.7	163.3	-18.9	26.9
Thailand	2,322	9.6	6.3	1.6	-10.3	42.1	163.8	47.1
ASEAN (average)	2,535	20.9	13.4	30.0	-3.9	34.5	27.4	21.9

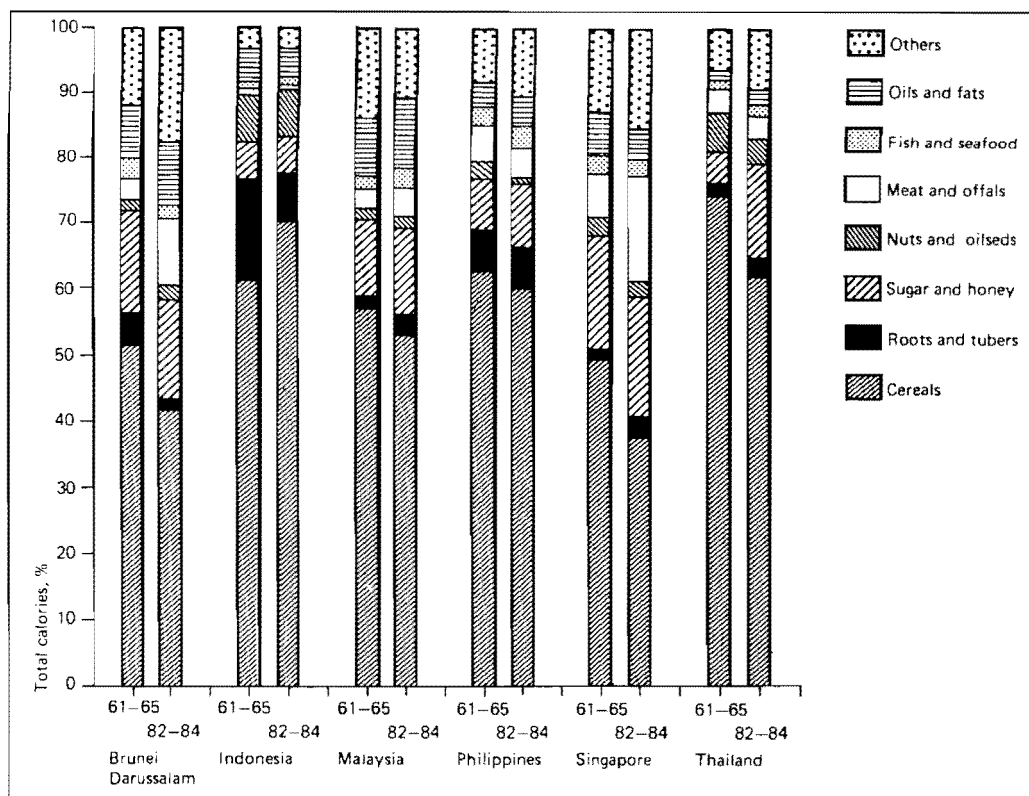


Fig. 3. Contribution by major food groups to total available calories – changes between 1961 and 1984. Plotted from data in ref. [13, 15]. Others include pulses, fruit, vegetable, eggs, milk, spices and stimulants.

Table 9 reveals that between 1961 and 1984, cereal contribution decreased in values ranging from 2.9% in Brunei Darussalam to 10.3% in Thailand. Indonesia was the only ASEAN country to have an increase of 12.1% in calories from cereals. Figure 2 compares the changes in the availability of calories from rice between 1961 and 1984, and it reiterates the position of Indonesia as the only member country to register an increase (11.7%) of calories from rice. The other countries showed decreases ranging from 4.6% for Malaysia to 15.4% for Brunei Darussalam.

Aside from cereals, roots and tubers, sugar, and oils and fats formed the other major sources of calories among the ASEAN countries (fig. 3).

Table 10. Pattern of available protein supply in ASEAN [13, 15]

	Total protein available in 1982-1984 g/capita/day	Change in total protein supply 1961-1984, %	Animal protein as % of total protein supply 1982-1984	Change in % of animal protein to total protein 1961-1984
Brunei Darussalam	74.6	51.3	52.4	9.8
Indonesia	51.7	39.8	12.8	0.6
Malaysia	58.0	20.3	43.1	14.8
Philippines	54.6	27.3	37.0	1.8
Singapore	76.6	26.0	58.1	17.5
Thailand	45.8	5.8	26.9	20.0
ASEAN (average)	60.2	28.5	38.4	10.8

Calorie contribution by the roots and tubers group, which consists of cassava mainly, increased the most in Thailand by 42.1% during the two decades (table 9). The other major producer of this crop in the region is Indonesia, but calories from its cassava supply decreased by 46.1% during the same period. Although table 9 indicates substantial increases in calories from roots and tubers in Malaysia and Singapore, the values must be considered in respect of their relatively small supply of available cassava.

Calories from sugar has been on the increase in ASEAN, with the exception of Brunei Darussalam and Singapore. Thailand registered the highest change of 163.3% between 1961 and 1984 (table 9), reflecting the country's diversification from rice to sugar production beginning in the 1970s. Table 9 also shows that contribution of calories from oils and fats increased considerably in all the ASEAN countries during the two decades.

#### *Available Protein Supply*

Total protein available in grams per capita per day in 1982-1984 differed widely among the ASEAN countries, ranging from 45.8 g in Thailand to 76.6 g in Singapore. Protein availability has been on a general upward trend since 1961, averaging 28.5% increase for the region (table 10). Thailand experienced the least change during the period (5.8%), as compared to 51.3% increase for Brunei Darussalam. Figure 4 shows the higher availability of total protein in Singapore and Brunei Darussalam than in the remaining ASEAN countries. These two countries also enjoyed a higher



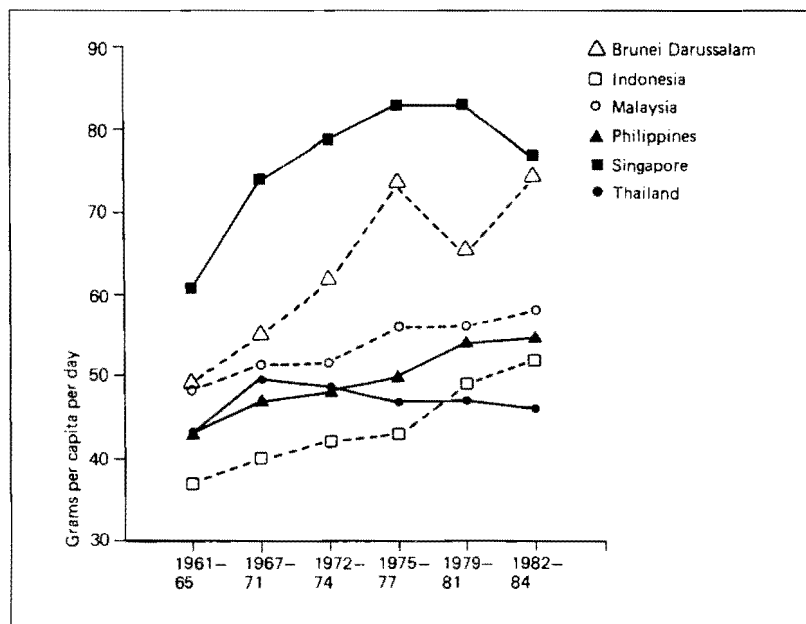


Fig. 4. Changes in availability of total protein between 1961 and 1984. Plotted from data in ref. [13-15].

percentage of protein from animal products (52.4-58.1 %) than the rest of ASEAN. Although Thailand's level of animal protein was much less at 26.9%, it is significant that its percent of animal protein to total protein increased much more than the change in total protein supply over the period of 1961-1984. In contrast, Indonesia and the Philippines had virtually stagnated in their available animal protein to total protein percentage (table 10).

