

FOOD SUPPLY AND DEMAND IN INDONESIA

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INTRODUCTION

Despite progress in agriculture and food production, the relative decline of agriculture compared to other sectors has been a central feature of Indonesian economic development over the past twenty-five years. While the GDP increased at an annual rate of 7% in real terms, agricultural output increased by only 4.3% between 1969 and 1970. In the same period, the share of agriculture in the GDP fell from 56% to 20%.

Food crops have been the main source of growth in incomes and employment from agriculture. The share of food crops within the agricultural GDP has remained steady at about 60% of the total agricultural value added. Government policies have focused on rice, which is Indonesia's staple food, and have included development and rehabilitation of irrigation systems, price supports for both inputs and output, and the adoption of better production technology. As a result, rice production has grown by 4.5% per annum over the past two decades, and Indonesia, which was once the world's largest importer of rice, has been self-sufficient since 1984.

TRENDS IN FOOD CONSUMPTION

Food consumption patterns are changing in response to rapid economic growth. As incomes increase, nutritional levels improve and diets become more diversified. During the past two decades, the consumption of cereals has continued to expand, and cereals have partially replaced root crops in the national diet (Table 1). Rice consumption has grown at a slower rate than total food consumption. Between 1968 and 1990, according to the food balance sheet, total food consumption grew by 3.9% per annum, while the consumption of rice increased at a rate of 1.7% per annum. The role of wheat as a source of calories has been increasing over the past few years. In 1984, annual wheat

consumption was 6.18 kg per capita, while in 1991 it was 9.17 kg per capita. If this trend continues, it is estimated that in the year 2000 Indonesia will have to import 3 million mt of wheat (Adnyana Made Oka 1993).

The Indonesian feed industry has grown rapidly over the past decade. The commercial poultry sector utilizes approximately 90% of all mixed and concentrated feeds. Modern poultry production is a highly industrialized activity, and is generally located near urban areas. Commercial poultry production grew by 27% per annum in the 1980s, compared with 7% for village poultry, 10% for pork, and 4% for beef. The supply of energy feeds is relatively abundant compared to that of protein feeds. Domestically produced feeds include corn, cassava, and a variety of agroindustrial by-products such as rice bran, copra meal and palm nut meal.

Soybean consumption has increased substantially, from 5.2 kg per capita in 1980 to 9.7 kg in 1990. This increase is partly a result of the increased use of soybean for feed. During the period 1984 - 1990, Indonesia imported an average of 392 thousand mt of soybean annually, or 26% of the annual supply.

Soybean consumption is much higher in Java than in the other islands, and is also higher in urban areas than in rural ones (Table 3).

The consumption of corn for human food is still high compared to other uses. The consumption of corn for feed has been growing rapidly, but from a low base. At present about 6% of corn is used for feed. Unlike soybean, corn consumption is higher in rural than in urban areas. Cassava consumption has declined during the past two decades, particularly in Java. The consumption of fresh and dried cassava is higher among low-income groups, since cassava is cheaper than rice. At present, most of the domestic use of cassava is for human consumption, and only about 15% is used for feed (Pakpahan *et al.*

1992).

The rate of population growth in Indonesia has been declining, and is expected to fall even more over the next two decades. At present, the population growth rate is about 1.9%, and it is expected to be 1.4% at the beginning of the next century. As population growth slows, the age composition of the population changes. Since the early 1970s, the proportion of the Indonesian population between the ages of 15 and 44 has been increasing, and this trend is likely to continue in the next century. At the same time, the proportion of children in the total population is declining. Because adults have higher nutritional needs than children, the aging of the population increases the amount of food needed just to maintain the nutritional status (Magiera 1991). Other demographic factors such as urbanization may also affect food demand. The trend toward urbanization in Indonesia is accelerating, and by 1990 about 30% of the total population was living in urban areas.

Other determinants of food consumption are income levels and income distribution. Economic growth in Indonesia has been quite rapid, with the real GDP growing by 7.7% per annum in the 1970s and by 5.4% during the 1980s. Private consumption expenditure (PCE) is a good indicator of household income, and has exhibited a rather different pattern of growth. Whereas the GDP growth rate fell in the 1980s, the growth in the real PCE rose from 6.3% per annum in the 1970s to 6.7% in the 1980s (Magiera 1991). Although income growth has undoubtedly played an important role in determining the past demand for staple foods, income elasticities are continually declining. In the future, therefore, income levels will probably have less impact on the demand for staples, and more impact on the demand for other foods. It has been estimated that the income elasticity of demand for rice will fall to zero by the year 2000. Because income elasticities in demand are much higher among low-income consumers, income growth that favors low-income consumers or regions could have a significant impact on the demand for staple foods.

