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# GROWTH AND EQUITY IN AGRICULTURAL DEVELOPMENT

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OXFORD

1983

Gower

DIOYO PRABOWO

*Demand for and Supply of Basic Food Products in the ASEAN Countries*

INTRODUCTION

The Association of South East Asian Nations or ASEAN is faced with a rapid increase in the demand for food. In the majority of ASEAN member countries, neither has food production kept pace with the increase in demand stemming from population and income growth, resulting in dependence on imports of varying magnitudes, nor has there been stability in food production as large parts of ASEAN are still dependent on the intensity of the monsoon.

Food self-sufficiency is one of the principal aims of the national development plans of the ASEAN member countries. At the same time, there is a reasonable degree of economic complementarity among the ASEAN countries since while some member are food deficit, others are surplus. There are, therefore, opportunities for intra-regional co-operation.

Article B.1 of the Declaration of ASEAN Concord, signed in Bali in February 1976, states that the member countries should all assist each other by giving priority of acquisition in respect of food (rice). The Declaration also enjoins the member countries to intensify their co-operation in the production of basic commodities, particularly food. The Economic Ministers' Meeting in Kuala Lumpur in March 1976 asked the ASEAN senior officials to study the basic commodities that might be included in the co-operation scheme. The ASEAN Meeting of Experts on Agricultural Planning held in Indonesia in August 1976 specifically stressed the need for a study of supply and demand for food and other strategic agricultural products. The study would enable ASEAN to assess the demand for food and other strategic agricultural commodities over the horizon 1975-90 and the production potentialities in meeting it. The study would also help to estimate the input requirements for achieving the production potential so that ASEAN member countries could take co-operative action in meeting the requirements.

The immediate objectives of the study are to estimate, for the period 1975-90:

- (a) the domestic and regional demand for ASEAN for rice and corn (maize), and
- (b) the production potential in the region.

## REGIONAL DEMAND FOR RICE AND CORN.

Demand is defined here as the sum of demand for food for human consumption and demand for non-food uses. Population and income are the most significant determinants of the demand for food. Consequently one needs to measure the income elasticity in order to estimate the future demand.

The various types of non-food uses were estimated independently for seed, waste, feed and industrial uses. Seed requirements depended to a large extent on the area sown. Waste was estimated as a proportion of domestic supply. For livestock feeds, the requirements were estimated on the basis of projected animal production. With regard to other industrial uses a continuation of past trends was assumed in most cases.

The probable demand for food was projected by individual country and the estimates were subsequently aggregated for the whole ASEAN region. Three alternative projections were made. Alternative I was formulated by taking the normal population growth rates and the most likely income growth rates in the ASEAN countries. Alternative II projections were based on a more optimistic expectation of population and income growth rates. Correspondingly more pessimistic assumptions of population and income growth rates relative to the most probable levels were made to generate Alternative III projections.

### *Rice*

The main importance of rice in the ASEAN region is its being a primary source of carbohydrate. Almost two-thirds of the daily intake come from rice. An important component of the index of food prices as well as the cost of living, rice is also important from the employment aspect. In all ASEAN countries, except Singapore, more than 50 per cent of the labour is employed in agriculture, a large part of which is in rice production. In the ASEAN region therefore, food literally means rice and the two terms are used interchangeably. The food balance sheets indicate that throughout ASEAN only in the Philippines did annual rice consumption remain stable at around 90 kilograms per caput. Thailand recorded the highest per caput consumption of 154 kilograms and Singapore the lowest.

Indonesia, a rice deficit country, recorded the highest income (expenditure) elasticity of 0.56. A 10 per cent rise in the per caput income, other things being constant, would raise rice consumption in Indonesia by 5.6 per cent. In Singapore the income elasticity of demand for rice was negative ( $-0.01$ ). For Thailand, a major rice exporting country, the estimate was a low income elasticity of 0.046. The estimates were 0.14 and 0.22 for Malaysia and the Philippines respectively.

The total demand for rice, food and non-food is shown in Table 1. It can be seen from Table 1 that the rice consumption of Indonesia alone is more than the equivalent of the amount consumed in the other four countries in ASEAN altogether. The importance of Indonesia to the rice demand is reflected by its share in the total rice consumption of the ASEAN. Under Alternative I the rice consumption (food and non-food) of Indonesia in 1981 was 1.3 times the consumption of the rest of ASEAN. It is projected that the ratio would be 1.4 times in 1985 and 1.5 times in 1990. It is projected that the annual rate of growth of the demand for rice in the ASEAN region would be 4.05 per cent during 1981–85 and 3.92 per cent during 1985–90 using Alternative I. Under Alternative II the annual rate of growth would be 4.12 and 4.05 per cent for the period 1981–85 and 1985–90 respectively. Under Alternative III the annual rate of growth would be 4.00 and 4.11 per cent for each period.