The pattern of per capita protein supply in many ASEAN countries during the two decades has undergone a shift towards an increased availability of animal protein especially from fish, meat, milk and eggs (table 11). Meat here includes beef, veal, buffalo meat, pork and poultry. It is mainly the latter two types of meat that are responsible for the growth of meat availability. The increased availability of eggs among the animal products is in contrast to the trend in countries like the USA [24], Canada [11] and Australia [34] where per capita egg consumption has gone down in recent years, most likely influenced by cholesterol implications. All the

Table 11. Changes in available protein supply in ASEAN [13, 15]

	Changes (%) in contribution of food groups to protein supply 1961-1984						
	cereals	pulses	nuts and oilseeds	meat and offats	eggs	fish and seafood	milk
Brunei Darussalam	-8.7	6.3	57.7	84.6	62.5	-44.9	37.3
Indonesia	9.7	-16.7	-3.5	-29.0	100.0	-1.3	166.7
Malaysia	-14.9	21.6	-84.8	36.5	24.2	54.6	56.1
Philippines	-1.2	-21.4	-52.6	-12.8	15.8	3.8	17.9
Singapore	-9.1	-41.9	-39.7	34.7	29.0	-15.1	55.9
Thailand	-8.5	-46.4	-39.2	14.7	-38.1	45.2	88.9
ASEAN	-5.5	-16.4	-27.0	21.7	32.2	7.1	70.5

Table 12. Changes in available fat supply in ASEAN [13, 15]

	Total fat available in 1982-84 g per capita per day	Change in total fat supply 1961-1984 %	Animal fat as % of total fat supply in 1982-1984	Change in ratio of animal fat to total fat 1961-1984, %	Main sources	
					animal fats	vegetable oils
Brunei Darussalam	74.9	37.2	51.8	13.9	butter	coconut oil groundnut oil
Indonesia	36.0	24.1	8.9	0.3	butter	coconut oil groundnut oil
Malaysia	56.9	38.1	36.4	-3.4	butter	palm oil coconut oil
Philippines	33.2	15.1	48.5	0.2	lard	coconut oil
Singapore	69.4	20.5	71.6	21.6	ghee butter	soybean oil maize oil
Thailand	28.2	-0.7	34.0	0.8	lard tallow	coconut oil soybean oil
ASEAN (average)	49.8	22.4	41.9	5.6		

ASEAN countries showed substantial expansion in their per capita milk supply over the past two decades. This is largely due to imports since domestic production of fluid milk has been slow to increase. It is reported that six countries in Southeast Asia, namely the Philippines, Indonesia, Thailand, Malaysia, Singapore and Burma import about a quarter of the

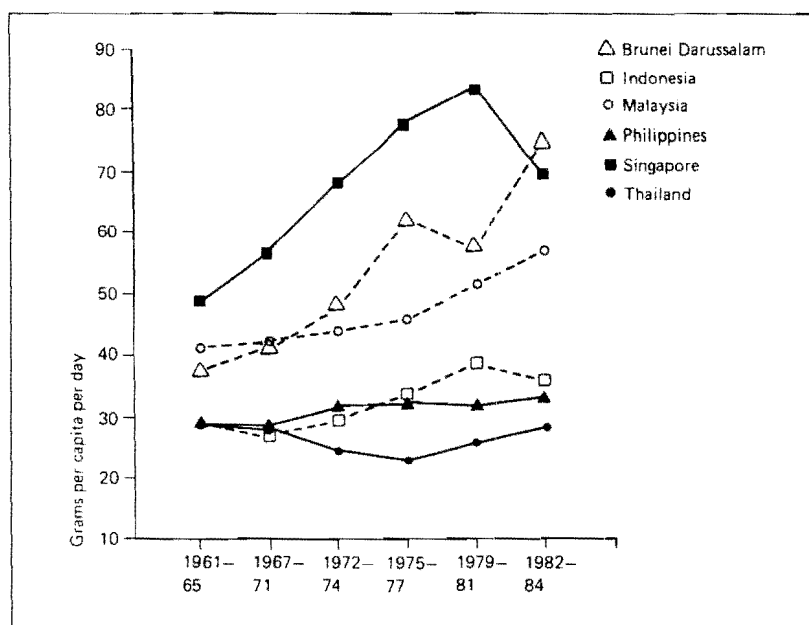


Fig. 5. Changes in availability of total fat between 1961 and 1984. Plotted from data in references [13-15].

world's trade in milk powder [20]. The same period between 1961 and 1984 saw a concomitant decline in the supply of protein from plant sources, notably cereals, pulses and nuts in almost all the ASEAN countries. This shift from less vegetable protein to more animal protein may be related to improvement in the gross national product (GNP) of the ASEAN countries. Increase in income also seems to displace fish as food for higher valued meat. Brunei Darussalam and Singapore, with the higher GNP per capita in the region, showed a substantial decline in the availability of fish between 1961 and 1984.

#### *Available Fat Supply*

Availability of total fat in gram per capita per day of the various ASEAN countries between 1961 and 1984 are represented in figure 5. Increase in fat availability during the period was substantial for Malaysia and Brunei Darussalam, and less for Indonesia, Singapore and the Philippines (table 12). Thailand showed a marginal decrease in fat availability

between 1961 and 1984. In terms of the percentage of animal fat in the total fat supply, the differences among the member countries were remarkable, ranging from about one third in Malaysia and Thailand, nearly half in the Philippines and Brunei Darussalam, to two thirds in Singapore. These levels of animal fat in the diet have changed more significantly for Singapore and Brunei Darussalam than for the other members, whose levels have virtually stagnated or even declined somewhat as in Malaysia and the Philippines. Table 12 also shows that the ASEAN countries, with the exception of Malaysia and Singapore, relied on butter, lard and coconut oil as their main fat sources. These contain a higher level of saturated fat than palm oil and soybean oil which are the principal fat sources in Malaysia and Singapore respectively.

