# Food Consumption Patterns and Related Demand Parameters in Indonesia: A Review of Available Evidence

John A. Dixon

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by

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CONTENTS

Foreword.....iv

1. Introduction.....1

2. Present Consumption Patterns.....2
Calories, Protein, and their Sources.....2
National Consumption Patterns of Basic Staple Foods.....7
Regional and Urban-Rural Differences.....9
Seasonality.....11
Variations by Income Groups.....13

3. Estimation of Demand Parameters.....17
Early Demand Estimates.....17
Demand Parameter Estimates Based on the Susenas V Survey.....21
Grouped Data Estimates.....39

4. Food Consumption Patterns in the Future.....41
Rice.....42
Wheat.....42
Corn and Cassava.....43

Appendix--Supplementary Tables.....45

Bibliography.....50

LIST OF TABLES

1. Per capita daily consumption and the contribution of vegetables, 1974-78.....3
2. Distribution of calories and protein by food groups, 1975-78.....4
3. Distribution of expenditures for the low-expenditure group and the rural and urban population, 1976.....5
4. Total calorie and protein intake estimated from the Susenas V Survey, 1976.....6
5. Food balance sheet estimates of food consumption, 1968-78.....8
6. Annual rural and urban consumption per capita, by crop, 1969/70, 1976, and 1978.....10
7. Comparison of Food Balance Sheet and Susenas estimates of annual consumption per capita, 1969/70, 1976, and 1978.....11
8. Per capita consumption of staples by season, 1976.....12
9. Staple food consumption by the poor, Java, 1969/70 and 1976....16
10. Expenditure elasticities for quantity of rice consumed by expenditure groups for urban and rural areas, 1967.....19
11. Hedley's estimated elasticities of demand by commodity, in rural and urban areas, 1969.....21
12. Elasticities estimated by the Frisch method.....22
13. Elasticities for food and other commodities derived from a linear expenditure system model, 1976.....23
14. Expenditure elasticities for rice from the International Bank for Reconstruction and Development, 1976.....23
15. Elasticities for rice by Alderman and Timmer, by expenditure group, based on Susenas V, 1976.....27
16. Engel functions for rice, Susenas V, 1976.....28
17. Expenditure elasticities by Alderman and Timmer for fresh cassava, based on Susenas V, 1976.....29
18. Consumption functions by Alderman and Timmer for fresh cassava, based on Susenas V, 1976.....30
19. Compensated own-price elasticities by Timmer and Alderman for rice and cassava, Susenas V, 1976.....31
20. Consumption functions for staple foods in rural Java, Susenas V, 1976.....34
21. Consumption functions for staple foods in urban Java, Susenas V, 1976.....35
22. Expenditure elasticities by expenditure groups, Java, Susenas V, 1976.....36
23. Own-price elasticities, Java, 1976.....38
24. Comparison of expenditure elasticities from five Susenas surveys, Java.....40

LIST OF TABLES, continued

25. Specification of regression variables.....45
26. Proportion of population at or below specified expenditure levels.....46
27. Summary of starchy staple consumption data from Susenas V, 1976.....47
28. Consumption functions for rice, Susenas V, 1976.....49

LIST OF FIGURES

1. Distribution of staple food consumption, Java, 1969/70.....14
2. Distribution of staple food consumption, Java, 1976.....15

## FOREWORD

The Rice Policies in Southeast Asia Project is a collaborative effort involving the International Food Policy Research Institute, the International Rice Research Institute, the International Fertilizer Development Center, and researchers and institutions in Indonesia, Malaysia, the Philippines, and Thailand.

As part of the project, a series of working papers was commissioned to provide an overview of the food consumption patterns and related household behavior in the four countries. The papers review and summarize available information on household food consumption by major commodity or commodity group, trends in staple food consumption, differences in consumption patterns among regions and between urban and rural households, and income and price elasticities for foods. Finally, the papers present projections for future demand of food staples.

The working papers are intended to sketch the broad dimensions of food consumption in the four countries and to identify key issues for further study. Rigorous analysis of some of the important issues, including the effects of various agricultural policies on food consumption and nutrition among low-income groups, is now under way by researchers at IFPRI and in the collaborating countries.

Mark W. Rosegrant
Coordinator, Rice Policies
in Southeast Asia Project

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# 1. INTRODUCTION

Rice is the staple of the Indonesian diet, and per capita consumption of rice has been increasing in recent years. Average consumption is now about 120 kilograms per capita per year, of which about 10 percent is supplied by imports. Rice is not the only staple food, however; for large parts of the population and in certain regions, other staples, especially corn and cassava, are important. Sweet potatoes, wheat, and various pulses also contribute significantly to calorie and protein intake. This study examines the size of and variations in staple food consumption in Indonesia and the economic parameters determining that demand. Although rice is the focus, nonrice substitutes are also highlighted in order to examine diversity in the staple food diet and to evaluate the scope for substitution between staples. Finally, estimates are made of future demand for rice and other foods and the impact of various government policies on consumption.

## 2. PRESENT CONSUMPTION PATTERNS

All countries have some variability in consumption, but Indonesia, because it is composed of islands, has more variability than most. As a result, an examination of national average data may miss important regional differences. In addition, consumption patterns vary by season, between urban and rural areas, and by income groups. Whereas too much aggregation hides interesting variations, too much disaggregation of consumption information results in a confusing mass of numbers, patterns, and exceptions. This paper broadly sketches out the patterns and variations in the diet of Indonesians in order to place other estimates, largely based on national aggregated data, in perspective.

### CALORIES, PROTEIN, AND THEIR SOURCES

Indonesians depend heavily on vegetable and cereal sources for calories, protein, and fats. Tables 1 and 2 present data on the average per capita consumption of calories, protein, and fats during the period 1974-78 as well as on the most important food groups.

These estimates are based on Food Balance Sheet (FBS) data;1/ the large share of calories, protein, and fats that came from vegetable sources during these five years is striking. Animal and dairy products, although important, contribute only slightly to calorie, protein, and fat intake. As seen in Table 2, cereals provide more than two thirds of the calories and protein in the diet. In fact, if the staple foods in the cereal and starchy food groups are added together, they account for 77 percent of all calories and 71 percent of all protein. The other major sources of calories are pulses, nuts and oilseeds, oils and fats, and sugar. The other important sources of protein are pulses, nuts and oilseeds, and fish. The remaining food groups are important because they provide necessary vitamins and minerals and add variety to the diet.

A major share of disposable income in Indonesia is spent on food. In both Java-Madura (hereafter referred to as Java) and off Java a larger share of total expenditures goes for food in rural areas than

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1/Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1968-74, RTB77-15 (Jakarta, 1977); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1975, RTB77-18 (Jakarta, 1977); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1976, RTB78-36 (Jakarta, 1978); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1977, RTB79-42 (Jakarta, 1979); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1978, RTB80-48 (Jakarta, 1980).

Table 1--Per capita daily consumption and the contribution of vegetables, 1974-78

| Years | Calories | | Protein | | Fats | |
|---|---|---|---|---|---|---|
| | Total | Share from Vegetables | Total | Share from Vegetables | Total | Share from Vegetables |
| | (kilo-calories) | (percent) | (grams) | (percent) | (grams) | (percent) |
| 1974 | 2,248 | 97.8 | 45.8 | 89.3 | 35.0 | 92.9 |
| 1975 | 2,150 | 98.0 | 45.3 | 88.2 | 33.2 | 93.6 |
| 1976 | 2,231 | 98.0 | 43.7 | 89.7 | 39.6 | 93.2 |
| 1977 | 2,314 | 98.0 | 44.5 | 90.0 | 42.6 | 93.3 |
| 1978 | 2,417 | 97.9 | 47.5 | 89.6 | 46.8 | 93.7 |

Sources: Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1968-74, RTB77-15 (Jakarta, 1977); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1975, RTB77-18 (Jakarta, 1977); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1976, RTB78-36 (Jakarta, 1978); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1977, RTB79-42 (Jakarta, 1979); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1978, RTB80-48 (Jakarta, 1980).

Note: Vegetables here include grains and such other staple foods as pulses, nuts, and roots and tubers. Animal and dairy products are not included.

in urban areas. For the poorer half of the population, the low-expenditure group (LEG), food accounts for more than 80 percent of all expenditures in rural areas and staple foods alone account for almost half of all expenditures. In urban areas a smaller percentage goes for food, but the LEG still allocates more than 70 percent of all expenditures to food (see Table 3). Clearly, food is important, and staple foods are particularly important; thus, government policies affecting the staple food system will affect many people. At present there are more than 70 million people in the LEG in Indonesia.

For comparison, in the developed countries of Europe and the United States food expenditures are 25-35 percent of total expenditures. In South Korea they are 43 percent and in the Philippines, 60 percent. The average figure for Indonesia is 74 percent.2/

2/The size of the Indonesian food expenditure share (74 percent) is influenced by possible underreporting of some nonfood expenditures. In general, the Indonesian expenditure surveys captured only 55-65 percent of total GNP. If all income and expenditures are included, the share for food might decrease somewhat because nonfood expenditures are more likely to be underreported, especially for the higher income levels.

Table 2--Distribution of calories and protein by food groups, 1975-78

| Food Group | Calories | Protein |
|---|---|---|
| | (percent) | |
| Cereals | 66.2 | 67.3 |
| Starchy foods (roots and tubers) | 11.1 | 4.2 |
| Sugar | 4.8 | 0.1 |
| Pulses, nuts, and oilseeds | 8.7 | 15.7 |
| Fruits | 1.5 | 0.9 |
| Vegetables | 0.4 | 1.3 |
| Meat | 0.8 | 2.6 |
| Eggs | 0.2 | 0.5 |
| Milk | 0.2 | 0.6 |
| Fish | 0.7 | 6.7 |
| Oils and fats | 5.3 | 0.0 |

Sources: Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1968-74, RTB77-15 (Jakarta, 1977); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1975, RTB77-18 (Jakarta, 1977); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1976, RTB78-36 (Jakarta, 1978); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1977, RTB79-42 (Jakarta, 1979); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1978, RTB80-48 (Jakarta, 1980).

Notes: Cereals include rice, corn, and wheat. Starchy foods include sweet potatoes, cassava, and sago. Pulses, nuts, and oilseeds include groundnuts, soyabeans, and coconuts/copra. Oils and fats include groundnut oil, copra oil, palm oil, and animal fats.

In Table 1, the estimates of total calories and protein available per capita appear to be high and seem adequate to meet basic needs. In his discussions of minimal calorie requirements, based on the 1973 FAO/WHO recommendations and the distribution by age and body weight of Indonesians, Sajogyo calculates the average minimal requirements to be 1,900 calories and 39.2 grams of protein per day.3/ When these figures are adjusted for "protein score" and a 10 percent loss factor, a minimal daily requirement of 2,100 calories and 45.9 grams of protein is needed. Based on FBS data, therefore, available calories are more than sufficient and protein is just adequate.

3/The question of minimal calorie requirements is discussed in Professor Sajogyo, "Kecukupan Kalori dan Zat Gizi Yang di Anjurkan untuk Indonesia" [Suggested Calorie and Nutrient Requirements for Indonesia] (mimeographed, no date), and "Tingkat Pendapatan Rumah Tangga dan Kecukupan Gizi" [Household Income Level and Nutritional Sufficiency], Widya Karya Nasional Pangan dan Gizi [National Workshop on Food and Nutrition], Bogor, July 10-14, 1978.

Table 3--Distribution of expenditures for the low-expenditure group and the rural and urban population, 1976

| Area | Percentage of Total Expenditures on All Food | Staple Foods | Nonfood Items | Average Per Capita Expenditures (Rp/month) |
|---|---|---|---|---|
| Java | | | | |
| Rural LEG | 82.5 | 50.7 | 17.5 | 2,096 |
| Rural total | 76.2 | 38.1 | 23.8 | 3,444 |
| Urban LEG | 72.6 | 33.5 | 27.4 | 3,427 |
| Urban total | 60.4 | 18.1 | 39.6 | 6,966 |
| Off Java | | | | |
| Rural LEG | 83.7 | 45.6 | 16.3 | 2,705 |
| Rural total | 79.4 | 34.8 | 20.6 | 4,705 |
| Urban LEG | 76.7 | 36.4 | 23.3 | 3,538 |
| Urban total | 70.3 | 23.8 | 29.7 | 6,443 |

Source: Indonesia, Central Bureau of Statistics, Susenas V, Pengeluaran Untuk Konsumsi Penduduk, Jawa-Madura, Luar Jawa, Indonesia [Susenas V, Population Consumption Expenditures, Java-Madura, Off Java, Indonesia], VUS79-29 (Jakarta, 1979), Tables 3.1, 3.2.

Notes: The lower expenditure group (LEG) contains the poorest half of the population in each category (for instance, rural Java). Staple foods include all cereals/grains and starchy foods (cassava, sweet potatoes, sago, and squash). Sugar is not included. The LEG figures were calculated by weighting each expenditure subgroup's expenditures by its population share. Expenditures are not just cash outlays for food and other goods and services. Especially in the rural sector, many foods and other goods are produced on the farm or received in kind as payment for labor or rent. These are valued at the local market prices for such goods.

Aggregate figures do not, however, provide information on intake by the various income groups. As seen in Table 3, most of the people in the LEG spend a large share of their budget on food, staple foods in particular.