TABLE 1 *Rice: Total demand (food and non-food uses) in ASEAN, 1981–85, 1990.*

(million metric tons)						
Country	1981	1982	1983	1984	1985	1990
<i>Alternative I</i>						
Indonesia	20.38	21.34	22.34	23.39	24.47	30.20
Malaysia	1.78	1.83	1.90	1.97	2.03	2.39
Philippines	4.91	5.05	5.21	5.37	5.53	6.42
Singapore	0.18	0.18	0.19	0.19	0.20	0.20
Thailand	8.82	9.03	9.25	9.47	9.69	10.93
ASEAN	36.07	37.44	38.89	40.39	41.92	50.14
<i>Alternative II</i>						
Indonesia	20.53	21.52	22.56	23.64	24.78	30.92
Malaysia	1.73	1.78	1.84	1.90	1.97	2.38
Philippines	4.91	5.05	5.22	5.38	5.54	6.43
Singapore	0.18	0.18	0.18	0.19	0.19	0.20
Thailand	8.77	8.97	9.17	9.38	9.59	10.67
ASEAN	36.12	37.50	39.17	40.49	42.07	50.60
<i>Alternative III</i>						
Indonesia	20.09	20.98	22.00	22.89	23.90	29.66
Malaysia	1.73	1.79	1.85	1.91	1.98	2.40
Philippines	5.02	5.18	5.36	5.54	5.73	6.77
Singapore	0.18	0.18	0.19	0.19	0.19	0.20
Thailand	8.96	9.20	9.45	9.63	9.95	11.30
ASEAN	35.98	37.33	38.85	40.16	41.75	50.33

*Corn*

In countries like Indonesia and the Philippines corn is second only to rice as a staple food. The per caput corn consumption in 1975 was highest in the Philippines and lowest in Singapore. In the Philippines, corn is primarily consumed as a staple food in Visayas region. In Indonesia corn is consumed by people in areas like East Java and Madura. The average consumption per caput in ASEAN was 16.74 kilograms per annum in 1975. With a total population of 185.65 million (excluding Thailand) the demand for corn in 1975 for the whole region would be 3.11 million metric tons. The income elasticity coefficients for Indonesia, Malaysia and the Philippines showed a negative sign indicating that corn is considered an inferior food in the ASEAN region.

TABLE 2 *Corn: total demand (food and non-food use) in ASEAN, 1981-85, 1990*

(thousand metric tons)

Country	1981	1982	1983	1984	1985	1990
<i>Alternative I</i>						
Indonesia	2,242.00	2,284.00	2,326.00	2,372.00	2,396.00	2,607.94
Malaysia	322.49	334.38	357.26	382.15	394.03	647.58
Philippines	3,094.92	3,200.56	3,311.76	3,425.54	3,553.89	4,225.76
Singapore	278.46	241.50	255.50	269.58	285.82	379.85
Thailand	384.00	398.00	412.00	427.00	436.00	516.00
ASEAN	6,321.87	6,458.44	6,662.52	6,876.27	7,065.74	8,377.13
<i>Alternative II</i>						
Indonesia	2,212.16	2,246.12	2,285.16	2,318.28	2,344.47	2,533.76
Malaysia	311.80	333.58	356.35	381.13	392.91	547.10
Philippines	3,082.00	3,185.21	3,293.89	3,405.05	3,530.69	4,187.58
Singapore	278.44	241.48	255.51	269.55	285.59	379.79
Thailand	384.00	398.00	412.00	427.00	436.00	516.00
ASEAN	6,268.40	6,504.39	6,602.91	6,801.01	6,989.66	8,164.23
<i>Alternative III</i>						
Indonesia	2,262.08	2,304.87	2,347.89	2,395.14	2,435.63	2,697.11
Malaysia	313.20	335.20	358.20	383.20	395.20	553.20
Philippines	3,143.11	3,258.04	3,378.91	3,502.76	3,661.61	4,372.66
Singapore	278.46	241.50	255.54	269.58	285.63	379.85
Thailand	384.00	398.00	412.00	427.00	436.00	516.00
ASEAN	6,380.85	6,537.61	6,752.54	6,977.68	7,214.07	8,518.82

Corn demand for industrial uses account for 4 per cent in Indonesia and 2 per cent in the Philippines of the total corn demand. The estimates of future corn consumption for animal feeds were based on the projected number of dairy cows, hogs and chickens. It was assumed that the share of corn in the animal feed would remain constant.