#### *Changes in Composition of Energy Intake*

The contribution of calories from protein, fat and carbohydrates towards the total energy intake for each ASEAN country between 1961 and 1984 is represented in figure 6. In general, the percentage of calories derived from carbohydrates has remained approximately between 70 and 80% over the 20 years. In comparison, carbohydrate energy intake of Japan dropped from 72.1 to 60.3% between 1965 and 1983, with a corresponding increase in energy from fat sources from 14.8 to 24.6% [1]. Among the ASEAN countries, Singapore, Brunei Darussalam and Malaysia shared a similar trend with Japan in increasing their ratio of fat calories during the same period. The other members showed a slight decline in the proportion of energy from fat sources, which is more in keeping with the change that occurred in the USA between 1977 and 1985, when both pre-school children and women were found to consume less food energy from fat and carbohydrates [24]. Changes in the level of energy from protein in the ASEAN diet ranged between 8 and 10% of the total calories. Only Singapore and Brunei Darussalam had their protein calories exceeding 10% in 1982–1984.

Differentiation between animal and plant sources of calories continue to receive interest in view of the implications of dietary fats with the development of ischemic heart disease. In this region, the average level of calories from animal products was 13.4% in 1982–1984 (table 9), one and half times higher than that for Asia [17]. Singapore, Brunei Darussalam and Malaysia had more available calories derived from animal sources than the average for ASEAN, with Singapore having the highest availability at 26.2%. These three members experienced a considerable increase in

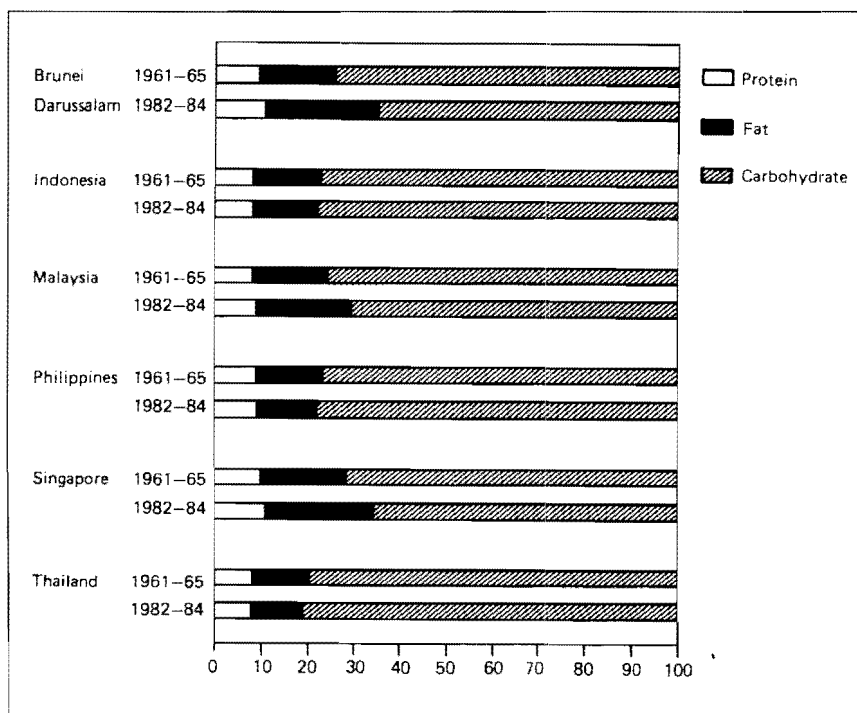


Fig. 6. Energy ratio of protein, fat and carbohydrate. Plotted from data in ref. [13, 15].

availability of animal calories (between 35.0 and 91.0%). Indonesia had the lowest ratio of animal calories to total calories and the situation has not changed for the last two decades. The Philippines showed a decrease in its percentage of calories from animal products, while Thailand's relatively low level of 6.3% of animal calories has hardly changed during the period of 1962-1984.

#### *Availability of Other Nutrients*

Besides calories and the macronutrients of protein and fat, four other nutrients have been selected on the basis of their importance in the ASEAN region. Vitamin A and iron deficiency are common in many parts of ASEAN followed by inadequate intake of thiamine and riboflavin [27] Figures 7 and 8 show the availability of these nutrients in 1980-1982.

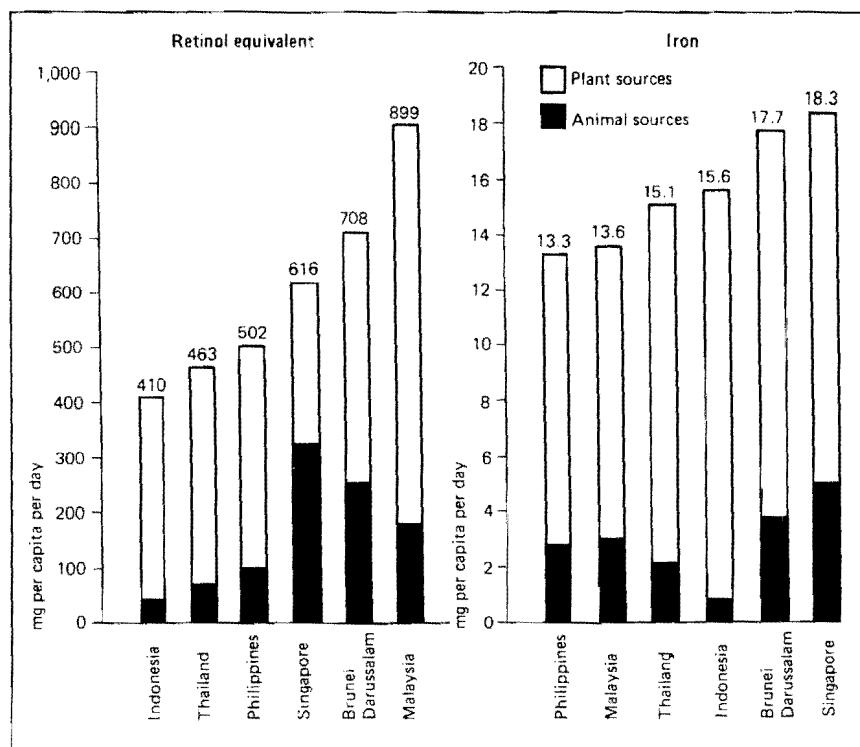


Fig. 7. Supply of total retinol equivalent and iron in 1980-1982. Plotted from data in ref. [17]. Total retinol equivalent/iron given on top of bars.