In an attempt to measure the calorie intake of the poorer sections of the population, Hutabarat calculated calories from all foods reported in the 1976 National Socioeconomic Expenditure Survey (Susenas), and made some adjustments for foods not reported. His results are presented for Indonesia as a whole and are not broken down into rural and urban areas.4/ His adjusted figures, which include an

4/Pos M. Hutabarat, "Proyeksi Distribusi Konsumsi Kalori Menurut Kelompok-Kelompok Pendapatan di Indonesia Tahun 1980" [Projections of the Distribution of Caloric Consumption by Income Groups in Indonesia in 1980] (M.S. thesis, Bogor Agricultural University Graduate School, 1979), p. 64.

upward adjustment for the LEGs, still show extremely low calorie and protein intake for many people. Table 4 presents these results.

The three lowest expenditure groups contain about 58 percent of the total population. The average consumption of calories by this group was 1,797 kilocalories per capita per day (or 87 percent of the estimated national average), and the average protein intake was 32.2 grams per capita per day (or only 74 percent of the national average). If the overall figures are compared to the calorie and protein estimates from the 1976 FBS (Table 1), one sees that Hutabarat's national estimates are much lower for calories and about the same for protein. When Hutabarat's estimates for the three lowest expenditure groups are compared with Sajogyo's estimates of calorie and protein requirements, it is clear that the calorie and protein intake of these groups (comprising more than half of the total Indonesian population) is much lower than required.

Underreporting of consumption does occur and some foods may not have been included in these surveys. Actual calorie intake may therefore be higher than these estimates. The final result is not changed, however: whereas calorie and protein consumption on average appear adequate to meet nutritional needs in Indonesia, a serious nutritional problem appears to exist for a number of people.

Table 4--Total calorie and protein intake estimated from the Susenas V Survey, 1976

| Monthly Expenditures Per Capita | Share of Total Population | Calories Per Capita Per Day | Protein Per Capita Per Day |
|---|---|---|---|
| | (percent) | (kilocalories) | (grams) |
| Less than Rp 2,000 | 15.3 | 1,381 | 22.2 |
| Rp 2,000-2,999 | 23.8 | 1,870 | 32.3 |
| Rp 3,000-3,999 | 19.5 | 2,034 | 40.2 |
| Rp 4,000-4,999 | 13.6 | 2,084 | 47.0 |
| Rp 5,000-5,999 | 8.8 | 2,288 | 52.7 |
| Rp 6,000-7,999 | 9.4 | 2,533 | 60.9 |
| Rp 8,000-9,999 | 4.2 | 2,794 | 69.7 |
| Rp 10,000-14,999 | 3.8 | 3,066 | 79.1 |
| More than Rp 15,000 | 1.6 | 3,284 | 93.3 |
| Average | | 2,064 | 43.3 |

Source: Pos M. Hutabarat, "Proyeksi Distribusi Konsumsi Kalori Menurut Kelompok-Kelompok Pendapatan di Indonesia Tahun 1990" [Projections of the Distribution of Caloric Consumption by Income Groups in Indonesia in 1990] (M.S. thesis, Bogor Agricultural University Agricultural School, 1979)

Note: Up to November 15, 1978, the exchange rate for rupiahs was U.S. $1 = Rp 415. Since then, U.S. $1 = Rp 625.

## NATIONAL CONSUMPTION PATTERNS OF BASIC STAPLE FOODS

National consumption patterns for individual foods are found in the FBS data. Although such estimates are limited by the problems inherent in preparing food balance sheets, they provide a broad picture of consumption and capture major changes. The FBS estimates for Indonesia of the availability of major staples for the past decade are presented in Table 5. Average annual rice consumption increased marginally from less than 110 kilograms per capita in the late 1960s and early 1970s to a range of 115-120 kilograms per capita in the last few years. If averages of the FBS data in Table 5 are taken for 1968-70, 1971-73, and 1975-78, the following pattern emerges:

| | 1968-70 | | 1971-73 | | 1975-78 | |
|---|---|---|---|---|---|---|
| Crop | Kilogram | Kilocalorie | Kilogram | Kilocalorie | Kilogram | Kilocalorie |
| Rice | 103.7 | 1,040 | 111.4 | 1,117 | 118.7 | 1,190 |
| Corn, grain | 21.5 | 206 | 20.6 | 200 | 21.9 | 209 |
| Cassava, fresh equivalent | 57.4 | 154 | 50.9 | 137 | 71.6 | 192 |
| Sweet potatoes | 18.0 | 47 | 16.4 | 43 | 15.6 | 41 |

Reported average yearly consumption of corn was constant at about 20 kilograms per capita, whereas cassava consumption fluctuated and sweet potato consumption declined slightly. Because of different calorie densities (cassava and sweet potatoes average about 25-30 percent of the total caloric value of rice or corn per unit weight), total calories available from cassava were about equal to those from corn. Sweet potatoes were much less important as a calorie source.

The usefulness of FBS data is limited because of problems in estimating total production, especially for crops other than rice, and difficulties in determining nonfood uses for the various foods. Another major drawback of FBS estimates is that they give no picture of the spatial or temporal variations, which are so interesting in Indonesia. Fortunately, however, Susenas data allow for disaggregation. This survey was first conducted in 1963/64 and is presently in its eighth round. Susenas I (1963/64) and Susenas II (1964/65) were small-sample, single-period expenditure surveys. Few published results from Susenas III (1967) are available.5/ Susenas IV (1969/70) was a two-round survey covering most of Indonesia. This was followed by Susenas V (1976), a three-round, year-long survey. Susenas VI (1978) had four rounds, and the initial results have just been published. Susenas VII (1979) has two rounds and is as yet unpublished.

5/Susenas III may have had an expenditure component, one that was used by Timmer in his 1971 article, but no public records from this survey were found by the author. See C. Peter Timmer, "Estimating Rice Consumption," Bulletin of Indonesian Economic Studies, July 1971.

Table 5--Food balance sheet estimates of food consumption, 1968-78

| Year | Rice[a/] | Corn[b/] | Cassava[c/] | Sweet Potatoes | Wheat | Soyabeans | Sugar[d/] |
|---|---|---|---|---|---|---|---|
| | (kilograms per capita per year) | | | | | | |
| 1968 | 96.5 | 26.2 | 64.5 | 19.1 | 3.3 | 3.3 | 10.6 |
| 1969 | 106.0[e/] | 17.4 | 56.5 | 17.9 | 2.6 | 3.1 | 11.4 |
| 1970 | 108.6 | 20.8 | 51.2 | 16.9 | 3.5 | 3.8 | 11.2 |
| 1971 | 108.0 | 18.7 | 47.9 | 16.7 | 4.7 | 3.9 | 12.6 |
| 1972 | 108.3 | 16.7 | 48.1 | 15.3 | 3.0 | 3.8 | 12.2 |
| 1973 | 118.0 | 26.5 | 56.6 | 17.2 | 3.6 | 3.6 | 11.2 |
| 1974 | 115.6 | 20.7 | 59.0 | 17.4 | 4.9 | 4.1 | 12.7 |
| 1975 | 114.2 | 20.6 | 60.8 | 16.8 | 4.0 | 4.0 | 10.1 |
| 1976 | 116.2 | 18.3 | 76.0 | 16.0 | 5.1 | 4.7 | 10.9 |
| 1977 | 120.9 | 21.5 | 75.7 | 16.2 | 4.0 | 4.0 | 11.1 |
| 1978 | 123.4 | 27.2 | 74.0 | 13.4 | 4.1 | 4.9 | 11.7 |

Sources: Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1968-74, RTB77-15 (Jakarta, 1977); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1975, RTB77-18 (Jakarta, 1977); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1976, RTB78-36 (Jakarta, 1978); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1977, RTB79-42 (Jakarta, 1979); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1978, RTB80-48 (Jakarta, 1980).

a/Rice includes milled rice only.
b/This does not include fresh corn (jagung muda).
c/This does not include cassava starch; cassava is given fresh root equivalent.
d/Includes all sugars: gula pasir (refined sugar), gula mangkok/tebu (brown coarse sugar), and gula kelapa/aren (palm sugar).
e/Estimated by Leon Mears.

Though there are year to year variations, Susenas surveys generally follow a common format: a random sample of households is selected and asked questions about family expenditures and consumption during the preceding week for food. the preceding month for clothing and other consumer items, and the preceding several months for durables. Home production is included and valued at local market prices. For most foods and all staples, both quantities and expenditures (in local market values) are reported. These data are presented in tables that divide the surveyed population into expenditure groups based on total reported per capita expenditures. In Susenas V and VI, for example, there are 12 expenditure subgroups: from less than Rp 1,000 per capita per month to over Rp 30,000 per capita per month. Children and adults are each counted as one in the per capita calculations.

## REGIONAL AND URBAN-RURAL DIFFERENCES

The most basic division of consumption patterns is between Java and the rest of the country. In general, people off Java have a more rice-centered diet than people on Java (see Table 6). This is especially true in rural areas; most urban people, whether on or off Java, rely on rice for staple food consumption. Table 6 compares consumption patterns in 1969/70, 1976, and 1978 by region, urban or rural location, and island group. Overall average per capita rice consumption has fluctuated around a rising trend; the largest increase has been in rural Java. Whereas urban rice consumption has traditionally been higher than rural consumption, this difference has narrowed. In 1978, in fact, the aggregate urban and rural figures were identical.

The most noticeable phenomena concerning nonrice foods are the decreases in rural corn consumption between 1967-70 and 1976-78 and the decreasing diversity in urban staple food diets; corn, dried cassava (gaplek), and sweet potatoes have all become less important in urban areas during the past decade.

Care should be used in interpreting these data. The 1969/70 figures are based on a five-month, end-of-year period; this is the traditional paceklik season, or period of food scarcity before the main rice harvest. During this period, consumption of rice substitutes like corn, fresh cassava, and gaplek increases. The 1976 and 1978 figures are for year-long periods, so most of this bias is removed. In spite of these caveats, the trends in these data based on expenditure surveys are similar to the FBS estimates based on production presented in Table 5.

If the FBS and Susenas estimates of per capita consumption are compared, it can be seen that in general the Susenas estimates are lower for all commodities. The two estimates of rice consumption are close but the estimates for the other staples vary greatly (see Table 7).

There are several reasons for this disparity. The FBS estimates are based on production; they derive availability for consumption as a residual after accounting for imports, exports, seed, feed, wastage, and industrial uses. The Susenas results are built up from reported consumption and expenditures. Therefore, any food used in a processed or prepared form (such as rice flour or cassava flour) appears in a different category. This bias leads to underestimation of total consumption of any food in the Susenas results.

The FBS figures for production of staples other than rice (especially cassava, corn, and sweet potatoes) may be overestimated because these estimates are difficult to make, given the complicated intercropping patterns practiced in unirrigated areas. Because these staples are inferior to rice, their actual consumption in the Susenas surveys may be underreported as well. If both of these biases are included (overreporting of production and underreporting of consumption), the true per capita consumption figures for corn, cassava, and sweet potatoes would lie between the FBS and Susenas estimates. For rice, the one noninferior good in Table 7, the discrepancy is much smaller: production estimates are more carefully and accurately made and there is less incentive to underreport consumption.

Table 6--Annual rural and urban consumption per capita, by crop, 1969/70, 1976, and 1978

| Region/Crop | 1969/70 | | | 1976 | | | 1978 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Rural | Urban | Total | Rural | Urban | Total | Rural | Urban |
| | (kilograms) | | | | | | | | |
| Indonesia | | | | | | | | | |
| Rice | 103.2 | 101.3 | 113.8 | 111.2 | 110.5 | 114.3 | 109.2 | 109.2 | 109.2 |
| Corn | 22.0 | 25.4 | 3.2 | 9.9 | 11.9 | 0.7 | 11.4 | 14.0 | 1.0 |
| Cassava, fresh | 21.9 | 23.7 | 12.3 | 26.2 | 29.9 | 9.5 | 20.2 | 22.9 | 8.8 |
| Cassava, gaplek | 7.7 | 8.9 | 1.4 | 6.4 | 7.9 | 0.2 | 7.3 | 8.8 | 0.0 |
| Sweet potatoes | 8.8 | 9.6 | 4.3 | 10.8 | 12.3 | 4.1 | 5.7 | 6.2 | 2.6 |
| Java | | | | | | | | | |
| Rice | 92.7 | 89.8 | 108.5 | 103.3 | 102.4 | 107.3 | 99.8 | 98.8 | 104.0 |
| Corn | 28.2 | 33.3 | 2.9 | 11.5 | 14.0 | 0.5 | 15.1 | 17.7 | 1.0 |
| Cassava, fresh | 21.4 | 23.3 | 11.5 | 21.6 | 24.9 | 6.7 | 20.3 | 22.9 | 7.8 |
| Cassava, gaplek | 9.5 | 11.1 | 1.7 | 8.0 | 9.7 | 0.1 | 9.4 | 11.4 | 0.0 |
| Sweet potatoes | 7.9 | 8.6 | 4.2 | 7.5 | 8.4 | 3.4 | 3.6 | 4.2 | 2.6 |
| Off Java | | | | | | | | | |
| Rice | 123.1 | 122.7 | 126.6 | 124.8 | 124.4 | 126.6 | 130.0 | 130.0 | 119.6 |
| Corn | 10.2 | 11.2 | 3.8 | 7.0 | 8.3 | 1.1 | 5.7 | 6.8 | 1.6 |
| Cassava, fresh | 22.9 | 24.3 | 14.0 | 34.2 | 36.5 | 14.4 | 20.2 | 22.4 | 10.4 |
| Cassava, gaplek | 4.3 | 4.9 | 0.5 | 3.8 | 4.6 | 0.3 | 3.1 | 3.6 | 0.0 |
| Sweet potatoes | 10.5 | 11.3 | 4.7 | 16.4 | 18.8 | 5.3 | 8.8 | 10.4 | 2.6 |

Sources: The figures for 1969/70 are from Indonesia, Central Bureau of Statistics, Susenas IV, Laporan 3 (Jakarta, no date), pp. 187-203. The 1976 figures are from Indonesia, Central Bureau of Statistics, Susenas V, Pengeluaran Untuk Konsumsi Penduduk, Jawa-Madura, Luar Jawa, Indonesia [Susenas V, Population Consumption Expenditures, Java-Madura, Off Java, Indonesia], VUS79-29 (Jakarta, 1979), pp. 42-82; and the 1978 figures are from Susenas VI, Series B, VUS81-34 (Jakarta, 1981).