Table 2 shows that under Alternative I the Philippines would have the highest demand at 3.6 million metric tons in 1985 and 4.2 million metric tons in 1990. Following the Philippines is Indonesia with 2.4 million metric tons in 1985 and 2.6 million metric tons in 1990. The changes in the population and income growth rates under Alternative II and III would not change substantially the estimates under Alternative I.

## REGIONAL SUPPLY OF RICE AND CORN

The probable output of food was projected by individual country and the estimates were subsequently aggregated for the whole ASEAN region. The projection methodology consisted of several steps. First, the historical performance of agricultural production was analysed and summarized statistically. The primary objective was to establish objectively the historical basis for projecting future production by measuring the nature of the response of crop production to the various inputs and other influences and by estimating how the production technology has changed regularly over time.

There are several alternatives which are potentially applicable to specify the econometric relationships between agricultural production and the explanatory variables. Which formulation is appropriate was not always intuitively obvious at the start of the analysis. Most alternatives had to be tried and the final choice had to be based on and supported by comparative empirical results. Therefore, the second step was the evaluation and the selection of alternative parameters from the statistical results. The statistics included the coefficients of production elasticity which are a measure of responsiveness of output to changes in production factors such as land, fertilizer or prices; the trend factor which was used to estimate the contribution of natural advances in production technology; and the rates of growth of the major inputs of production which were employed as a historical basis for projecting future input levels. Third, the selected estimates of parameters, together with an updated set of base period quantities for each country, were applied to project the growth in input utilization and subsequently the changes in agricultural production.

The major shortcoming inherent in the trend projections emanated from the assumption that the forces which generated the observed pattern of production would remain in the future. To the extent that the assumption is realized, the trend projections could be regarded to closely approximate the forecast of probable production. Where the assumption is not a tenable proposition, it was considered more logical and correct to take into consideration the factors which would impinge on the historical trends.

TABLE 3 *Trend projections of domestic output of food in the countries of ASEAN, 1981-85 and 1990*  
(thousand metric tons)

Commodity/Country	1981	1982	1983	1984	1985	1990
Milled Rice						
Indonesia	19,696	20,355	21,014	21,672	22,331	25,624
Malaysia	1,179	1,191	1,204	1,216	1,228	1,290
Philippines	5,052	5,197	5,342	5,487	5,633	6,359
Thailand	12,410	12,704	12,997	13,290	13,583	15,050
ASEAN	38,337	39,447	40,557	41,665	42,775	48,323
Corn						
Indonesia	2,863	2,766	2,669	2,573	2,477	1,995
Malaysia	42	44	45	47	49	57
Philippines	3,306	3,423	3,539	3,656	3,773	4,358
Thailand	3,248	3,400	3,553	3,705	3,858	4,620
ASEAN	9,459	9,633	9,806	9,981	10,157	11,330

Government plans, programmes and targets do exist and they definitely influence the historical pace of development and the changes in the various sectors of the economy. This realization brought an inevitable adjustment in the trend projections. This was the fourth stage in the projection methodology.

TABLE 4 *Projections of most likely or probable domestic output of food in ASEAN member countries, 1981-85 and 1990*  
(thousand metric tons)

Commodity/Country	1981	1982	1983	1984	1985	1990
Milled Rice						
Indonesia	21,070	21,911	22,752	23,593	24,434	29,038
Malaysia	1,433	1,491	1,549	1,607	1,665	1,959
Philippines	4,815	4,971	5,128	5,284	5,440	6,223
Thailand	12,069	12,348	12,634	12,925	13,224	14,825
ASEAN	39,387	40,721	42,063	43,409	44,763	52,045
Corn						
Indonesia	3,305	3,320	3,333	3,347	3,362	3,433
Malaysia	42	44	45	47	49	57
Philippines	3,390	3,589	3,715	3,889	4,071	4,625
Thailand	3,224	3,369	3,513	3,658	3,802	4,526
ASEAN	9,961	10,322	10,606	10,941	11,284	12,641

The trend projections of rice and corn are summarized in Table 3 while the revised projections are presented in Table 4. The revision was based on a review of plans and targets for 1981 to 1985 and the resource constraints faced by various countries. The adjusted projections incorporated the perceivable binding effects of land availability and the impact expected from government initiatives in food and agriculture.