Malaysia, Brunei Darussalam and Singapore recorded over 600 to nearly 900 retinol equivalents per capita per day. They had a higher level of retinol equivalent than the other member countries because of their higher availability of animal products. Nonetheless, the percentage of retinol equivalent from plant sources exceeded that from animal products for all the ASEAN countries, with the exception of Singapore, whose total retinol equivalent was due almost equally to animal and plant sources. Table 13 indicates that Malaysia and Indonesia experienced the fastest expansion in the supply of available retinol equivalent in ASEAN between 1969 and 1982, this growth being due mostly to an increase in the availability of plant retinol equivalent. Palm oil is likely the single most important source of retinol equivalent that contributed to the substantial increase.

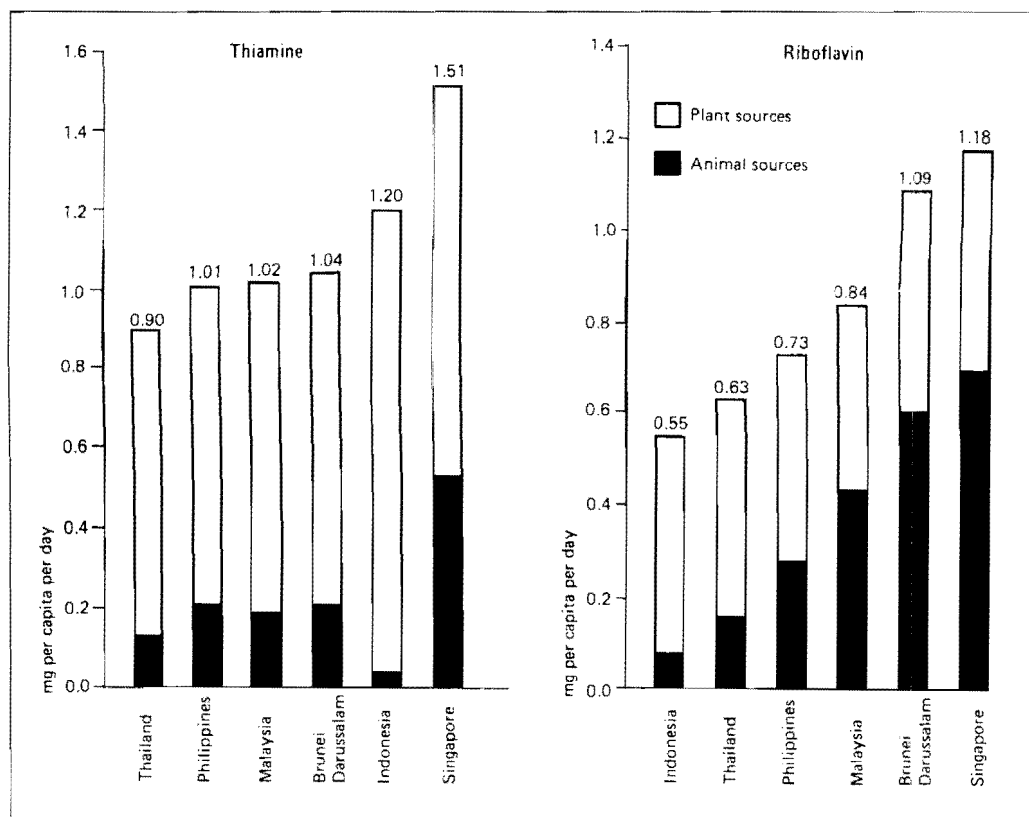


Fig. 8. Supply of thiamine and riboflavin in 1980-1982. Plotted from data in ref. [17]. Total thiamine/riboflavin given on top of bars.

The amounts of iron, thiamine and riboflavin available to the ASEAN population increased by 13.2, 17.1 and 17.1% respectively between 1969 and 1982. Table 13 shows that, on the average, ASEAN relied on plant products for 82, 75 and 58% of its iron, thiamine and riboflavin supply respectively. During the period of 1969-1982, Indonesia experienced the best overall improvement in the availability of iron, thiamine and riboflavin. Plant sources of iron in the diet of the region comprise of soybean, mungbean, spinach, squash and maize. The main source of thiamine is rice followed by soybean, mungbean and peanuts. The beans and sweet potatoes serve as important plant sources of riboflavin.

Table 13. Percent changes in the availability of retinol equivalent (RE), iron, thiamine and riboflavin in ASEAN, 1969-1982 [17]

	Retinol		Iron		Thiamine		Riboflavin	
	plant RE ÷ total RE in 1982	change in availability of total RE %	plant iron ÷ total iron in 1982	change in availability of total iron %	plant thiamine ÷ total thiamine in 1982	change in availability of total thiamine %	plant riboflavin ÷ total riboflavin in 1982	change in availability of total riboflavin %
Brunei								
Darussalam	64	14.9	79	5.4	80	11.8	44	11.2
Indonesia	90	73.7	96	22.8	77	26.3	76	25.0
Malaysia	80	92.9	78	3.0	80	13.3	49	25.4
Philippines	80	37.5	78	29.1	68	21.7	62	19.7
Singapore	48	19.2	74	9.6	60	26.9	42	18.0
Thailand	85	2.9	86	9.4	86	2.3	75	3.3
ASEAN (average)	75	40.2	82	13.2	75	17.1	58	17.1

### *Food Consumption*

Data on food consumption are based on results of dietary surveys that have been undertaken over different time periods in some of the ASEAN countries. Primary consumption information complements food availability data, since the latter describes average food supplies at the national level, while the former provides an insight into actual dietary intakes at the household level. The present report encountered a scarcity of recent consumption data for a few ASEAN countries.

#### *Patterns of Staple Food Consumption*

*Cereals.* Rice holds the central place among the staple foods and is considered the staff of life throughout ASEAN and in many other parts of Asia. It is common for the people, particularly the poorer population, to derive the bulk of their calories from carbohydrates. In a dietary survey undertaken in 1982 using food weighing method, Konjing and Veerakitpanich [26] found the per capita calorie consumption of the rural families in the Northeastern provinces averaged 2,100 cal per day compared to 1,800 cal consumed by slum dwellers in Bangkok. Cereals, predominantly



rice, accounted for 82% of the total calorie intake in the Northeast and 51% in Bangkok. A similar rural-urban pattern of food consumption prevails in Malaysia. In a series of studies carried out in 1979–1983 covering 550 households living in poor villages in different parts of peninsular Malaysia, Chong et al. [10] found that rice and wheat products (flour, bread and biscuits) constituted 61% of the villagers' daily intake of 1,874 cal. In East Malaysia (Sabah), an extensive nutritional study conducted in 1978–1980 revealed that the Kadazan and other natives settled on upland areas and coastal plains had 70–74% of their calorie intake from cereals, rice mainly [8]. By comparison, urban households in the Peninsula were found to rely less on cereals for calories (52% of the total) [28].