Note: Some discrepancies between total, rural, and urban data come from rounding. Rice does not include glutinous rice or rice products. Corn is corn grain only and does not include corn flour. Cassava flour is not included. Gaplek is dried, sliced cassava and has not been converted to fresh root equivalent.

Table 7--Comparison of Food Balance Sheet and Susenas estimates of annual consumption per capita, 1969/70, 1976, and 1978

| Crop | 1969/70 | | 1976 | | 1978 | |
|---|---|---|---|---|---|---|
| | FBS[a] | Susenas IV | FBS | Susenas V | FBS | Susenas VI |
| | (kilograms per capita) | | | | | |
| Rice | 107.3 | 103.2 | 116.2 | 111.2 | 123.4 | 109.2 |
| Corn | 19.1 | 22.0 | 18.3 | 9.9 | 27.2 | 11.4 |
| Cassava, fresh and dried)[b] | 53.9 | 41.1 | 76.0 | 42.2 | 74.0 | 38.5 |
| Sweet potatoes | 17.4 | 8.8 | 16.0 | 10.8 | 13.4 | 5.7 |

Sources: The Food Balance Sheet estimates are from Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1968-74, RTB77-18 (Jakarta, 1977); Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1976, RTB78-36 (Jakarta, 1978); and Indonesia, Central Bureau of Statistics, Food Balance Sheets, 1978, RTB80-48 (Jakarta, 1980). The Susenas estimates are from Indonesia, Central Bureau of Statistics, Susenas IV, Laporan 3 (Jakarta, no date); Indonesia, Central Bureau of Statistics, Susenas V, Pengeluaran Untuk Konsumsi Penduduk, Jawa-Madura, Luar Jawa, Indonesia [Susenas V, Population Consumption Expenditures, Java-Madura, Off Java, Indonesia], VUS79-29 (Jakarta, 1979); and Indonesia, Central Bureau of Statistics, Susenas VI, Series B, VUS81-34 (Jakarta, 1981).

a/The 1969/70 FBS estimate is the simple average of the two years.
b/Cassava is expressed in fresh root equivalent; dried forms are converted to fresh root equivalent using a 1:2.5 ratio; starch has not been included in the Susenas figures.

A last source of error is in the population estimates used in calculating the FBS figures. The just-completed 1980 census found actual population to be higher than expected. Thus, the 1976 and 1978 FBS results should be reduced because the total population in those years apparently was higher than originally calculated. This change does not affect the Susenas results.

In this study the Susenas results are relied on heavily because, even with the possible biases mentioned above, they are the most complete, consistent sets of available data on consumption patterns in Indonesia. If the slight underreporting of certain nonrice foods is taken into consideration, the Susenas data can be used to provide disaggregated information on food intake.

## SEASONALITY

In Indonesia staple food consumption patterns vary by season, especially in rural areas. Because Indonesia's population is still 80

percent rural, the patterns of harvesting, seasonal food availability, and seasonal changes in relative prices cause major adjustments in the staple foods consumed during the course of the year. This is especially true for poor consumers who have limited resources and spend a large share of their total expenditures on food.

Measuring seasonality in consumption is difficult. Information is required on dietary patterns at several times during the year. The 1976 Susenas survey was carried out in three discrete subrounds. The patterns observed seem to reflect the cycles of harvesting (and availability) of major staples, especially in rural areas. There is less variation in urban areas because almost all staple foods are purchased, not produced, and rice is the dominant staple.

Table 8 shows the annual consumption rate in kilograms per capita, based on the weekly consumption rate reported in each subround in 1976 and the yearly rate from the entire survey (Table 6).

These patterns reflect the general harvesting schedule. The main rice harvest occurs from March to May; rice consumption is highest then (and rice prices are lowest). Corn is usually harvested in January and cassava in the mid-year period, although fresh roots may be harvested earlier, especially during the paceklik period before harvest of the main rice crop. In 1976, for example, rice shortages and high rice prices early in the year led to substantial early harvesting of fresh cassava, as reflected in subround I. Usually fresh cassava consumption would peak in subrounds II and III.

The examination of seasonal consumption patterns is a valuable exercise but one that requires considerable care and caution. Unusual agricultural conditions in any year may influence patterns in unexpected ways. Therefore, comparable data from several years are

Table 8--Per capita consumption of staples by season, 1976

| Crop | 1976 | Annual Rate[a/] Subround I (January-April) | Subround II (May-August) | Subround III (September-December) |
|---|---|---|---|---|
| | | (kilograms per capita) | | |
| Rice | 111.2 | 113.6 | 115.5 | 105.5 |
| Corn, grain | 9.9 | 12.2 | 8.7 | 8.8 |
| Cassava, fresh | 26.2 | 33.1 | 26.9 | 17.0 |
| Cassava, dried | 6.4 | 5.6 | 7.2 | 6.6 |
| Sweet potatoes | 10.8 | 12.4 | 10.6 | 9.1 |

Source: Indonesia, Central Bureau of Statistics, Susenas V, VUS79-24, VUS79-25, and VUS79-26 (Jakarta, 1979).

Note: The figures for the 1976 column are from Table 6.

a/These are the rates based on consumption in the subrounds listed.

needed, as well as information about crop-specific problems in any given year. One expects rural consumption to exhibit larger seasonal variations than urban consumption because of the greater reliance on domestic production in rural areas and the larger importance of non-rice staples.

## VARIATIONS BY INCOME GROUPS

As a rule, poor people not only consume less food than rich people, but different foods. Poor rural Indonesians consume more nonrice staples such as corn, cassava, and sweet potatoes. This is because of the lower cost per calorie of these foods and because many poor people live in upland, rainfed areas where these crops are more common than irrigated rice. Poor people in the lowland, wet rice (sawah) areas consume more rice.

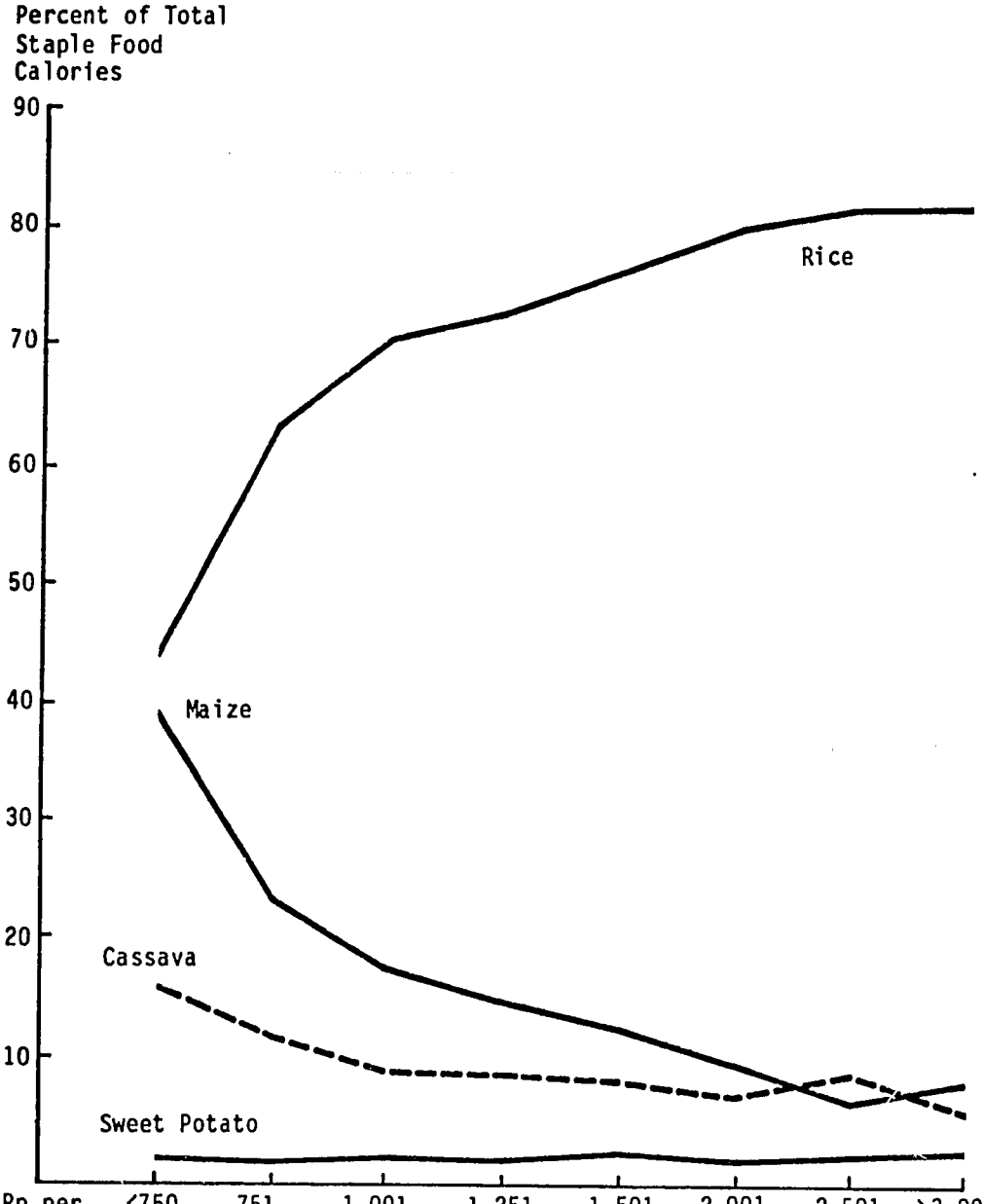
Figures 1 and 2 show the distribution of staple food calories from rice, corn, cassava, and sweet potatoes for Java, both urban and rural, based on the 1969/70 and 1976 Susenas surveys. The poorer parts of the population diversify their staple food diet much more than the higher expenditure groups, although richer people consume a greater variety of foods overall.

If this approach is taken one step further and urban and rural areas are examined separately (Table 9), the differences are striking. Even for the poorest half of the population in urban areas, rice is the main staple food; its importance appears to have been increasing. In rural areas rice consumption has also increased, but there is much more diversity. The 1969/70 survey was conducted during the main corn harvest and this is reflected in the data.

The results in Table 9 are for Java. An examination of data for the other regions or for Indonesia as a whole would show less staple food diversity among poor people because rice is more important and corn is less important in diets off Java.

In conclusion, staple food consumption patterns in Indonesia are not uniform. The differences by region, by urban or rural residence, by season, and by income group are all important in understanding what determines demand for different staple foods and how basic economic forces and government policy affect the consumption and nutrition of different groups in the population.

Figure 1. Distribution of staple food consumption, Java, 1969/70

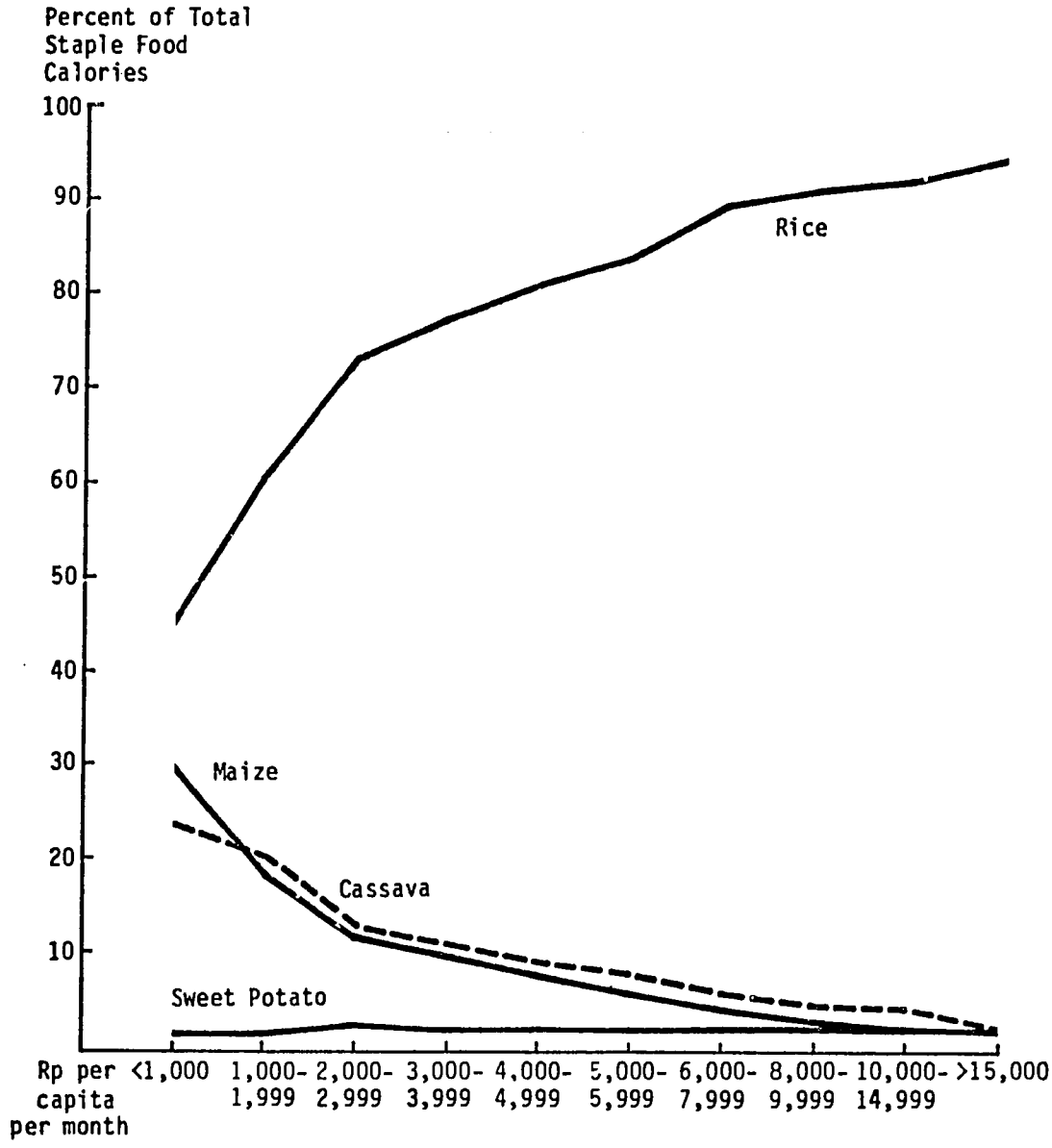



| Rp per capita per month | <750 | 751-1,000 | 1,001-1,250 | 1,251-1,500 | 1,501-2,000 | 2,001-2,500 | 2,501-3,000 | >3,000 |
|---|---|---|---|---|---|---|---|---|
| Percent of Population | 31.4 | 20.3 | 14.7 | 10.2 | 11.6 | 5.5 | 2.6 | 3.8 |

Source: Data from Susenas IV presented in Lie Goan-Hong, "Average Food Consumption," p. 52.