Gini coefficients for both rural and urban areas in Indonesia have fallen during the period 1980 - 1987 (Table 2). This indicates an improvement in the distribution of incomes. Any further improvements in the future will, by favoring low-income classes, effectively increase the aggregate expenditure elasticity of demand. As elasticities for food staples are generally higher in rural areas than in urban ones, economic growth in rural areas will improve the relative distribution of

incomes and raise effective expenditure elasticities for Indonesia as a whole. Although the growth in urban incomes has tended to exceed that of rural areas over the past decade, the gap between the growth rates has been smaller in recent years.

The growth in the per capita consumption of high-value foods such as animal products, fruit and vegetables is expected to accelerate over the next two decades. As far as animal products are concerned, the largest increase is expected to be in the consumption of intensively raised poultry. This will mean a big increase in the demand for feed, especially soymeal (Magiera 1991).

TRENDS IN SUPPLY

Between 1969 and 1992, rice production increased at an average rate of 4.7% per annum (Table 3). Rice production in 1992 was 48.2 million mt of unmilled rice, equivalent to 31.4 million mt of milled rice. Rice production in 1993 was slightly lower, however, because of a slight decrease in the area harvested. Higher rice yields as a result of improved technology such as high-yielding varieties, chemical fertilizers and better water management, have been the most important factor in increased rice production.

A decline in the irrigated area, particularly in Java, has so far been offset by an increase in rice cropping intensity and increased yields. However, if this decline continues, it will be difficult for Java to maintain its role as a source of growth for future rice production. The conversion of irrigated rice land to other uses can be expected to continue in the future. In Java, over the past two decades, about half a million ha of irrigated land have been converted to other uses, an average of about 25 thousand ha per year. Of this, 56% was converted into non-agricultural use (real estate, roads, industrial sites etc.) and the rest was converted into non-rice farming, such as brackish water ponds for shrimp and milkfish. A large part of this land had originally been some of the most productive irrigated land in Java. Corn is the second most important food crop, in terms of area harvested and production (Table 3). As with rice, there was a reduction in corn production in 1993 compared to 1992 because of a fall in the harvested area (Table 3). Java is still the most important corn production area, and in 1990 grew 66% of the country's corn. Although corn yields have increased significantly from less than 1 mt/ha in 1969 to more than 2 mt/ha in the 1990s, they are still lower than the world average. Most of the areas planted in corn are not irrigated, and there is still

Table 2. Average per capita expenditure in urban and rural areas of Indonesia

	1980	1981	1984	1987
Urban				
Food (US\$/month*)	405	8,898	13,632	17,494
Non-food items (US\$/month)	272	7,917	11,565	15,919
Total (US\$/month)	678	16,815	25,197	33,413
Gini coefficient	.36	.33	.32	.32
Food share	59.8	52.9	54.1	52.4
Share of cereals	26.3	26.3	22.1	17.9
Share of processed foods	11.0	8.1	14.6	16.6
Rural				
Food (US\$/month)	296	6,210	9,146	12,147
Non-food items	104	3188	4197	5,926
Total	400	9398	13343	18,075
Gini coefficient	.31	.29	.28	.26
Share of food	74.0	66.1	68.5	67.2
Share of cereals	37.7	37.1	34.5	32.4
Share of processed foods	4.9	4.4	7.6	8.4
National average				
Food (US\$/month)	321	6,823	10,199	13,559
Non-food (US\$/month)	142	4,265	5,928	8,566
Total	463	11,088	16,127	22,125
Gini coefficient	.34	.33	.33	.32
Share of food	69.3	61.5	63.2	61.3
Share of cereals	34.5	33.9	30.6	28.6
Share of processed foods	6.6	5.5	9.8	10.6
Ratio of urban to rural expenditure	1.71	1.81	1.91	1.81

1US\$ = 18 Indonesian Rupiah

Source: Biro Pusat Statistik (Magiera 1991).

widespread use of traditional varieties.

Self sufficiency in soybean has been an important objective over the last two decades. The production of soybean increased at a rate of 5.1% per annum from 1969 to 1990 (Table 7), but this was not sufficient to meet the expanding demand for soybean. During the period 1969 - 1974, 84% of increased production was due to an expansion in the harvested area, but this later fell slightly. During the period 1983 - 1988, the contribution of expansion in area planted was only 64%. In 1969, the average soybean yield was 0.7 mt/ha. This increased to slightly more than one mt/ha in the 1990s. There has not been much progress in improving the productivity of soybean, compared to improvements in corn yields, even though soybean has been given a greater price incentive.

The third most important staple food crop is

cassava, 1.4 million ha of which is planted each year. Java still has the greatest share in area planted and production, although this is declining over time. Indonesia is a net exporter of cassava, even though its current level of cassava exports is below the quota established by the EC market. With regard to both production technology, and the demand aspect, there is good potential for expanding cassava production.