Due to the bulk of cereals in the diet, the poorer people in ASEAN derive a major proportion of their protein from cereals. Lie et al. [27] reported in 1976 that plant foods contributed 63–82% of the total protein consumed by Indonesians from different islands. In Maluku and Irian Jaya, for example, the staple plant foods comprised of rice and maize (mainly), sago and sweet potato. The amount of cereals in the Filipino diet makes it the dominant contributor of many nutrients besides protein. In 1978, Villavieja [40] found the one-day per capita cereal intake of 334 g in Luzon and Visayas contributed 54% of total protein, thiamine and niacin intakes. Furthermore, 40 and 34% of iron and riboflavin intake respectively were obtained from the cereal group.

*Fish and Livestock Products.* Besides cereals, fish occupies an important position in supplying protein to the ASEAN people. Fresh or salted fish is practically the sole animal protein among the lower income families in Indonesia ranging from 27.3 g per person per day in Jawa to 3.3 g in Kalimantan [27]. In the Philippines, fresh, dried, smoked and processed fresh water and salt water fish amounted to 67 g per capita per day [40]. Among Malaysian villagers, fish consumption is high as revealed in a number of studies [10, 44]. The daily quantity of fish eaten averaged about 70–100 g per capita in the inland villages compared to over 100 g in coastal locations. In this manner, 25–35% of the total protein came from fish and seafood. A similar level of fish protein constituted the diet in Singapore in 1978 [2].

In general, consumption of meat is low when compared to fish. Religious prohibitions on pork by Muslims and on beef by Hindus and Buddhists result in poultry meat being probably the most popular meat of the various races in the ASEAN region. The demand for livestock products tend to increase with income as reflected by their higher consumption among the more affluent. Among the urban households in Malaysia, the

consumption of meat (including poultry), eggs and milk was found to be 2.4, 1.9 and 1.6 times respectively more than that in the rural sector [28]. The contribution of these three items to the total protein consumed in rural areas was 12 % only [10]. Likewise, in the rural Northeastern provinces of Thailand, the people had less protein of animal origin than their urban counterparts [26]. Meat and eggs contributed 17 and 31 % of the rural and urban consumption of animal protein respectively. Milk is largely an imported item in the ASEAN countries and, hence, it is outside the reach of the lower income group. In Metropolitan Manila, daily per capita intakes of milk as well as of eggs, meat and poultry were 2–2.5 times greater than those in the rural parts of Luzon – Visayas [40]. Sweetened condensed milk was the preferred type of milk reported in these surveys, whereas fresh fluid milk is taken at an insignificant level. Under 2 % of 1,219 households in urban-rural locations in Malaysia included fluid milk in their daily diet [44].

#### *Food Availability versus Consumption Data*

Intakes of calories, protein and fat, as obtained from some nutrition surveys, are compared with food balance sheet data for the corresponding periods. The comparison is restricted only to Thailand and Malaysia since more recent survey data could be obtained for these two countries. In both countries, available calories per capita per day was reported to be higher than the levels obtained from surveys (table 14). A difference between the

Table 14. Comparison of available calories, protein and fat with consumption levels (per capita per day)

	Calories		Protein		Fat	
	available calories <sup>1</sup>	consumption of calories <sup>2</sup>	available protein <sup>1</sup> , g	consumption of protein <sup>2</sup> , g	available fat <sup>1</sup> , g	consumption of fat <sup>2</sup> , g
<i>Malaysia</i>	2,549		58.0 (24.9) <sup>3</sup>		56.9	
Rural		1,988		48.8 (20.0)		26
Urban middle class		2,162		62.0 (32.0)		32
<i>Thailand</i>	2,322		45.9 (12.2)		28.4	
Rural		2,125		63 (15)		15
Urban slums		1,777		57 (27)		59

<sup>1</sup> Period for available calories, protein and fat: Malaysia and Thailand, 1982–1984.

<sup>2</sup> Survey period: Malaysia, 1986 [28]; Thailand, 1982 [26].

<sup>3</sup> Grams of animal protein in parentheses.

two sets of data is expected, reflecting food wastage, overeating by the affluent and inherent problems in collating and analyzing data on a per capita basis [36]. The gap is widest among the poor, be they in rural villages or urban slums. In Malaysia, rural consumption of calories was 22% below the availability average, while the urban areas had 15% less. The problem is made more acute by the fact that these poverty populations had consumption levels of energy below the recommended daily allowances. In 1982, the rural poor in Malaysia had a calorie intake which ranged between 79 and 101% of the recommended level.

It was found that the rural Northeastern region of Thailand had a comparatively higher calorie intake than the urban slums. Both groups belong to the lower income sector; however, the subsistence farmers in the Northeast do not have to rely as much on purchases as the urban households, being able to derive the bulk of their calorie needs from their own cultivation of rice, cassava and maize. In comparing with availability data, the calorie consumption by the Northeastern region amounted to 91.5% of the national average, whereas the slums showed an intake level of 76.5% only (table 14).

With respect to protein intake, dietary surveys found its level close to or higher than the national availability figures for Malaysia and Thailand. Malaysian urban households consumed more protein, including animal protein, than their rural counterparts. In Thailand, it is the rural region that recorded a higher level of protein intake than the urban slums in Bangkok; however, the latter's intake of animal protein was found to be greater, indicating that the rural Northeastern region tends to derive most of its protein from rice and other plant sources.

In comparing fat consumption with its availability, it was found that both the rural and urban households in Malaysia did not consume as much fat as reported in its food balance sheet. In contrast, the urban sector of Thailand showed fat consumption to be twice the national average, whilst its rural region had an intake of approximately one quarter of that consumed by the urban households.

### *Trends in Food Trade*

The role of food trade is considered to be of major importance in relieving supply deficits in developing countries. In 1976-1980, all the four developing regions of Asia, North Africa/Middle East, Sub-Sahara

Africa and Latin America were net food importers [33]. In Asia, imports of basic food staples, mainly cereals, were about double its exports in the late 1970s. Paulino [33] also pointed out that between 1966–1980, net food imports in East and Southeast Asia increased by about a million tons in a decade. The present report found that ASEAN as a group managed to remain a net exporter of food in the early 1980s. This is due to the largest two exporters in this group, namely Thailand and Malaysia, showing a positive annual export growth during 1980–1983 (table 15). Brunei Darussalam was the other member to produce a positive growth but her export volume was miniscule in relation to that of the other members. On the other hand, the decreasing rate of food exports shown by Indonesia and the Philippines may reduce ASEAN's position as a net exporter. Singapore's negative rate of exports reflects a decline in her entrepot food trade, rather than a reduction in food production.