Figure 2--Distribution of staple food consumption, Java, 1976

Percent of Total




Source: Special computer runs made by the author using Susenas V data.

Table 9--Staple food consumption by the poor, Java, 1969/70 and 1976

| | Expenditure Groups | Percent of Total Population | Calories Per Person Per Day | | Share of the Four Staples | | | |
|---|---|---|---|---|---|---|---|---|
| | | | All Foods | Four Staples | Rice | Maize | Cassava | Sweet Potatoes |
| | | | | | (percent) | | | |
| Susenas IV (1969/70) | | | | | | | | |
| Rural | 1-4 | 56.8 | 1,398 | 1,225 | 49.0 | 34.9 | 14.9 | 1.3 |
| Urban | 1-6 | 53.7 | 1,225 | 1,023 | 88.1 | 5.6 | 5.7 | 0.7 |
| Susenas V (1976) | | | | | | | | |
| Rural | 1-3 | 53.0 | 1,305 | 1,160 | 67.4 | 14.6 | 16.3 | 1.8 |
| Urban | 1-6 | 57.6 | 1,293 | 1,061 | 96.0 | 0.9 | 2.3 | 0.9 |

Sources: The Susenas IV calculations are from Lie Goan-Hong, "Average Food Consumption," pp. 54-56. The Susenas V calculations are from special computer runs made by the Central Bureau of Statistics using the 1976 Susenas data.

Note: Data from the 1978 Susenas survey are not yet available in this format. The figures for total calories per person per day are low. This is due both to low consumption and to exclusion of some foods from the calculations. Although these figures may be 10-15 percent low, the interesting numbers are the percentage distributions of calories among the four staples included.

## 3. ESTIMATION OF DEMAND PARAMETERS

Demand parameters can be analyzed in several ways. A graphical or tabular examination of the patterns of consumption and changing trends can be made for different regions or income groups. As incomes rise, the rapid decrease in the percentage of staple food calories provided by nonrice staples is evident (Figure 1). The changing nature of rice consumption is reflected in Table 6. Previously, average rice consumption was larger in urban areas than in rural areas, but by 1978 there was no difference for Indonesia as a whole. Urban consumption was still marginally larger on Java, and the reverse was true off Java. Seasonal and regional variations are also brought out by simple tabular analysis.

Quantitative estimates of elasticities can also be made. The expenditure elasticity of demand is the most easily estimated elasticity. If an increase in income or total expenditures causes an increase in demand for a commodity, the commodity is a normal good. If demand for the commodity declines with increases in income or expenditures, it is an inferior good. Expenditure elasticities can be estimated from either time-series data or cross-sectional data. Own-price elasticities are estimates of changes in demand for a particular food when its price changes and all other prices are unchanged. Cross-price elasticities are estimates of changes in demand for a food when the relative price of another food changes; for instance, how the demand for rice is affected when the price of corn increases. Both own- and cross-price elasticities are difficult to estimate using cross-sectional data, because there might not be enough variation in prices to give meaningful results.

A number of authors have estimated demand elasticities for rice and other foods in Indonesia. Estimating procedures vary, the data sets used are not always the same, and results differ. These studies will now be examined in detail so that the quality of the data, the estimating procedures used, the assumptions made, and the final results can all be evaluated.

### EARLY DEMAND ESTIMATES

The expenditure elasticity of demand for rice is a parameter of great interest to policymakers and economists. The aggregate elasticity estimated for the whole country is an aid to understanding the impact of national per capita income growth on rice consumption. If there are either differences in the growth of per capita income or a redistribution of a given amount of wealth among income groups, the income-specific expenditure elasticities indicate what will happen to total demand. Whereas poor consumers usually have a much higher expenditure elasticity for rice than richer ones, the amount they

consume per capita is less than that consumed by richer consumers. This means that an increase in total demand for rice is less than certain if income is redistributed from the rich to the poor.

In 1971 Timmer estimated expenditure elasticities for rice using two different cross-sectional surveys.6/ The first set of estimates was based on a Jakarta household consumption survey made between November 1968 and January 1969. The results showed the classic pattern of expenditure elasticities declining as expenditure increased.

| Total Monthly Expenditures on Rice per Household (Rp) | Expenditure Elasticity |
|---|---|
| 1,000 | 1.45 |
| 2,000 | 1.03 |
| 3,500 | 0.77 |
| 5,000 | 0.64 |
| 10,000 | 0.45 |
| 25,000 | 0.28 |
| 50,000 | 0.20 |

Timmer noted three caveats: first, these were urban, cross-sectional elasticities, not time series; second, they were expenditure elasticities, not income elasticities, so that savings were not included although they would probably be small for low- and middle-expenditure consumers; and finally, these elasticities were for the value of expenditures on rice, not the quantities of rice consumed. There is a definite "quality elasticity," perhaps as large as 0.2, which indicates that wealthier consumers not only increase the amount of rice consumed per capita, but also purchase higher quality, more expensive rice. The average elasticity of demand for rice, based on average food expenditures for the sample, was 0.55 (or only 0.35 if the quality component was subtracted); based on average total expenditure (food plus nonfood), the elasticity of demand for rice was 0.45 (or 0.25 if the quality component was subtracted).

In a second estimate, Timmer used the household expenditure survey for Java done in September and October 1967 (Susenas III). This survey included all five provinces on Java (Jakarta, Yogyakarta, East Java, Central Java, and West Java) and both urban and rural areas. It reported both physical quantities and values of rice consumed. Timmer estimated expenditure elasticities for quantity of rice consumed by three expenditure classes (low, medium, and high) for both urban and rural areas.7/ Weighted by population shares, the average elasticity was 0.74 in rural areas and 0.44 in urban areas (see Table 10).

The overall figure for Java, weighting the urban and rural estimates by their population shares, was 0.69 for 1967. Adjusted for changes in per capita income between 1967 and 1970, the final estimate for Java was 0.65. The average expenditure elasticity of Jakarta consumers was only 0.19 in 1967.

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6/ Ibid.

7/ Ibid., p. 77.

Table 10--Expenditure elasticities for quantity of rice consumed by expenditure groups for urban and rural areas, 1967

| Region | Urban Expenditure Groups | | | | Rural Expenditure Groups | | | |
|---|---|---|---|---|---|---|---|---|
| | Under Rp 300 (Low) | Rp 301-1,000 (Medium) | Above Rp 1,000 (High) | Weighted Average | Under Rp 300 (Low) | Rp 301-1,000 (Medium) | Above Rp 1,000 (High) | Weighted Average |
| Jakarta | 0.19 (0.0465)[a] | 0.19 (0.6952) | 0.19 (0.2583 | 0.19 | --- | --- | --- | --- |
| West Java | 0.75 (0.1032) | 0.47 (0.7660) | 0.05 (0.1308) | 0.44 | 0.73 (0.2239) | 0.52 (0.7008) | 0.15 (0.0753) | 0.54 |
| Central Java | 0.42 (0.2371) | 0.42 (0.7053) | 0.42 (0.0576) | 0.42 | 0.76 (0.5504) | 0.67 (0.4291) | 0.31 (0.0205) | 0.71 |
| East Java | 0.89 (0.1608) | 0.47 (0.7526) | 0.23 (0.0866) | 0.52 | 1.71 (0.4490) | 0.69 (0.5391) | 0.42 (0.0119) | 1.14 |
| All Java[b] | 0.75 (0.1371) | 0.44 (0.7217) | 0.13 (0.1412) | 0.44 | 0.92 (0.4238) | 0.63 (0.5434) | 0.34 (0.0328) | 0.74 |

Source: Graphical analysis of the Indonesia, Central Bureau of Statistics, Java Cross-Section Survey of Household Expenditures, September and October 1967, in C. Peter Timmer, "Estimating Rice Consumption," Bulletin of Indonesian Economic Studies, July 1971.

a/The figures in parentheses are population weights.
b/The weighted average elasticity for urban and rural Java combined is 0.69. The relative population weights are: urban (0.1635) and rural (0.8365).

Timmer also discussed the own-price elasticity for rice. After considering a number of factors, including substitutes for rice and cross-price effects, he concluded that:

> Since an own price effect by itself will contain some of the effect from closely competing commodities, the own price elasticity should drop in absolute terms when separate price effects are introduced. A range of -0.1 to -0.3 seems reasonable. At the same time, the cross substitution effects in Indonesia seem very high, presumably because there are five major carbohydrates from which to choose and they fill such similar roles in the diet. On these a priori and impressionistic grounds, the value of the cross price elasticity will be assumed to be in the range of 0.3 to 0.5. To recapitulate, if the demand equation contains only an own price effect, the value of the price elasticity will be set at -0.5. If the demand equation contains both an own price and a cross price term for closely competing carbohydrates, the own price elasticity will be in the range of -0.1 to -0.3 and the cross price elasticity will be 0.3 to 0.5.8/

In 1978 Douglas Hedley presented results of estimates done by Boediono at Gadjah Mada University.9/ Boediono, using a Linear Expenditure System and data for all Indonesia from the Susenas IV survey of 1969-70, found that only cereals and housing were necessities since they had expenditure elasticities less than 1.0; all other consumption categories included were "luxuries." Boediono used grouped data and made estimates for nine commodity groups (see Table 11). Foods were divided into four subgroups: cereals, fish, tobacco, and other food. Cereals included rice, corn, and wheat (it is not clear if tubers and root crops were included). Since in Indonesia corn is usually considered an economically inferior food, its inclusion in this group would pull down the average expenditure elasticity.

Although some details of Boediono's study are not clear, two points need to be made: the cereals category combined both normal and superior foods (rice and wheat) with inferior ones (corn and, if included, cassava and sago); the estimates were probably made on value, not quantity, and so tended to overestimate demand for physical quantities of rice since both quantity and average quality or price per kilogram increase as expenditures increase. These two effects work in opposite directions: the first effect tends to depress the expenditure elasticity estimate whereas the second tends to increase it. These results are comparable to Timmer's estimates based on the 1967 expenditure survey for Java:

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8/Ibid., pp. 80-81.

9/Douglas D. Hedley, "Supply and Demand for Food in Indonesia," paper presented at the Workshop on Research Methodology, Department of Agricultural Economics and Rural Sociology, Bogor Agricultural University, March 1978.

Table 11--Hedley's estimated elasticities of demand by commodity, in rural and urban areas, 1969

| Commodity | Demand Elasticities Based on Expenditures | | Demand Elasticities Based on Prices | |
|---|---|---|---|---|
| | Rural | Urban | Rural | Urban |
| Cereals | 0.71 | 0.50 | -0.68 | -0.51 |
| Fish | 1.30 | 1.18 | -1.06 | -1.03 |
| Tobacco | 1.13 | 1.11 | -0.93 | -0.97 |
| Other food | 1.13 | 1.16 | -0.95 | -1.01 |
| Housing | 0.84 | 0.98 | -0.71 | -0.87 |
| Clothing | 1.12 | 1.12 | -0.93 | -0.98 |
| Durables | 1.69 | 1.64 | -1.37 | -1.42 |
| Festivals | 1.17 | 1.18 | -0.96 | -1.03 |
| Miscellaneous | 1.30 | 1.36 | -1.06 | -1.17 |

Source: Douglas Hedley, "Supply and Demand for Food in Indonesia," paper presented at the Workshop on Research Methodology, Department of Agricultural Economics and Rural Sociology, Bogor Agricultural University, March 1978, p. 17.

| | Timmer Oct.-Nov. 1967 Survey Java (rice) | Boediono 1969-70 Survey Indonesia (cereals) |
|---|---|---|
| Expenditure elasticities | | |
| Rural | 0.74 | 0.71 |
| Urban | 0.44 | 0.50 |
| Own-price elasticities | | |
| Rural | -0.50 | -0.68 |
| Urban | | -0.51 |

DEMAND PARAMETER ESTIMATES BASED ON THE SUSENAS V SURVEY

Susenas V was conducted in three rounds in 1976: January-April, May-August, and September-December. In each round about 18,000 households were surveyed. These data have been used by many researchers to estimate a wide range of statistics and elasticities.