## DEMAND AND SUPPLY IMPLICATIONS

This section integrates the probable supply and demand situations and provides some implications for agricultural production and foreign trade. Table 5 presents a picture of domestic production compared with the most likely level of internal absorption for the ASEAN region in 1985 and 1990. The prospects show a favourable potential balance for the ASEAN region with respect to rice and corn.

### RICE

The production orientated programmes in the rice sectors in ASEAN countries have been found instrumental in sustaining the advances in output. On the other hand, population and income changes have steadily and surely raised rice consumption over the years. Nevertheless, the ASEAN region as a whole could look forward to a favourable situation with respect to foodgrains. The production sufficiency ration (PSR) for rice has values over unity which indicate that there would be a potential exportable rice surplus from the ASEAN region through 1990. Total domestic output would exceed the regional requirements by about 2.84 million metric tons in 1985 and 1.5 million metric tons in 1990.

Looking at individual cases reveals country differences with respect to the nature of production constraints, potentials and strategy for increasing the domestic output of rice in individual countries. The production patterns among countries and the projected exportable rice surplus for the ASEAN countries as a group indicate strongly some opportunity for intra ASEAN trade in rice.

Thailand continues to occupy its position as the main rice exporter with a potential exportable surplus rising from 3.53 to 3.89 million metric tons in 1985 and 1990. Singapore produces no rice crop and would have to meet its domestic needs wholly through imports. Malaysia could become the largest rice importer among ASEAN countries since domestic production would potentially supply only about 82 per cent of internal consumption both in 1985 and 1990. Maintaining relative self sufficiency, the Philippines would continue to produce rice primarily for internal consumption only, since foreign trade in rice is not a major orientation.

Together with Thailand, Indonesia remains in the centre of the rice situation. Its large population and recent advances in rice production

TABLE 5 *Probable domestic output and internal absorption of rice and corn in individual ASEAN countries, 1985 and 1990*

(million metric tons)

		1985				1990			
		Supply	Demand	Potential Balance <sup>1</sup>	PSR <sup>2</sup>	Supply	Demand	Potential Balance <sup>1</sup>	PSR <sup>2</sup>
1.	Milled Rice								
	Indonesia	24.43	24.47	-0.04	0.99	29.04	30.20	-1.16	0.95
	Malaysia	1.67	2.03	-0.36	0.82	1.96	2.39	-0.43	0.82
	Philippines	5.44	5.53	-0.09	0.98	6.22	6.42	-0.20	0.97
	Singapore	-	0.20	-0.20	0.00	-	0.20	-0.20	0.00
	Thailand	13.22	9.69	+3.53	1.36	14.82	10.93	+3.89	1.35
	ASEAN	44.76	41.92	+2.84	1.07	52.04	50.14	+1.90	1.03
2.	Corn								
	Indonesia	3.36	2.40	+0.96	1.40	3.43	2.60	+0.83	1.32
	Malaysia	0.05	0.39	-0.34	0.13	0.06	0.65	-0.59	0.09
	Philippines	4.07	3.55	+0.52	1.15	4.62	4.23	+0.39	1.09
	Singapore	-	0.28	-0.28	0.00	-	0.38	-0.38	0.00
	Thailand	3.80	0.44	+3.36	8.64	4.53	0.52	+4.01	8.71
	ASEAN	11.28	7.06	+4.22	1.60	12.64	8.38	+4.26	1.51

Source:

<sup>1</sup>+ and - signs indicate surplus and deficit respectively

<sup>2</sup> Production sufficiency ratio

ensures that Indonesia would influence heavily the potential rice balance in the ASEAN region. A traditional (and in fact the world's largest) importer, Indonesia hopes to soon meet all its rice intake from domestic sources, particularly around 1985. A fast growth in production was recorded starting in the latter part of the 1970s as a result of the Special Intensification Programme (Insus). However, there is a distinct possibility that the rice situation in Indonesia could slide back in 1990 when the growing intakes due to population and income growth would overtake domestic rice output by 1.16 million metric tons. It is indeed feasible to cover up the potential rice shortfalls in 1990 through further production intensification and land developments for rice cultivation outside Java.

A close examination of historical evidence and the growth rate of harvested rice area implied by the 1985 targets in ASEAN countries would support the conclusion that a further acceleration of rice production would have to come from technical changes. The harvested rice area could not be expanded as fast as during the earlier decade.