In 1983, food imports contributed 15.6% of total imports for Brunei Darussalam, the highest proportion in the region, followed by 10.7% for Malaysia. These two countries also showed the fastest increase rate for food imports between 1980 and 1983 (at 13.7 and 5.1% respectively). Thailand depended least on food imports which amounted to only 3.8% of

Table 15. Food<sup>1</sup> imports and exports: ASEAN countries, 1980–1983 [18]

	Food imports in 1983 million US\$	Food exports in 1983 million US\$	Average annual change 1980–1983, %		Food imports ÷ total imports in 1983, %	Food imports ÷ total exports in 1983, %
			imports	exports		
Brunei						
Darussalam	113.2	4.0	13.7	23.9	15.6	3.3
Indonesia	1,247.2	1,284.0	–1.4	–4.3	7.6	5.9
Malaysia	1,414.7	2,196.2	5.1	4.3	10.7	10.0
Philippines	573.4	1,490.3	4.0	–9.5	7.7	9.8
Singapore	2,098.6	1,351.1	2.0	–4.4	7.5	9.6
Thailand	394.7	3,228.7	–2.5	11.4	3.8	6.2
ASEAN (total)	5,741.8	9,554.3	–	–	–	–

<sup>1</sup> Food and animals + beverage + oilseeds + animal and vegetable oil + fish and fishery products.

her total. Moreover, her import of food has been decreasing at 2.5% per year. The food bill for the other three member nations averaged 7.5% of their total imports.

A country's food imports can also be considered in terms of the proportion of foreign exchange earned through total exports which has to be spent on importing food. The gap between export earnings and food expenditure at the macro level can be over 100% in critical food deficit countries where demand for imports climbs as production falls. In ASEAN, food imports ranged from approximately 3-6% for Brunei Darussalam, Indonesia and Thailand, to about 10% for the Philippines, Singapore and Malaysia. Brunei Darussalam is actually a net importer of virtually all her food needs, but due to huge exports of crude oil, natural gas and petroleum products (a total of US\$ 7 billion in 1984), her food import pales on comparison.

Table 16 highlights the net trade of some major foods of ASEAN, showing that in 1984 the region was a net exporter of rice, maize, sugar and palm oil. Besides these commodities, ASEAN also ranked as a net exporter of fruits, such as bananas, pineapples and mangoes, coffee, cocoa beans, pepper, cassava and coconut products including copra, coconut oil and

Table 16. Net trade<sup>1</sup> of major food items in ASEAN in 1984 [5, 18]

	Rice		Maize	Wheat <sup>3</sup>	Meat <sup>4</sup>	Milk <sup>5</sup> and cream	Sugar	Palm oil
	1980 1,000 MT <sup>2</sup>	1984						
			1,000 MT	1,000 MT	10 MT	10 MT	10 MT	1,000 MT
Brunei								
Darussalam	-16	-17	-0.1	-5	-511	-358	-760	-1
Indonesia	-2,012	-414	+101	-1,452	+14	-108	-31	+228
Malaysia	-168	-438	-953	-552	-2,388	-4,602	-44,353	+2,551
Philippines	+263	-190	-182	-778	-214	-5,528	+88,031	-28
Singapore	-188	-210	-318	-160	-6,495	-4,229	-12,379	-9
Thailand	+2,798	+4,616	+3,116	-141	+3,384	-4,199	+124,020	-3
ASEAN (total)	+677	+3,347	+1,562	-3,088	-5,986	-10,626	+154,528	+2,738

<sup>1</sup> Net trade is exports minus imports: plus for net export and minus for net import.

<sup>2</sup> Metric tonnes.

<sup>3</sup> Wheat + flour.

<sup>4</sup> Fresh, chilled or frozen.

<sup>5</sup> Evaporated, condensed, dried or fresh.

desiccated coconut [5]. In this respect, Thailand plays a significant role in being solely or largely responsible for ASEAN being a net exporter of rice, maize, cassava and sugar, among other food exports. Rice is a case in point where all the ASEAN countries in 1984 were net importers, with the exception of Thailand (table 16). Between 1980 and 1984, the net trade for rice increased fivefold due mainly to a 65% increase in rice export by Thailand and a corresponding 79% decline in its import by Indonesia. However, the Philippines and Malaysia increased their reliance on rice import over the same period by 1.7 and 2.6 times respectively. Malaysia has reviewed downward its target for self-sufficiency in rice to vacillate between 55 and 65% from a previously targeted level of 85% [41].

With regards to maize, Thailand recorded over 3 million metric tonnes for export in 1984. The other ASEAN exporter of maize is Indonesia who, until 1983, was a net importer because of its high yielding seed varieties that provided for profitable production being persistently damaged by disease (downey mildew). The country's production has improved tremendously and in 1984 she managed to export about 100,000 metric tonnes. Malaysia is a leading ASEAN importer of maize for food and currently 95% of its import comes from Thailand.

Thailand and the Philippines were the only exporters of sugar among the ASEAN countries in 1984 (table 16). However, the position of the latter as a net exporter of sugar has become precarious because, not only is the country badly hit by the slide in sugar price since the early 1980s, resulting in the fall in cane production and closure of mills, but the Philippines is also embroiled in a recently decreed land reform aimed at dividing up the sugar haciendas among the millions of the landless poor. Sugar exporters around the world are already encountering very stiff competition, made worse by a sugar market that has been diminishing since 1982 [21]. The Food and Agriculture Organization estimates that since 1973, developed countries have decreased the annual per capita sugar consumption by 5 kg or 12%, especially among net importers of raw sugar, notably the USA, Canada and Japan. Health implications from excessive sugar intake is believed to be partly responsible for the cutback in these countries.

Malaysia provided the major proportion of the palm oil trade in ASEAN, with Indonesia contributing about 8% to the region's net export of 2.7 million metric tonnes in 1984. Malaysia relies on palm oil and products for 18.6% of her total export earnings in 1984 [5]. Dependence on a few primary commodities for export has resulted in Malaysia being subjected to the vagaries of changes for these commodity prices. As an exam-

Table 17. Relationship between per capita income and imports of selected higher valued food items [18]

	Gross national product per capita in 1984, US \$	Average growth rates of real gross domestic product, 1971-1984, %	Per capita imports (kg) in 1984		
			meat <sup>1</sup>	milk <sup>2</sup>	wheat <sup>3</sup>
Brunei Darussalam	not available	4.5	23.7	6.0	2.4
Indonesia	490.9	7.1	0.02	0.3	9.0
Malaysia	2,004	7.6	1.6	4.9	39.5
Philippines	602	4.7	0.05	1.0	14.6
Singapore	7,139.2	8.8	28.3	14.1	79.8
Thailand	801	6.5	0.01	0.9	2.9

<sup>1</sup> Fresh + chilled + frozen meat.

<sup>2</sup> Dry milk.

<sup>3</sup> Wheat + fluor in wheat equivalent.

ple, the price of palm oil averaged about US\$ 450 per tonne, in 1985, but plummeted to below US\$ 200 by March 1986.