Boediono obtained a complete elasticity matrix for 41 commodity groups in Indonesia using the Frisch techniques; both Susenas IV and Susenas V data were used.10/ There is a question of whether the budget shares taken from the 1971 input-output table for Indonesia were

10/Boediono, "Elasticitas Permintaan untuk Berbagai Barang di Indonesia: Penerapan Metode Frisch" [Demand Elasticities for Various Goods in Indonesia: The Frisch Estimating Technique], Ekonomi dan Keuangan Indonesia, September 1978.

still valid for 1976. Boediono fitted double log functions. His results for major foods are shown in Table 12.

In another study Hedley made estimates based on the 1976 Susenas survey using a linear expenditure system (LES).11/ His results were based on aggregate per capita consumption data drawn from subround II (May-August 1976); the estimated expenditure elasticity for cereals was about 0.55. An earlier estimate from subround I (January-April 1976), based on aggregate household data, gave a higher figure of 0.68. Interestingly, Hedley felt that this was too high, although it was close to Boediono's estimate for rice alone. If Boediono's estimates for rice and corn plus tubers were weighted by budget shares, their combined elasticity (a cereal elasticity) would be about 0.63.

Hedley's estimates of expenditure elasticities, based on subround II of the 1976 Susenas survey, are presented in Table 13. Rice is not reported separately but is included in the cereals category; this results in the previously mentioned problem of lumping normal or superior staples with inferior staples and thereby reducing results. The basic results are consistent with general trends, however, and rural elasticities are considerably higher (0.56-0.69) than urban ones (0.23-0.39).

In 1978 the World Bank estimated expenditure elasticities for rice based on the 1976 Susenas data (see Table 14).12/ The population was broken down by urban and rural areas as well as by expenditure groups. The overall elasticity of demand of 0.47 was lower than Hedley's estimate of 0.55. The Bank's urban estimates were lower than Hedley's both on Java and off Java, whereas the rural Java estimates

Table 12--Elasticities estimated by the Frisch method

| Commodity | Income Elasticities | Budget Shares | Own-Price Elasticities |
|---|---|---|---|
| Rice | 0.689 | 0.221 | -0.633 |
| Corn and roots and tubers | 0.300 | 0.038 | -0.255 |
| Vegetables and fruits | 1.170 | 0.082 | -0.966 |
| Sugar | 1.411 | 0.029 | -1.153 |
| Fish | 1.271 | 0.066 | -1.041 |
| Livestock products | 2.168 | 0.028 | -1.735 |
| Prepared foods | 1.225 | 0.004 | -1.007 |

Source: Boediono, "Elasticitas Permintaan untuk Berbagai Barang di Indonesia: Penerapan Metode Frisch" [Demand Elasticities for Various Goods in Indonesia: The Frisch Estimating Technique], Ekonomi dan Keuangan Indonesia, September 1978.

11/Douglas D. Hedley, Rice Buffer Stocks for Indonesia: A First Approximation, Working Paper No. 2 (Washington, D.C.: International Food Policy Research Institute, 1979).

12/International Bank for Reconstruction and Development, personal communication.

Table 13--Elasticities for food and other commodities derived from a linear expenditure system model, 1976

| Commodity | Java | | Off Java | |
|---|---|---|---|---|
| | Urban | Rural | Urban | Rural |
| Cereals | 0.2385 | 0.5618 | 0.3889 | 0.6903 |
| Meat, fish, milk, eggs | 1.3381 | 1.6561 | 1.1828 | 1.2392 |
| Vegetables, pulses, fruit | 0.8563 | 1.0236 | 1.1123 | 1.0977 |
| Other food | 0.9404 | 0.8839 | 0.9949 | 0.9510 |
| Tobacco | 0.8846 | 1.2411 | 0.9440 | 1.0813 |
| Housing, light, water, fuel | 1.2499 | 0.9746 | 1.2857 | 1.0451 |
| Clothing | 1.0465 | 1.2891 | 1.1029 | 1.1762 |
| Durables | 1.9307 | 2.4816 | 2.0739 | 1.9240 |
| Festivals | 1.0551 | 1.6553 | 0.7479 | 1.6207 |
| Miscellaneous | 1.3126 | 1.4339 | 1.3678 | 1.1444 |
| Total food | 0.8209 | 0.8835 | 0.8526 | 0.9326 |
| Other commodities | 1.2889 | 1.3993 | 1.3351 | 1.2642 |

Source: Douglas D. Hedley, "Supply and Demand for Food in Indonesia," paper presented at the Workshop on Research Methodology, Department of Agricultural Economics and Rural Sociology, Bogor Agricultural University, March 1978.

Note: The elasticities were derived from a Linear Expenditure System (LES) model using data from Susenas, Round II, May-August 1976. The data are taken from Indonesia, Central Bureau of Statistics, VUS78-25 (Jakarta, 1978).

Table 14--Expenditure elasticities for rice from the International Bank for Reconstruction and Development, 1976

| Region | Expenditure Groups (Rp per capita per month) | | | | Weighted Average |
|---|---|---|---|---|---|
| | 0-1,999 | 2,000-3,999 | 4,000-7,999 | 8,000 and above | |
| Java | 0.96 | 0.58 | 0.32 | 0.16 | 0.49 |
| Urban | 0.46 | 0.25 | 0.12 | 0.07 | 0.15 |
| Rural | 0.99 | 0.62 | 0.38 | 0.24 | 0.56 |
| Other islands | 1.04 | 0.67 | 0.34 | 0.22 | 0.44 |
| Urban | 0.90 | 0.55 | 0.42 | 0.03 | 0.32 |
| Rural | 1.15 | 0.68 | 0.33 | 0.29 | 0.49 |
| Indonesia | 0.98 | 0.61 | 0.33 | 0.19 | 0.47 |

Source: International Bank for Reconstruction and Development, personal communication, 1979.

were quite similar (about 0.56). The off Java rural estimates vary considerably: Hedley's 0.69 versus the Bank's 0.49. However, different data sets were used and estimating procedures were also different. It is assumed that the Bank's estimate used data from all three rounds (Hedley used only one, subround II), but because the Bank's estimates were for rice only while Hedley's were for cereals, one would expect that the Bank's elasticities would be higher, not lower, since they excluded the less-preferred staples like corn and dried cassava.

Another series of detailed estimates using the 1976 Susenas data was made under the direction of Peter Timmer. These estimates used data disaggregated by income groups, by urban and rural areas, and by major island groupings. Expenditure elasticities, own-price elasticities, and cross-price elasticities for a variety of staples were estimated. In addition, dummy variables were used for regions and seasons in order to capture the variations in Indonesian consumption and demand patterns more fully. The main limitations of these studies were that only three staples were included: rice, corn grain (jangung pocelan), and fresh cassava; dried cassava (gaplek) was excluded.

In work carried out in Indonesia by the author and others (principally Affendi Anwar of the Bogor Agricultural University), the data were disaggregated further and new commodities were added: dried cassava (gaplek), sweet potatoes, brown sugar, white sugar, cooking oil, and kerosene (an important rural fuel). All of these analyses were done on per capita consumption figures grouped by both quantity (kilograms or liters) and value (rupiah). The provincial data of per capita consumption were grouped by expenditure classes, by urban and rural areas, and by subround. Hence for each commodity there were theoretically 1,800 observations: 12 (expenditure groups) x 2 (urban and rural) x 3 (subrounds) x 25 (provinces included; the provinces of Timor Timur and Irian Jaya were excluded from Susenas V).

For each observation, quantity consumed and expenditure on that commodity were reported. Some observation cells were blank and those with a sample population of less than 10 (only about two to three households surveyed) were excluded.

The model developed by Timmer was a log-log relationship with dummy variables for region, round, urban or rural location, and other variables. Both linear and quadratic forms were used. The quadratic form was favored because it better represented the effect of the Engel Curve of changing demand elasticities with increasing income. In addition, some estimates were made using the semilog format.

The general estimating form used was:

$$Q_x = A + A_1 + a_1TX + a_2TX2 + a_3P_x + a_4P_y + a_5R_j + a_6T_k + a_7D_1 + E,$$

where,

Q = log of per capita commodity consumption in kilograms per week per observation,

A = intercept,

$A_1$ = income class specific intercept,

TX = log of total expenditure for respective cell mean observation (Rp per month),

TX2 = TX squared,

$P_x$ = log of own price of commodity x, calculated as commodity value divided by commodity quantity,

$P_y$ = log of price of other commodities, $y \neq x$,

$R_j$ = zero-one dummy variable for region j,

$T_k$ = zero-one dummy variable for sample rounds I, II, and III,

$D_1$ = other zero-one dummy or interaction variables as specified in the text, and

E = error term.

Later, Timmer and Harold Alderman also made runs on the Susenas V data.13/ They did four basic disaggregations: rural Java, urban Java, rural off Java, and urban off Java, reaggregated as needed. In addition, the entire sample of 12 expenditure subgroups was divided into four subsets based on per capita monthly expenditures:

Poor = less than Rp 2,000 per capita per month;
Low = Rp 2,000-3,000 per capita per month;
Medium = Rp 3,000-5,000 per capita per month;
High = more than Rp 5,000 per capita per month.

The same breakdowns were used for all areas, and this appears to be a shortcoming in the analysis. Incomes per capita vary considerably between regions and between urban and rural areas. Since the aim in grouping such data by income class is to observe similarities and differences between regions (on Java, off Java, urban or rural), this artificial grouping of all those with incomes less than a certain amount may seriously limit understanding and comparisons of the behavior of comparable groups of poor consumers. For example, the percentage of the sample population in the poor category varied greatly:

13/For a discussion of the general approach and the Indonesian case, see C. Peter Timmer and Harold Alderman, "Estimating Consumption Parameters for Food Policy Analysis," American Journal of Agricultural Economics 61 (December 1979): 982-987. Most of the results presented here are from an unpublished draft of this paper, Harold Alderman and C. Peter Timmer, "Food Price Policy and Protein Calorie Intake: Estimating Consumption Parameters for Indonesia," Cambridge, Mass., August 1979. The general topic of Indonesian food policy and these results also appeared in C. Peter Timmer, "Food Prices and Food Policy Analysis in LDCs," Food Policy 5 (August 1980): 188-199; and Harold Alderman and C. Peter Timmer, "Food Policy and Food Demand in Indonesia," Bulletin of Indonesian Economic Studies, November 1980.

| | (percent) |
|---|---|
| Rural Java | 23.2 |
| Rural off Java | 9.2 |
| Urban Java | 1.8 |
| Urban off Java | 3.2 |

The wide spread between these percentages is a misleading indication of the true incidence of poverty and nutritional difficulties in Indonesia.

All reported results were based on runs on the entire sample. Because the number of households in each observation cell (in theory 1,800 cells per commodity) varied roughly with its share in the total Indonesian population, all observations were weighted by the square root of the number of individuals reported in each cell. The appendix gives details of the specification of regression variables and results of various runs.14/

A series of elasticity estimates was derived based on various Engel functions: double log quadratic, double log linear, and semilog linear. The total results for Indonesia are presented in Table 15 and the Engel functions themselves in Table 16. The elasticities calculated in Table 15 were evaluated at the mean of the expenditures in each expenditure group as well as the mean expenditure for the entire sample; they included the price of rice (log) but not the prices of other staples.

In evaluating the four series of elasticities, Alderman and Timmer eliminated RI 3a, the log linear form, because rice consumption showed clear curvilinear patterns. Both the log-log quadratic (RI 1a) and log-log linear with inverse term (RI 2a) had strong points, although much of the error in the quadratic formulation occurs in the higher income brackets (as the curve is forced down), whereas RI 2a may overestimate elasticities in the lowest income group. RI 4a, the semilog form, had the best fit and is the commonly used form of the Engel curve for basic grains. In subsequent price response analysis, Alderman and Timmer relied on the log-log quadratic form (RI 1a) because it yielded more plausible results.

The estimates in Table 15 based on the log-log quadratic formulation (equation RI 1a) and the positive elasticities, especially in the poor and low rural expenditure classes, show that rice was a luxury good for a large share of the Indonesian population. The elasticities were large (0.4 to 0.7), even in the highest expenditure classes in rural areas. In urban areas, on the other hand, rice elasticities dropped sharply as incomes rose. The urban population was concentrated in the upper two income classes whereas the reverse was true in rural areas.

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14/None of the regression results for corn grain are presented due to continuing problems with the corn data. Corn consumption in Indonesia is regional and the preliminary regression results were unsatisfactory.

Table 15--Elasticities for rice by Alderman and Timmer, by expenditure group, based on Susenas V, 1976

| Regression Number | Expenditure Group | | | | Indonesian Average |
|---|---|---|---|---|---|
| | Poor | Low | Middle | High | |
| RI 1a (log-log quadratic) | | | | | |
| Urban[a/] | 0.997 | 0.759 | 0.533 | 0.070 | 0.265 |
| Rural[a/] | 1.168 | 0.924 | 0.704 | 0.364 | 0.581 |
| Total[b/] | 1.156 | 0.917 | 0.680 | 0.276 | 0.526 |
| RI 2a (log linear with log TX inverse term) | | | | | |
| Urban[a/] | 1.157 | 0.686 | 0.404 | 0.105 | 0.284 |
| Rural[a/] | 1.378 | 0.808 | 0.597 | 0.343 | 0.639 |
| Total[b/] | 1.362 | 0.803 | 0.570 | 0.272 | 0.572 |
| RI 3a (log linear) | | | | | |
| Urban[a/] | 0.284 | 0.284 | 0.284 | 0.284 | 0.284 |
| Rural[a/] | 0.654 | 0.654 | 0.654 | 0.654 | 0.654 |
| Total[b/] | 0.628 | 0.639 | 0.603 | 0.543 | 0.590 |
| RI 4a (semilog) | | | | | |
| Urban[a/] | 0.398 | 0.293 | 0.248 | 0.219 | 0.237 |
| Rural[a/] | 1.000 | 0.619 | 0.473 | 0.364 | 0.521 |
| Total[b/] | 0.957 | 0.605 | 0.442 | 0.321 | 0.472 |

Source: Harold Alderman and C. Peter Timmer, "Food Price Policy and Protein Calorie Intake: Estimating Consumption Parameters for Indonesia," Cambridge, Mass., August 1979.