The decline in the irrigated area has reopened the debate about the need to increase the production of rice and other food crops, to ensure Indonesia's food security. Future strategies for irrigation and land development must take into account, not only rice production, but also food crop diversification in irrigated rice farming areas. In the year 2005, the demand for cereals in Indonesia is expected to be around 48 million tons, but as mentioned above, the

Table 3. Average growth rate in harvested area, yield and production of food crops in Indonesia, 1969-1990

Crops	1969-73	1974-78	1978-83	1984-90	1969-78	1979-90	1969-90
Area:							
• Rice	0.7	0.8	1	1.2	0.9	1.5	1.3
• Corn	3.8	3	0.5	1.9	0	1.7	0.8
• Soybean	5.9	-2.7	-4.9	6.2	1.2	6.0	3.0
• Cassava	0.6	-2.1	-3	-0.3	-0.4	-0.5	-0.4
• Sugarcane	n.a	10.5	3.7	1.1	10.5	0.2	4.1
Yield:							
• Rice	2.9	2.1	6.5	1.9	2.5	2.9	3.4
• Corn	3.6	4	4.7	3.8	3.9	4.4	4.1
• Soybean	1.1	2.4	-1.2	3.5	1.9	2.7	2.1
• Cassava	-0.1	1.8	0.8	2.1	2.9	2.5	2.5
• Sugarcane	n.a	-1.4	2.2	3.7	-1.4	0.4	0.4
Production:							
• Rice	3.6	2.9	7.5	3.1	3.4	4.4	4.7
• Corn	7.4	7	5.1	5.7	3.9	5.6	4.9
• Soybean	7	-0.3	-6.1	9.7	3.1	8.7	5.1
• Cassava	0.5	-0.2	-2.2	1.8	2.5	2.2	2.0
• Sugarcane	n.a	9.1	6	4.8	9.1	4.2	4.5

per capita consumption of rice is expected to fall while the demand for other foods such as soybean and vegetables will increase.

In Java, many of the irrigation systems are already at an advanced stage of development, but there is still room for improvement, not only in terms of greater water use efficiency, but also with regard to crop diversification in rice-based irrigation systems. One of the alternatives to be considered is the development of groundwater pump irrigation. Pump irrigation is relatively expensive compared to river diversion irrigation, and is best suited to high-value crops such as vegetables and soybean. Using pump irrigation from groundwater in Java would mean a saving of scarce surface water, which in turn would help meet urban and industrial needs. Competition for scarce water resources means that sites should be selected only after careful evaluation of demand and supply in river basins.

Notwithstanding Indonesia's satisfactory economic performance overall, there is a wide range of incomes and about 15% of the population remains below the poverty level. Part of the poverty in rural areas is related to small farm size and the lack of irrigation. However, the use of small-scale

groundwater irrigation facilities makes it possible to target low-income groups as beneficiaries with far greater accuracy than is possible with large-scale irrigation systems (Johnson *et al.* 1993).

Another potential area for expansion is swamp reclamation. From a total of about 39 million ha of swamp, only about 1.4 million ha has been reclaimed, mostly in Sumatera and Kalimantan. Productivity of the reclaimed swampland is much lower than in irrigated areas. Even though the investment cost per unit area for swamp reclamation is much lower than for irrigation development, the cost of improving productivity might be much higher, because of major constraints in the soil and water environment. Furthermore, the economic infrastructure in these areas is not well developed.

It is still possible to improve the productivity of food crops, as indicated by an analysis of the gap between the potential farm yield, obtained in demonstration plots where improved technology is implemented, and actual farm yields. According to Roche *et al.* (1992), it might be difficult to achieve a break-even yield of 1.3 mt/ha of soybean in irrigated areas of western Java, but there is more reason for optimism in eastern Java where the break-

even point is lower and the average yields in research trials are much higher. Corn yields have been improving significantly, and scientists expect that average yields of 2.5 - 5.0 mt/ha will be obtained with better varieties and cultivation practices.

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DISCUSSION

Dr. Mutert of the Potash and Phosphate Institute, Singapore, noted that cassava consumption in Indonesia is declining, and reminded the meeting that Dr. Saleem Ahmed in an earlier paper presentation had recommended a greater emphasis on non-cereal crops, since many root and vegetable crops make more efficient use of land and fertilizer. This fall in cassava consumption might therefore be seen as a move away from sustainability. Dr. Effendi Pasandaran agreed, and pointed out that the consumption of imported wheat is also increasing, but that it is very difficult to change this trend. The decline in cassava consumption reflects the higher incomes and better diets of the Indonesian people.