The ASEAN region in 1984 was a net importer of wheat, meat, milk and cream. Population growth and rising incomes in the region are propelling the demand for these higher-valued food items. Brunei Darussalam, buoyed by one of the highest per capita GNP in the world, imported substantially more livestock products on a per capita basis than the rest of ASEAN in 1984, with the exception of Singapore (table 17). A major percentage of Brunei's meat import comprised of duck meat (41.7%), while beef, beef preparations and veal constituted approximately 24% of its total meat import, followed by chicken meat at 14.2% [15]. As for Singapore, her per capita imports of meat, milk and wheat products were 28.3, 14.1 and 79.8 kg respectively. About two thirds of Singapore's meat import was for chicken meat (64.1%) followed by mutton and lamb (11.6%) and pork (9.4%) [15]. Singapore also recorded a relatively high level of per capita import of wheat and wheat products. The other ASEAN countries showed comparatively lower per capita import of meat, as pork and chicken meat are produced domestically in adequate quantities to meet the demand of a wide section of the population in these countries. Nonetheless, it has been postulated that the import for beef will rise as its demands has been growing at the estimated rate of 5-6% in Thailand [38] and Malaysia [41].

### *Nutritional Implications*

#### *Population Increase and Food Production*

Between 1961 and 1980, Asia (excluding China) increased production of major food crops by 2.8% yearly, and it is projected that she will increase at an average annual rate of 3.0% between 1980 and 2000 [33]. In comparison, ASEAN as a group performed almost twice as well with food production showing yearly increase of 5.4% between 1970 and 1979 (table 18). In 1980–1984 the region's annual increase rate of 3.0% was closer to the projected figure for Asia in general. While food production continues to increase, so does population growth. In Asia (excluding China), population expanded by 2.4% per year between 1961 and 1980. Consequently, food output on a per capita basis increased at a minuscule level of 0.1% for Asia (excluding China) during the 1960s and 1970s [33].

The annual growth rate of population varies widely among the ASEAN countries, ranging from 1.2% for Singapore to 3.9% for Brunei Darussalam between 1980 and 1984; the average growth rate for ASEAN during the same period was 2.4%, which is similar to the rate for Asia (table 18). Population growth in ASEAN is at a comparable level with the average rates of other developing regions such as Latin America (2.6%) and North Africa/Middle East (2.7%) [33]. During the past 20 years, the

Table 18. Annual growth rates (%) of population and food production<sup>1</sup> in ASEAN [4, 18, 33]

	Population		Food production		Per capita food production	
	1970–1979	1980–1984	1970–1979 (1969–1971 = 100)	1980–1984 (1974–1976 = 100)	1971–1979 (1974–1976 = 100)	1980–1984
Brunei Darussalam	3.5	3.9	–	–	–	–
Indonesia	2.3	2.2	3.2	3.5	1.5	0.6
Malaysia	2.4	2.6	5.1	3.7	2.2	0.7
Philippines	2.8	2.5	3.9	0.9	3.0	–0.7
Singapore	1.5	1.2	9.1	6.8	10.2	4.4
Thailand	2.5	2.0	5.8	4.2	1.8	1.0
ASEAN	2.5	2.4	5.4	3.8	3.7	1.2
Asia	2.3 (excludes China) <sup>2</sup>		2.8	4.7	–	–

<sup>1</sup> Food production represents disposable agricultural production for any use except seed and feed.

<sup>2</sup> 1960–1980.



ASEAN nations have experienced an increase in population growth mainly due to the reduction in mortality rates. Family planning programs have had a limited impact on reducing birth rates, with the exception of Singapore, where its success, especially in the 1960s and 1970s, is closely due to national social policies [7]. Under conditions of relatively high population growth rates, food production is hard-pushed to stay abreast of demand.

Table 18 shows that between 1970 and 1979, food production growth exceeded population increase in all the ASEAN countries. This pattern prevailed in 1980–1984, with the exception of the Philippines whose production rate fell behind its population growth rate. In general, the food growth rates for all the ASEAN countries were higher during the 1970s (averaging 5.4%) than between 1980 and 1984 (3.8%).

When food production is expressed on a per capita basis, it brings into focus the reality that food growth in ASEAN has been insignificant throughout the 1970s, and even less encouraging in the first half of the 1980s. The average per capita food production change for ASEAN was 1.2% per year between 1980 and 1984, with Indonesia, Malaysia and Thailand averaging 1.0% or less annually. The Philippines recorded a negative per capita index during this period. Such a slow rate of growth seems to indicate very little improvement in the nutritional status of the population in general and among the poor in particular.

#### *Prevalence of Malnutrition*

One of the most common forms of malnutrition in this region is protein energy malnutrition (PEM), particularly among growing children. Table 19 shows the magnitude of PEM in Indonesia, Malaysia, the Philippines and Thailand. Albeit that different classification of PEM had been used, the prevalence of mild to moderate type was identified in fairly high percentages. In Indonesia, 30% of the preschool children were estimated to be affected by mild to moderate PEM. This compares with 15.8% in the Philippines having moderate PEM. In Thailand, 6.7% of the infants and school children were assessed to show moderate PEM. It was found that among poor preschoolers in rural Malaysia, 37% were underweight and 43% stunted. Almost as high a prevalence of stunting and underweight was shown by children 6–12 years old in Malaysian villages.

Aside from PEM, iron-deficiency anemia and vitamin A deficiency also pose as important health concerns in different parts of ASEAN. Anemia was recognized in approximately one third to half of the preschool children in Indonesia, Malaysia and the Philippines (table 20). In Thailand

and Malaysia, 30–60% of school children were shown to be anemic. Among pregnant women, a higher proportion extending to 70% was examined to be at the anemic level. Vitamin A deficiency in the form of xerophthalmia is the most important cause of blindness in Indonesia [39]. It was estimated that 3–4 per thousand or about 100,000 preschool children become blind each year. Vitamin A deficiency is not such a serious public health problem in the rest of ASEAN.

Iodine deficiency resulting in goiter tends to be localized in its prevalence. Endemic areas, such as the mountainous interior of Sabah and Sarawak in East Malaysia, and the rural North and Northwestern regions in Thailand, have a high percentage of the population, especially among the women, with iodine deficiency goiter (table 20).

Table 19. Prevalence of PEM in ASEAN [39]

	Indonesia 1980–1981	Malaysia 1979–1983	Philippines 1984	Thailand 1985
Preschool children	30% mild to moderate 3% severe	43% stunted 5% wasted 37% underweight	15.8% moderate 2.2% severe	(infants and school children) 28.5% mild 6.7% moderate 0.8% severe
Children 6–12 years	–	49% boys and 35% girls stunted 2% boys and 2% girls wasted 38% boys and 23% girls underweight	–	(school children in rural areas) 14–42% mild 1–7% moderate

Classification of PEM:

Indonesia: Mild to moderate PEM is 60–80% Harvard standard of body weight for age. Severe PEM is below 60% Harvard standard.

Malaysia: Stunting is height for age below –2 standard deviations of the National Centre for Health Statistics (NCHS) median. Wasting is weight for height below –2 SD of the NCHS median. Underweight is weight for age below –2 SD of the NCHS median.