Note: See Table 16 for the estimating equations used in the regression results reported above. See the appendix for details on the parameters used in the regressions.

a/To find the expenditure elasticities for rural households in Java with per capita monthly expenditures below Rp 1,000 (that is, PTX), add 0.055 for RI a, 0.116 for RI 2a, and subtract 0.044 for RI 3a. PTX was not significant in RI 4a.

b/The total expenditure elasticities are a weighted average of the urban and rural elasticities, assuming the following weights, based on the proportion of total consumption:

| | Expenditure Group | | | | |
|---|---|---|---|---|---|
| | Poor | Low | Middle | High | Total |
| Urban weight | 0.006 | 0.008 | 0.049 | 0.110 | 0.173 |
| Rural weight | 0.078 | 0.185 | 0.307 | 0.257 | 0.827 |

Census weights are used for population.

Table 16--Engel functions for rice, Susenas V, 1976

| Independent Variables | Regressions in LQRICE | | | | | | Regressions in QRICE | |
|---|---|---|---|---|---|---|---|---|
| | RI a | RI 1a | RI 2 | RI 2a | RI 3 | RI 3a | RI 4 | RI 4a |
| LTX | 5.517 | 4.868 | 0.096 | 0.080 | 0.446 | 0.654 | 0.731 | 1.107 |
| | (13.358) | (12.811) | (1.920) | (1.481) | (15.379) | (19.235) | (17.405) | (24.600) |
| LTX2 | -0.297 | -0.252 | --- | --- | --- | --- | --- | --- |
| | (12.375) | (11.129) | | | | | | |
| NVTX | --- | --- | -2075.853 | -2002.300 | --- | --- | --- | --- |
| | | | (12.454) | (12.491) | | | | |
| UTX | --- | -0.152 | --- | -0.174 | --- | -0.370 | --- | -0.594 |
| | | (3.234) | | (3.955) | | (7.708) | | (9.429) |
| | --- | 0.055 | --- | 0.116 | --- | -0.044 | --- | 0.041 |
| | | (2.037 | | (4.143) | | (1.517) | | (1.079) |
| URBAN | --- | 1.206 | --- | 1.402 | --- | 3.064 | --- | 4.797 |
| | | (3.015) | | (3.719) | | (6.383) | | (8.900) |
| LPR | --- | -1.162 | --- | -1.203 | --- | -1.122 | --- | -1.773 |
| | | (8.803) | | (9.325) | | (7.530) | | (9.046) |
| WJAVA | --- | 0.056 | --- | 0.046 | --- | 0.051 | --- | -0.018 |
| | | (1.057) | | (0.885) | | (0.850) | | (0.228) |
| CJAVA | --- | -0.058 | --- | -0.070 | --- | -0.052 | --- | -0.329 |
| | | (1.036) | | (1.296) | | (0.825) | | (3.964) |
| EJAVA | --- | -0.149 | --- | -0.156 | --- | -0.144 | --- | -0.436 |
| | | (2.365) | | (2.557) | | (2.028) | | (4.688) |
| SUMATRA | --- | 0.157 | --- | 0.162 | --- | 0.189 | --- | 0.287 |
| | | (3.271) | | (3.522) | | (3.566) | | (4.042) |
| KALIMAN | --- | 0.134 | --- | 0.144 | --- | 0.148 | --- | 0.204 |
| | | (2.310) | | (2.526) | | (2.242) | | (2.345) |
| SULAWESI | --- | -0.371 | --- | -0.345 | --- | -0.391 | --- | -0.476 |
| | | (6.397) | | (6.053) | | (6.015) | | (5.535) |
| RD1 | --- | -0.038 | --- | -0.039 | --- | -0.035 | --- | 0.014 |
| | | (1.118) | | (1.182) | | (0.897) | | (0.274) |
| RD2 | --- | -0.105 | --- | -0.104 | --- | -0.090 | --- | -0.058 |
| | | (2.763) | | (2.971) | | (2.250) | | (1.094) |
| Constant | -24.533 | -16.557 | 2.106 | 6.536 | -3.042 | -0.766 | -3.701 | 1.768 |
| $R^2$ | 0.51 | 0.59 | 0.51 | 0.71 | 0.35 | 0.61 | 0.40 | 0.71 |

Source: Harold Alderman and C. Peter Timmer, "Food Price Policy and Protein Calorie Intake: Estimating Consumption Parameters for Indonesia," Cambridge, Mass., August 1979.

Notes: The numbers in parentheses are t-statistics. See the appendix for details and definitions of the variables used in the regressions.

Results for fresh cassava were also presented (see Table 17). Four different log-log quadratic functions were estimated using various specifications of independent variables (see Table 18); the results in Table 17 are based on form CS3 in Table 18. The $R^2$s were consistently lower than for the rice equations reported earlier.

The expenditure elasticities were largely positive for fresh cassava; only in the high expenditure class was the elasticity negative. The overall urban elasticity was negative, however, because of the large portion of the urban population with high expenditures. As seen in the appendix, Table 26, more than 60 percent of the population in urban Java was in the high expenditure class; the figure was about 55 percent in urban off Java. The overall elasticities of demand for fresh cassava in rural areas were positive and substantial, especially for the poor and low expenditure groups that contain the majority of the rural population.

Compensated own-price elasticities were also estimated for rice and fresh cassava (see Table 19). The average Indonesian own-price elasticity for rice was -0.81 in urban areas and -0.84 in rural areas. The elasticities were higher (about -1.3) for the poorest group, indicating the greater price responsiveness of poorer consumers. The sizes of the fresh cassava own-price elasticities were similar to those for rice, starting at about -1.3 for the poorest groups and

Table 17--Expenditure elasticities by Alderman and Timmer for fresh cassava, based on Susenas V, 1976

| Area | Expenditure Groups | | | | |
|---|---|---|---|---|---|
| | Poor | Low | Middle | High | Indonesia |
| Urban | 0.830 | 0.522 | 0.230 | -0.369 | -0.047 |
| Rural | 0.994 | 0.679 | 0.394 | -0.046 | 0.410 |
| Total[a/] | 0.990 | 0.676 | 0.387 | -0.077 | 0.386 |

Source: Harold Alderman and C. Peter Timmer, "Food Price Policy and Protein Calorie Intake: Estimating Consumption Parameters for Indonesia," Cambridge, Mass., August 1979.

a/The total expenditure elasticities are a weighted average of the urban and rural elasticities, assuming the following weights, based on the proportion of total consumption.

| | Expenditure Groups | | | | |
|---|---|---|---|---|---|
| | Poor | Low | Middle | High | Total |
| Urban weight | 0.003 | 0.004 | 0.016 | 0.029 | 0.052 |
| Rural weight | 0.123 | 0.210 | 0.345 | 0.270 | 0.948 |

Census weights are used for the population.

Table 18--Consumption functions by Alderman and Timmer for fresh cassava, based on Susenas V, 1976

| Independent Variables | Regressions on LQCASS | | | |
|---|---|---|---|---|
| | CS 1 | CS 2 | CS 3 | CS 4 |
| LTX | 6.551 | 5.323 | 5.781 | 5.932 |
| | (4.781) | (2.568) | (2.090) | (2.778) |
| LTX2 | -0.365 | -0.299 | -0.326 | -0.335 |
| | (4.563) | (2.670) | (2.835) | (2.763) |
| PTX | 0.073 | --- | --- | --- |
| | (0.702) | | | |
| UTX | -0.136 | -0.137 | -0.140 | -0.140 |
| | (9.714) | (9.786) | (10.0) | (10.0) |
| LCSSP | -0.896 | --- | --- | --- |
| | (5.834) | | | |
| CSX1 | --- | -0.962 | -1.284 | -1.281 |
| | | (5.090) | (3.415) | (3.327) |
| CSX2 | --- | -0.900 | -0.818 | -0.810 |
| | | (5.521) | (2.050) | (2.005) |
| CSX3 | --- | -0.972 | -0.943 | -0.973 |
| | | (6.231) | (3.370) | (3.438) |
| CSX4 | --- | -0.872 | -0.780 | -0.765 |
| | | (5.626) | (3.961) | (3.844) |
| RX1 | --- | --- | 0.996 | 0.980 |
| | | | (1.778) | (0.903) |
| RX2 | --- | --- | 0.709 | 0.820 |
| | | | (1.241) | (0.686) |
| RX3 | --- | --- | 0.787 | 0.209 |
| | | | (1.463) | (0.230) |
| RX4 | --- | --- | 0.685 | 1.011 |
| | | | (1.300) | (1.357) |
| X1 | --- | --- | --- | 1.738 |
| | | | | (0.271) |
| X2 | --- | --- | --- | 1.291 |
| | | | | (0.164) |
| X3 | --- | --- | --- | 4.567 |
| | | | | (0.840) |
| WJAVA | 0.150 | 0.150 | 0.072 | 0.071 |
| | (0.739) | (0.739) | (0.346) | (0.340) |
| CJAVA | 0.361 | 0.373 | 0.285 | 0.288 |
| | (1.719) | (1.776) | (1.307) | (1.315) |
| EJAVA | 0.489 | 0.499 | 0.420 | 0.425 |
| | (2.038) | (2.079) | (1.714) | (1.735) |
| SUMATRA | 0.100 | 0.103 | 0.010 | 0.016 |
| | (0.552) | (0.566) | (0.052) | (0.083) |
| KALIMAN | 0.546 | 0.543 | 0.414 | 0.417 |
| | (2.588) | (2.561) | (1.824) | (1.821) |
| SULAWESI | 1.155 | 1.147 | 1.038 | 1.042 |
| | (5.397) | (5.330) | (4.613) | (4.611) |
| Constant | -22.629 | -21.953 | -27.582 | -29.867 |
| $R^2$ | 0.39 | 0.39 | 0.39 | 0.40 |

Source: Harold Alderman and C. Peter Timmer, "Food Price Policy and Protein Calorie Intake: Estimating Consumption Parameters for Indonesia," Cambridge, Mass., August 1979.

Notes: See the appendix for details and definitions of the variables used in the regressions. The numbers in parentheses are t-statistics.

Table 19--Compensated own-price elasticities by Timmer and Alderman for rice and cassava, Susenas V, 1976

| Crop/Area | Expenditure Group | | | | Indonesian Average[a] |
|---|---|---|---|---|---|
| | Poor | Low | Middle | High | |
| Rice | | | | | |
| Urban | -1.323 | -1.056 | -0.921 | -0.717 | -0.811 |
| Rural | -1.325 | -0.986 | -0.824 | -0.614 | -0.842 |
| Total | -1.325 | -0.989 | -0.842 | -0.645 | -0.837 |
| Revised total | -1.921 | -1.475 | -1.156 | -0.743 | -1.105 |
| Cassava | | | | | |
| Urban | -1.272 | -0.813 | -0.942 | -0.781 | -0.861 |
| Rural | -1.258 | -0.805 | -0.937 | -0.780 | -0.905 |
| Total | -1.258 | -0.805 | -0.937 | -0.780 | -0.904 |

Sources: The rice and cassava figures are from Harold Alderman and C. Peter Timmer, "Food Price Policy and Protein Calorie Intake: Estimating Consumption Parameters for Indonesia," Cambridge, Mass., August 1979. The revised total rice figures are from C. Peter Timmer and Harold Alderman, "Estimating Consumption Parameters for Food Policy Analysis," American Journal of Agricultural Economics 61 (December 1979): 982-987.

a/Constructed from weights shown in footnotes in Table 15 for rice and in Table 17 for cassava. For rice, see regression RI 5b, Table 28. For cassava, see regression CS 3 in Table 18.

declining to about -0.8 for the highest income groups. The closeness of urban and rural estimates is surprising, and a revised series of rice own-price elasticities is also shown in a later article.15/

Another set of estimates using the 1976 Susenas survey was made by the author based on the model and work of Timmer but making two major changes in approach: first, including more commodities -- dried cassava (gaplek), sweet potatoes, white sugar, brown sugar, cooking oil, and kerosene -- and, second, disaggregating the income classes differently in order to make groupings on and off Java for calorie consumption and population size.

To make these estimates, the same information as before was entered for the new commodities: consumption in kilograms per capita per week (or liters for cooking oil and kerosene) and expenditures (real or imputed) in rupiahs for that commodity. Data on the new commodities were entered only for Java.

15/The revised own-price elasticities are larger for all income classes. See Timmer and Alderman, "Estimating Consumption Parameters."

Another major difference between this approach and Timmer's was that separate intercepts were not entered into the equations for the expenditure groups. Instead, estimations for a whole population group, such as for rural Java, were made, usually in a log-log quadratic form, and then separate estimations were made using a log-linear formulation for each of the income groups. Dummy variables were entered for region and subround.