In terms of global outlook, the ASEAN rice output as forecast would increase faster in 1985 and 1990 relative to the change in world production. Averaging 13.4 per cent of world rice output in 1974-76, the ASEAN rice production would increase to about 15.09 per cent in 1985 and 15.43 per cent in 1990. The share of Thailand in the export markets amounted to 15.66 per cent of the total in 1976-78. The exportable surplus of Thailand would constitute about 26.67 per cent in 1985 and rise to 27.78 per cent of the projected world exports in 1990. Therefore, Thailand is going to be an increasingly important supplier in the world rice market. For the ASEAN region as a whole the share of its exportable rice surplus in the world trade would be slightly lower.

### *Corn*

The ASEAN region is projected to have excess supplies of corn in 1985 and 1990. The favourable balance was based on the upgrading of corn yields in major producing countries. The assumption was that the development and diffusion of high yielding corn hybrids would improve average farm yields in the Philippines, Indonesia and Thailand. If so, domestic supplies would exceed demand well into the 1990s in these countries. Considering that existing productivity is rather low compared to potential corn yield levels, there exists a substantial leeway for corn production to increase in the ASEAN region.

The Philippines would continue as the largest corn producer in ASEAN whereas Thailand would have the biggest exportable surplus due to a comparatively small domestic absorption. In the Philippines, as in Indonesia, corn is normally utilized both as human food and as animal feed. Taking only feed corn, the comparative intakes in Thailand and the Philippines *vis-à-vis* their respective meat outputs would suggest that the former consumes a lower proportion and that corollarily there is a greater utilization of other feedstuffs in meat production.

The apparent differences in feeding technology may have important

implications for other countries. For instance, although the overall corn balance in the Philippines indicated a surplus, only the supply of food (white) corn is more than adequate and the internal requirements of feed (yellow) corn continue to exceed the domestic output. A similar situation exists in Indonesia. Preferred by feedmillers, yellow corn is imported for feed while government procured corn could not be disposed of easily in the market.

Corn consumption is dependent on prices. As an inferior food, corn can compete if its price is relatively low compared to the rice price. In Indonesia the price support for corn is linked with the rice price rather than with the world price of corn. The relatively high price support induces production but at the same time dampens the demand of the feedmilling industry for indigenous corn and makes corn a relatively expensive substitute as food.

The constraints to corn production and utilization rest with the technology, production cost structure, quality and variety of corn available. Without a better technology, favourable corn production potential in ASEAN would not be effectively and competitively utilized. In the immediate future it would be practical as well as economical to find out what other feedstuffs and agricultural by-products (and to what extent) can replace yellow corn in the ration. The substitution of other feed ingredients for yellow corn would alleviate the excess demand and relax some of the constraints on accelerating meat production. In the long run there would be substantial gains from improving corn production technology by developing and diffusing adaptable varieties of corn.

At the present time ASEAN corn output represents an insignificant proportion of the world's output of coarse grains. As forecast, the ASEAN output would constitute only about 1.30 per cent of the projected world production of coarse grains in 1985 and 1990. In terms of global exports the share of Thailand is estimated to improve marginally from 2.86 per cent in 1974-76 to 3.41 per cent in 1985 and 3.80 per cent in 1990.

## DISCUSSION OPENING – MASAHIKO SHIRAISHI

I am particularly interested in this paper by Dibiyo Prabowo because I am working with an Indonesian Team from Gadjah Mada University and Pajajaran University on a socio-economic study of rice farming and marketing in Indonesia. We have already published a report on a case study of Gadingsar village in Central Java in April 1982. So I should like to comment mainly on the agricultural situation in Indonesia.

I have three points. Firstly, cassava is a very important food, as well as corn, in Indonesia. I would like to know how one should estimate the demand and supply of cassava. Secondly, according to IRRI statistics, I notice that only 38.8 per cent of the rice area is technically irrigated in Indonesia, while 40 per cent is rainfed, 16.5 per cent upland and 4.7 per cent deep-water. I think rice production and introduction of modern varieties of rice depend on this basic structure in future as adoption of HYV

rice depends on the land-use pattern for rice in Indonesia, that is, irrigated, rainfed, upland, deep-water.

Thirdly, Indonesia produces about 50 per cent of ASEAN rice. From my survey in Indonesia, about 75 per cent of the rice produced by farmers is used for home consumption and the amount marketed is thus only 25 per cent of the total.

I would like to know the near future position concerning marketing structures, agricultural co-operatives and the traditional harvesting and other institutions.