Philippines: Moderately malnourished is 60–90% below the Philippines' growth standard of body weight for age. Severely malnourished is below 60% of the Philippines' growth standard.

Thailand: Mild PEM is 75–89% of Thailand's standard of weight for age based on modified Gomez's classification. Moderate PEM and severe PEM are respectively 60–74% and below 60% of Thailand's standard.

In contrast, the young children in Singapore have been found to manifest the consequence of overnutrition. Between 1976 and 1983, a total of 705,511 school children aged 7–12 years were screened for obesity based on the Quetelet's index [23]. It was revealed that the prevalence of childhood obesity reached 8% of the boys and girls in 1983, and is on the increase. This is a reflection of the growing affluence of the country, whose demand for total calories, protein and animal fats has been on the rise, as shown previously by the food availability data.

It is recognized that food consumption is closely correlated with the GNP of a country, but what is more important nutritionally is available income for food at the household level. Geissler and Miller [19] found malnutrition to be more prevalent in the Philippines than in Thailand, despite the considerable rise in GNP over the last decade in both countries. The critical difference lies in the higher inflation rate in the Philippines,

Table 20. Prevalance of anemia, vitamin A deficiency and goiter in ASEAN [39]

	Indonesia 1980–1981	Malaysia 1979–1983	Philippines 1982	Thailand 1985
<i>Iron deficiency anemia</i>				
Infants	–	34%	50%	–
Preschool children	40%	33%	32% (preschool and school children)	10–40%
School children	9%	37% (adolescent girls)	–	30–60%
Adults	–	25% (18–45 years female)	–	17–37%
Pregnant women	70%	–	49%	30–70%
<i>Vitamin A deficiency</i>				
Preschool children	50% with night blindness	–	1.8% with night blindness 1.4% with Bitot's spot	–
<i>Iodine deficiency goiter</i>				
	10–90% endemic areas	1.5% of total population in Sarawak; endemic in Sabah and Northern Peninsular Malaysia	7.6% women of child-bearing age, 7.5% lactating mothers, 3.2% pregnant women in endemic areas	10% school children in North and Northeast regions

Iron deficiency anemia:

Malaysia: less than 15% serum transferrin saturation.

Thailand: less than 33% hematocrit level.

thereby rendering its cost of basic needs including food to be higher than in Thailand. Although income data from household surveys should be interpreted with caution, nonetheless, the persistence of malnutrition in the region serves to indicate that there exist certain segments of the population, who are too poor to afford nutritional adequacy for their children and pregnant and lactating women. The proportion of such poverty-stricken communities varies from country to country in the region, with Singapore and Brunei Darussalam perhaps least afflicted on account of the absence of a poor rural sector, as is found in the other member countries.

While the plight of the rural poor has long been recognized, countries are only recently coming to grips with the health problems of urban squatters. Between 1970 and 1980, the proportion of urban to total population increased by 5% in Indonesia, which is equivalent to 12.1 million people. During the same period, the urban population increase in Malaysia was 7.4% (13.8 million), in the Philippines, 4.4% (5.6 million), and 3.8% (3.1 million) in Thailand [37]. A comprehensive health and nutritional study on spontaneous settlements in Manila in 1975 identified 9.6% of the population from 6,000 households to have third-degree malnutrition, 37.5% of them showing second-degree malnutrition, and 20% with anemia [6]. Within any city, there are some slum areas which enjoy a higher nutritional sufficiency than others, as demonstrated in a study of ten squatter communities in Bangkok in 1982 [26]. The calories index ranged from 55 in one location to 130 in another (a nutrient index of 100 indicates adequacy), while that for protein and iron was found to range between 69 and 253 and between 100 and 385 respectively.

One consequence of rural-urban migration on food production is that the agriculture labor force becomes reduced. Between 1973 and 1983, the population in the agriculture sector decreased by 4–5% in Thailand and the Philippines, and by 8–9% in Indonesia and Malaysia [35]. Rice fields, rubber and oil palm plantations in Malaysia encounter a shortage of workers, and so labor has to be contracted from countries such as Indonesia. With a rapid rate of population growth, Indonesia's population has reached 168 million in 1987. In order to reduce the population in high-density Java, transmigration was conceived and since 1950, hundreds of thousands of families have been re-settled, particularly in Sumatra, followed by Kalimantan. Cash crop cultivation on larger holdings is emphasized in order to improve the standard of living of the transmigrants [3]. Marketing and other problems abound with the transmigration program, and consequently, able-bodied men have sought employment elsewhere.

*Concluding Remarks*

ASEAN became 20 years old in August 1987, and its claim to international prominence has been greater in the field of politics, especially in respect of its efforts to reconcile the disparate groups in Kampuchea, than in regional economic collaboration as originally envisaged for the organization. Differences in national economic priorities remain deep and it has been suggested that the similarity in factor endowment and climatic conditions among the member countries has resulted in their economies becoming more competitive than complementary [9]. Intra-ASEAN trade in 1985 amounted to less than one fifth of the group's trade with the rest of the world. Individually, each of them has forged ahead averaging 4.5–9% annual growth in real gross domestic product between 1971 and 1984 [18]. In respect of food production, ASEAN as a group manages to export a variety of important foodstuffs including rice, maize, cassava, sugar, fish, poultry, fruits, palm oil, beverages and spices.

However, this enviable food situation in ASEAN needs to be considered in the light of two caveats. Firstly, the group owes its net food export position mainly to just one member country, namely Thailand. The remaining members are net importers of food including rice (with the exception of Indonesia). Secondly, the high population growth rate of the group (except for Singapore) will not help to ameliorate the problem of inequitable distribution of food. Although food availability data indicated that the average national supply of calories and most nutrients were adequate, the persistence of PEM as well as the deficiencies of iron and vitamin A in parts of ASEAN demonstrates the ironical manifestation of hunger amid a region of plenty. A high population growth also tends to negate improvements in food production and the countries will rely increasingly on food imports to meet the growing demands. Malaysia, as an example, imported US\$ 260 million worth of food items in 1975, but the bill totalled an astronomical US\$ 1.4 billion in 1984. The need to reduce food imports has become imperative in view of the substantial losses in export earnings from primary commodities, whose prices plunged during 1985–1986.

Since large segments of the population in ASEAN depend upon agriculture, it is socially and politically rational for ASEAN to strive for regional food security in the long run. Towards this end, not only rice but other food staples should be included in the effort to coordinate supply, stock piling and food trade. ASEAN already has established a multitude of

projects with foreign assistance (for example, Australia, the USA, Canada and Japan) for technical cooperation and development in many areas of agriculture such as food handling, plant quarantine training, seed technology, forest management and agriculture cooperatives. Success in regional integration of agricultural production and trade would further boost ASEAN's economic standing in the world.

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