The expenditure groups used were derived by calculating per capita consumption of calories from six starchy staples and then creating low, medium, and high groupings that shared similar calorie levels in urban and rural areas on Java and off Java. The final groupings are:

| | Low | | Medium | | High | |
|---|---|---|---|---|---|---|
| | Susenas Sub-groups | Share of Population (percent) | Susenas Sub-groups | Share of Population (percent) | Susenas Sub-groups | Share of Population (percent) |
| Java | | | | | | |
| Rural | 1-3 | 54.6 | 4-6 | 37.1 | 7-12 | 8.4 |
| Urban | 1-6 | 50.9 | 7-9 | 40.2 | 10-12 | 8.5 |
| Off Java | | | | | | |
| Rural | 1-3 | 27.6 | 4-6 | 47.9 | 7-12 | 25.5 |
| Urban | 1-4 | 28.7 | 5-7 | 47.6 | 8-12 | 23.8 |

The share of population is the percentage of the total population in each region (for example, rural Java) in the given expenditure group.

One problem with this approach is that the same calorie cutoff point was used for both urban and rural areas. In fact, since urban people usually require fewer calories on the average than rural people, estimates based on these groupings tend to underestimate elasticities of demand for the urban low-expenditure group. This occurs because a larger percentage of people who are relatively better off are included in this low expenditure group, and they would be expected to have lower expenditure elasticities for staples than would poorer people.

The existing formulation used was similar to Timmer's:

$$Q_i = B + B_1\ TX + B_2\ TX2 + B_3\ P_i + B_4\ P_j + B_5\ D \ldots\ldots + E,$$

where,

$Q_i$ = log of quantity of commodity i in kilograms or liters per capita per week,

TX = log of total expenditures on all goods in rupiahs per month,

TX2 = TX squared,

$P_i$ = log of price of good i calculated as commodity value divided by commodity quantity, rupiahs per kilogram or liter,

$P_j$ = log of prices of other goods j, $j \neq i$,

D = zero-one dummy variables for region and round, and

E = error term.

The regressions for the entire urban and rural samples were usually estimated in log-log quadratics. Results of the fullest specification are given in Tables 20 and 21. Because a quadratic formulation was used, the expenditure elasticities have to be evaluated at different levels of expenditure. Table 22 compares the separate linear estimates of expenditure elasticities for the three expenditure groups with those estimates derived from regressions on the entire sample (Tables 20 and 21), evaluated at the mean expenditure of each group.

Table 21 shows that rice is a strongly normal food for the low expenditure group in rural areas with an overall elasticity of 0.97. Because more than half of the rural population is in this group, a substantial built-in demand for rice is indicated as rural incomes increase. In urban areas the rice elasticities are smaller and become negative in the highest expenditure group.

Fresh cassava also has substantial, positive expenditure elasticities for the poorest half of the rural (0.8) and urban (0.4) populations; it becomes an inferior good (a negative expenditure elasticity) only when income is high. The overall expenditure elasticity of fresh cassava is positive (0.3) in rural areas and negative (-0.1) in urban areas.

Expenditure elasticity estimates for gaplek were only made for rural areas. As seen in the earlier descriptive analysis of dietary patterns, gaplek is an economically inferior food for all but the poorest consumers. Sweet potatoes behave as a normal food in most rural areas, but play only a minor role in the diet. The overall expenditure elasticity for sweet potatoes is positive -- 0.1 in urban areas and 0.6 in rural areas. The overall rural expenditure elasticity for gaplek is negative and large (-0.6). Since fresh cassava and gaplek are consumed in roughly equal portions in rural areas (on a fresh root basis), the larger negative expenditure elasticity for gaplek means that as incomes increase, the decrease in gaplek consumption will more than equal the increase in fresh root consumption. The net result, therefore, would be a decrease in cassava consumption. The only other factor is that demand for cassava starch and products containing cassava starch will increase (they have positive expenditure elasticities); this aspect will be discussed later.

Table 20--Consumption functions for staple foods in rural Java, Susenas V, 1976

| Independent Variables | Dependent Variables | | | | |
|---|---|---|---|---|---|
| | LQRICE | LQCASS | LQGAP | LQSPOT | LQCORN |
| LTX | 4.099 | 7.764 | 18.316 | 12.571 | -0.547 |
| | (11.4) | (4.1) | (5.3) | (5.3) | (2.6) |
| LTX2 | -0.217 | -0.459 | -1.160 | -0.731 | --- |
| | (9.9) | (4.0) | (5.5) | (5.1) | |
| LPRI | -0.839 | 2.003 | -1.838 | -0.516 | 4.862 |
| | (4.0) | (1.1) | (0.5) | (0.2) | (1.5) |
| LPCORN | -0.049 | 0.251 | 0.289 | -0.030 | 1.029 |
| | (0.8) | (0.7) | (0.5) | (0.0) | (1.5) |
| LPCASS | 0.011 | -0.813 | -0.152 | 0.069 | 0.218 |
| | (0.3) | (4.8) | (0.5) | (0.3) | (0.7) |
| LPGAP | 0.022 | -0.069 | -1.855 | 0.076 | 0.310 |
| | (0.3) | (0.2) | (2.6) | (0.1) | (0.4) |
| LPSPOT | -0.048 | -0.797 | 0.671 | --- | -2.302 |
| | (0.5) | (1.6) | (0.7) | | (2.7) |
| WJAVA | 0.477 | 0.107 | -5.056 | 0.540 | -1.575 |
| | (10.2) | (0.4) | (10.4) | (1.6) | (3.3) |
| CJAVA | 0.223 | -0.064 | -1.194 | 0.448 | 1.299 |
| | (5.1) | (0.3) | (2.8) | (1.5) | (3.1) |
| EJAVA | 0.020 | 0.093 | -0.693 | 0.420 | 2.451 |
| | (0.4) | (0.4) | (1.6) | (1.4) | (5.8) |
| JAKARTA | --- | --- | --- | --- | --- |
| ROUND1 | --- | 0.591 | -0.843 | -0.072 | 0.797 |
| | | (2.0) | (1.6) | (0.2) | (1.5) |
| ROUND2 | --- | 0.550 | -0.846 | -0.383 | 0.264 |
| | | (1.6) | (1.4) | (0.9) | (0.4) |
| Constant | -14.201 | -39.223 | -58.778 | -53.793 | -21.667 |
| $R^2$ | 0.943 | 0.551 | 0.781 | 0.419 | 0.789 |

Notes: See the appendix for details and definitions of the variables used in the regressions. The numbers in parentheses are t-statistics.

Table 21--Consumption functions for staple foods in urban Java, Susenas V, 1976

| Independent Variables | Dependent Variables | | | | |
|---|---|---|---|---|---|
| | LQRICE | LQCASS | LQGAP | LQSPOT | LQCORN |
| LTX | 2.308 | 3.379 | --- | 5.925 | --- |
| | (8.1) | (1.7) | | (2.5) | |
| LTX2 | -0.121 | -0.201 | --- | -0.334 | --- |
| | (7.6) | (1.8) | | (2.6) | |
| LPRI | -0.484 | 1.049 | --- | 3.994 | --- |
| | (1.6) | (0.5) | | (1.6) | |
| LPCORN | 0.036 | 0.177 | --- | 0.109 | --- |
| | (1.2) | (0.8) | | (0.4) | |
| LPCASS | 0.055 | 0.441 | --- | 0.312 | --- |
| | (1.2) | (1.5) | | (0.9) | |
| LPGAP | --- | --- | --- | --- | --- |
| LPSPOT | 0.062 | -0.413 | --- | -2.686 | --- |
| | (0.5) | (0.5) | | (2.5) | |
| WJAVA | 0.147 | -0.156 | --- | 0.540 | --- |
| | (2.6) | (0.4) | | (1.2) | |
| CJAVA | 0.078 | 0.651 | --- | -0.012 | --- |
| | (1.7) | (2.1) | | (0.0) | |
| EJAVA | -0.009 | 0.520 | --- | 0.035 | |
| | (0.2) | (1.6) | | (0.1) | |
| JAKARTA | 0.042 | -0.274 | --- | 0.719 | --- |
| | (0.6) | (0.6) | | (0.1) | |
| ROUND1 | 0.035 | 0.906 | --- | -0.053 | --- |
| | (0.9) | (3.4) | | (0.2) | |
| ROUND2 | -0.022 | 0.393 | --- | 0.193 | --- |
| | (0.5) | (1.3) | | (0.5) | |
| Constant | -8.416 | -22.964 | --- | -40.845 | --- |
| $R^2$ | 0.721 | 0.428 | --- | 0.301 | --- |

Notes: See the appendix for details and definitions of the variables used in the regressions. The numbers in parentheses are *t*-statistics.

Table 22--Expenditure elasticities by expenditure groups, Java, Susenas V, 1976

| Crop/Area | Expenditure Groups: Low A | Low B | Medium A | Medium B | High A | High B | Sample Average B* |
|---|---|---|---|---|---|---|---|
| Rice | | | | | | | |
| Urban | 0.368 | 0.329 | 0.056[a/] | 0.107 | -0.02[a/] | -0.121 | 0.194 |
| Rural | 0.971 | 0.831 | 0.364 | 0.485 | 0.122[a/] | 0.133 | 0.560 |
| Fresh cassava | | | | | | | |
| Urban | 0.423[a/] | 0.094 | -0.231[a/] | -0.275 | n.e.[a/] | -0.654 | -0.131 |
| Rural | 0.773 | 0.849 | 0.476 | 0.117 | -1.201[a/] | -0.627 | 0.276 |
| Gaplek | | | | | | | |
| Urban | n.e. | n.e. | n.e.[a/] | n.e. | n.e.[a/] | n.e. | n.e. |
| Rural | 1.761 | 0.833 | -0.667[a/] | -1.018 | -3.219[a/] | -2.90 | -0.616 |
| Sweet potatoes | | | | | | | |
| Urban | 0.801 | 0.462 | -0.388[a/] | -0.152 | n.e.[a/] | -0.782 | 0.087 |
| Rural | 1.829 | 1.556 | 0.516[a/] | 0.390 | -0.252[a/] | -0.795 | 0.644 |

Notes: Not estimated = n.e.
A means that the elasticities were estimated by log linear regressions on data subsets created by dividing the entire urban or rural sample into three income groups, Low, Medium, and High. B means that the elasticities were estimated by evaluating the whole sample quadratic function (Tables 20 and 21) at the mean monthly expenditure per capita of each income subgroup. These are:

| | Low | Medium (Rp) | High |
|---|---|---|---|
| Urban | 3,543 | 8,871 | 22,760 |
| Rural | 1,874 | 4,161 | 9,366 |

B* is the estimated expenditure elasticity for the entire urban or rural sample based on the regression results presented in Tables 20 and 21. The urban and rural samples were evaluated at their average per capita expenditure levels; these levels are Rp 6,207 per month in urban areas and Rp 3,499 per month in rural areas.

a/This figure was not statistically significant.

If the average urban and rural estimates of Timmer's approach and the author's approach are compared (see Tables 15, 17, and 21), one finds the following whole sample estimated expenditure elasticities:

| | Timmer (RI 1a and CS 3) | | Dixon | |
|---|---|---|---|---|
| | Elasticity | Average Total Expenditure (Rp per capita) | Elasticity | Average Total Expenditure (Rp per capita) |
| Rice | | | | |
| Urban | 0.265 | 7,443 | 0.194 | 6,207 |
| Rural | 0.581 | 4,114 | 0.560 | 3,499 |
| Fresh cassava | | | | |
| Urban | -0.047 | 7,443 | -0.131 | 6,207 |
| Rural | 0.410 | 4,114 | 0.276 | 3,499 |

Although the two sets of estimates were made using different data sets and with somewhat different models,16/ the estimates are similar in size and present a picture of strong overall demand for rice and fresh cassava. If the urban and rural estimates are weighted by the population and consumption shares used by Timmer (0.827 rural and 0.173 urban for rice, and 0.052 urban and 0.948 rural for fresh cassava), the weighted average expenditure elasticities are:

| Crop | Timmer (Total Indonesia) | Dixon (Java only) |
|---|---|---|
| Rice | 0.526 | 0.497 |
| Fresh cassava | 0.386 | 0.255 |

As can be seen, the estimates are close for rice and differ slightly for fresh cassava. The size of the elasticities for both foods is impressive, and income-led increases in demand for rice and fresh cassava could be substantial.

When estimates were made of cross-price elasticities, they were not statistically significant, perhaps because relative prices varied too little during the survey. Estimates of the own-price elasticities for the whole urban and rural sample as well as for the expenditure groups (based on the fullest specification of the model for each) are given in Table 23. Rural consumers appear to be much more responsive to rice prices than urban consumers. This agrees with the earlier descriptive material on seasonal changes in rural consumption patterns and the greater diversity of rural staple food consumption. The rural own-price elasticity for rice is, at -0.8, almost twice as large as

16/The Timmer results are based on all-Indonesia data whereas the Dixon results are based on Java alone.

the urban one. Rural fresh cassava elasticities are normal, urban cassava shows a surprisingly positive own-price elasticity, and rural gaplek has a lower sample elasticity than any of the individual estimates.17/

All the expenditure elasticities for rice based on the 1976 cross-sectional data were high; all overall estimates are in the 0.45-0.55 range with higher rural than urban elasticities:

| | Overall | Urban | Rural |
|---|---|---|---|
| Boediono | 0.689 | --- | --- |
| Hedley (cereals) | 0.55 | 0.24-0.39 | 0.56-0.69 |
| World Bank | 0.47 | 0.15-0.32 | 0.56-0.49 |
| Timmer (RI 1a) | 0.53 | 0.27 | 0.58 |
| Dixon (Java only) | 0.50 | 0.19 | 0.56 |

Two elasticities are given for both urban and rural areas by Hedley and the World Bank. The first figure is for Java and the second is for off Java.

Table 23--Own-price elasticities, Java, 1976

| Crop/Area | Whole Sample | | Expenditure Groups: Low | | Medium | | High | |
|---|---|---|---|---|---|---|---|---|
| Rice | | | | | | | | |
| Urban | -0.48 | (1.6) | -0.31 | (0.6) | -0.56 | (1.4) | n.e. | |
| Rural | -0.84 | (4.0) | -1.28 | (1.8) | -0.45 | (1.4) | 0.18 | (0.2) |
| Fresh cassava | | | | | | | | |
| Urban | 0.44 | (1.5) | 1.27 | (1.2) | 0.14 | (0.6) | n.e. | |
| Rural | -0.81 | (4.8) | -1.09 | (2.8) | -0.82 | (6.1) | -0.67 | (0.8) |
| Gaplek | | | | | | | | |
| Urban | n.e. | | n.e. | | n.e. | | n.e. | |
| Rural | -1.86 | (2.6) | -2.49 | (1.7) | -2.06 | (3.4) | -2.18 | (0.5) |
| Sweet potato | | | | | | | | |
| Urban | -2.69 | (2.5) | -3.60 | (2.9) | 0.34 | (0.2) | n.e. | |
| Rural | n.e. | | -2.43 | (3.8) | -2.12 | (2.5) | -4.82 | (1.4) |

Notes: The numbers in parentheses are *t*-statistics; n.e. means not estimated.

17/The own-price elasticity for fresh cassava in urban markets could be positive because wealthier consumers pay a higher unit price because of quality differences or differing retail markups in the various markets.

There is considerable consistency within the rural expenditure elasticity estimates; the elastic nature of rural rice demand in part reflects the variability in the staple food diet mentioned earlier. The low urban elasticity estimates are in agreement with the relatively stable per capita urban rice demand noted between 1969 and 1978.

## GROUPED DATA ESTIMATES

A final series of estimates was made by the author on grouped data from five different Susenas surveys.18/ Expenditure elasticities were estimated by regressing quantity consumed on total expenditures by urban or rural areas of Java. The sample was highly aggregated and the data were broken down only by expenditure groups, varying in number from 5 in the 1963-64 survey to 12 in the 1976 and 1978 surveys.

The results are presented in Table 24. They support the earlier description of the foods consumed and their roles in the diet. The expenditure elasticities of rice were strongly positive, whereas the expenditure elasticities of corn and dried cassava in urban and rural areas were negative. The size of these negative elasticities for corn and dried cassava increased. The expenditure elasticities of fresh cassava were positive in rural areas, but were mostly negative in urban areas. The results would be different if the data were broken down by expenditure groups because corn and cassava are consumed primarily by low-income groups. The expenditure elasticities of the lowest income group, for example, were positive for corn and dried cassava. As incomes increased, each elasticity rapidly became negative and the sample averages were negative.

During this period positive expenditure elasticities for rice were consistently high and rural elasticities were much larger (from 0.5 to 1.0) than urban ones (from 0.1 to 0.5). Positive elasticities for fresh cassava were found in rural areas and averaged 0.3 to 0.5; the elasticities were considerably smaller in urban areas. The aggregated cassava elasticities (fresh and dried forms together) were frequently small and sometimes statistically insignificant. There is a good explanation for this. The fresh and dried forms have opposite characteristics, but here both were aggregated and were expressed in fresh root equivalent. The total amount demanded thus showed little variation because when expenditures are high, fresh root consumption replaces gaplek consumption. Furthermore, all of the regressions were

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18/The results were estimated from data for Java grouped by expenditure classes for urban and rural areas. For fresh and dried cassava and corn the estimates were based on linear regressions of the log of consumption on the log of total expenditure. For rice and all cassava, a double log quadratic function was fitted. The independent variable, total expenditures, included all expenditures (real and in kind) on food and nonfood items.

weighted by the population in each expenditure group and were then evaluated at the mean expenditures. This weighting, used for the consumption and expenditure variables, gives the greatest weight to the expenditure groups that contain the majority of the population. These groups also display the most diversity in staple food consumption and exhibit a large amount of substitution between staples as incomes increase.

Table 24--Comparison of expenditure elasticities from five Susenas surveys, Java

| Survey/Area | Rice[a] | Fresh Cassava | Dried Cassava | All Cassava[a] | Corn |
|---|---|---|---|---|---|
| Susenas I (1963-64) | | | | | |
| Rural | 0.71 | 0.33 | -0.27 | 0.03[b] | -0.13 |
| Urban | 0.22 | -0.03[b] | -0.13[b] | -0.10 | -0.10[b] |
| Susenas II (1964-65) | | | | | |
| Rural | 1.05 | -0.02[b] | | --- | -0.12[b] |
| Urban | 0.52 | 0.02[b] | | --- | -0.64 |
| Susenas IV (1969-70) | | | | | |
| Rural | 0.95 | 0.59 | -0.30 | -0.07[c] | -0.37 |
| Urban | 0.37 | 0.16[c] | -1.52 | 0.10 | -0.67[c] |
| Susenas V (1976) | | | | | |
| Rural | 0.56 | 0.28 | -0.62 | --- | -0.55 |
| Urban | 0.19 | -0.13 | n.e. | --- | n.e. |
| Susenas VI (1978) | | | | | |
| Rural | 0.51 | 0.18 | -0.88 | 0.28 | -0.80 |
| Urban | 0.12 | -0.13[c] | -1.04 | -0.11 | -0.93 |

Source: Computer runs made by the author using published Susenas results.

Notes: Log-log linear forms were used except as noted; all results are significant at the 5 percent level except as noted. N.e. means not estimated.

a/A log-log quadratic form is used.
b/This figure is not statistically significant.
c/This figure is significant at the 10 percent level.

## 4. FOOD CONSUMPTION PATTERNS IN THE FUTURE

At present, Indonesia's population is about 150 million; by the year 2000 it is expected to reach 210 million. Although forecasting events 20 years in the future is always difficult, it is probable that the food consumption patterns of Indonesia in the year 2000 will be similar to those at present. Rice will still be the main staple and corn and cassava probably will still be important in rural areas. Wheat's role will grow. Major changes in consumption are not forecast unless the Indonesian economy undergoes major structural changes. Urban areas and industrial manufacturing should increase in importance, but most people will continue to live in rural areas, and agriculture will employ most of the labor force. If economic growth continues to be rapid (GNP per capita increased at 5.7 percent per year during 1970-77),19/ consumption patterns will change as more food and better quality foods are demanded. Vegetable sources will remain the basis of the diet for both calories and protein; a change to a diet based heavily on meat or dairy products is unlikely.

Meeting Indonesia's food needs in the year 2000 will require careful coordination of production and trade policies. At present Indonesia imports large amounts of sugar, soyabeans, and some staple foods, especially rice and wheat.20/ Since basic food needs are not being met entirely from domestic production, it is likely that some imports will continue to be necessary, especially if urbanization, real per capita income, and expenditures increase. A special problem is the nutritional status of the poorest half of the population, who are probably receiving fewer calories and less protein than they need. Total food availability will therefore have to increase to meet their needs for a basic minimum diet and to provide for the consumption needs of those people with greater resources as well.

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19/International Bank for Reconstruction and Development, 1979 World Bank Atlas (Washington, D.C.: IBRD, 1979), p. 21.

20/Badan Urusan Logistik (BULOG) already plays a major role in several commodity markets. In recent years it has imported from 1.5 to 2.5 million tons of rice annually (domestic production has averaged 16-17 million tons) as well as all of the wheat (over 1 million tons annually); large quantities of sugar (as much as 500,000 tons annually or one third of local supplies) and soyabeans have also been imported and distributed through market operations. For more information see BULOG, "Food/Rice Price Stabilization in Indonesia," in BULOG Annual Report, 1978/79 (Jakarta: BULOG, 1979).

## RICE

Rice consumption per capita will increase in response to higher incomes, more so in rural than in urban areas. Whereas average consumption of rice is about 120 kilograms per capita per year, wealthier people are consuming much more of it, especially in rural areas. The richest third of the total rural population in 1976 was consuming 130-140 kilograms of rice per capita per year. For urban areas the figure was lower: the richest third of the total urban population in 1976 was consuming about 125 kilograms of rice per capita per year.

Urbanization will also affect average rice demand. Whereas in the past urban rice consumption per capita was larger than rural consumption, the most recent data show a parity between the two areas as average rural consumption increases slightly and average urban consumption decreases, probably because wheat and other calorie and protein sources are being substituted for rice (see Table 6).

A paradox arises from this trend: urbanization might reduce rice consumption, even though the urban diet is much more rice-centered than the rural. This result is due to the lower expenditure elasticities of demand for rice in urban areas (0.12 in urban versus 0.50 in rural areas in 1978) and the lower target consumption level of upper-income urban groups. Fewer calories are required per capita in urban areas than in rural areas (less physical labor is performed) and more wheat and nonstaple foods are eaten as incomes increase.

Increased urbanization will, of course, increase demands on the marketing and procurement systems, which will have to ship, handle, store, and sell the required rice. Domestic production will need to increase or imports will have to rise rapidly.

Price changes can also change the demand for rice. As seen in Table 23, rural consumers are more responsive to changes in rice's own price than are urban consumers. The average own-price elasticity of demand for rice in rural areas is -0.8, whereas in urban areas it is closer to -0.5.

The net effect on per capita rice consumption will therefore depend on changes in income, relative prices, and residence. Equitable increases in per capita incomes will increase rice demand, whereas relative price rises or urbanization may reduce rice demand. In general the own-price elasticities are larger than the expenditure elasticities; a 10 percent increase in both incomes and the relative price of rice will therefore decrease per capita rice demand.

## WHEAT

Although little wheat is consumed now (see Table 5), it is a major import, and wheat consumption will probably increase in both urban and rural areas. Wealthier urban people are already substituting some wheat for rice. If the price of wheat flour can be kept constant relative to rice or even reduced, consumption of wheat products should increase. Wheat flour now sells for about the same price as medium-quality rice in urban markets. Increased wheat consumption will mean increased imports, but because wheat grain and wheat flour

are considerably cheaper than rice on the world market and are traded in a market that is larger and more stable than the one for rice, wheat imports might be an attractive alternative to rice imports.21/

## CORN AND CASSAVA

The future role of corn and cassava in the Indonesian diet is uncertain. These staples are consumed almost exclusively in rural areas, though there is some demand in urban markets for fresh cassava and cassava starch. Analysis of consumer demand patterns from the Susenas surveys indicates that corn and dried cassava have negative expenditure elasticities for all but the poorest consumers (see Tables 22 and 24).22/ The expenditure elasticity of fresh cassava is positive in rural areas and for part of the urban population. Fresh cassava, however, is bulky and difficult to store and handle and would be difficult to rely on as a major alternate calorie source.23/

Demand could be shifted to corn and cassava by a massive change in their prices relative to that of rice. Rural consumers do respond to prices (see Table 23), but rapid and large rice price changes would be risky in urban areas where little corn or cassava are eaten. If low-cost wheat flour were made available, however, it could lessen the harm to nutrition that a large increase in the price of rice would cause.

Another way to increase demand for corn and cassava is by developing new forms of consumption for them, forms that will be accepted by consumers. Dried cassava flour can be added to wheat flour in bread or noodle making. Corn or cassava could be processed and packaged in new ways; some African and South American countries have done this. The goal should be to develop new forms that can be domestically produced, easily stored, and easily accepted by consumers in both rural and urban areas. In addition to the advantages of a lower cost option to rice, Indonesian farmers would benefit from increased demand and higher prices for corn and cassava.

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21/For a critical view of wheat's possible role in Indonesia see Albert J. Nyberg, "Food Policy -- Import Substitution or Import Dependence," paper presented at the Third Biennial Meeting of the Agricultural Economics Society of Southeast Asia in Kuala Lumpur, Malaysia, November 1979; Kajian Ekonomic Malaysia (Malaysian Economic Studies) 26, June and December 1979.

22/For more information on cassava in Indonesia see J. A. Dixon, "Production and Consumption of Cassava in Indonesia," Bulletin of Indonesian Economic Studies, November 1979.

23/Cassava starch is a frequently overlooked good. A large amount of total fresh root production is used to manufacture starch and most of this starch is used in the food industry at either the village level or in larger operations. These starch-based food products have strong, positive expenditure elasticities and are an increasingly important source of demand for cassava and a growing source of calories in the diet.

Another option for corn and cassava is to increase the demand for these crops for other uses. Corn can be exported or used as animal feed. Cassava can be turned into starch or pellets for animal feed. At present large amounts of cassava are used for the domestic starch industry and the foreign pellet market. If farmers can earn a good income and have a steady source of demand for their crops from these industrial uses, they can increase their total income and purchase part of their staple food requirements. Efforts to increase demand for corn and cassava are particularly important because these two crops are frequently grown by poor farmers on marginal lands. The twin tasks of increasing demand by developing new product forms and increasing production will be a major goal of development in the agricultural sector in the next 20 years.

In sum, food consumption patterns in the year 2000 will be similar to those at present but the relative importance of various foods may shift, depending on income growth, income distribution, and urbanization. Per capita rice and wheat consumption will increase and corn and cassava consumption will probably decrease. Whether consumption needs will be met from Indonesian production depends on the total amount demanded and productivity changes for rice. Wheat will continue to be imported. Corn and cassava production should be more than adequate to meet domestic demand. Although not discussed at length in this paper, it is expected that the consumption of nonvegetable foods will also increase, especially if there are increases in real per capita income.

Questions remain about consumption patterns and the nutrition of the poorest half of the population. Their diet will continue to be dominated by rice, corn, and cassava, and there might well be large numbers of people consuming less than the minimal daily requirement. Poor people do not get enough food because they are poor. If they have enough purchasing power they choose a mixed diet that fulfills their calorie and protein needs. It is hoped that economic growth and development will continue so that all members of society will be able to meet their basic food needs. At the same time, this will mean large increases in total food demand, which will have to be met either by increased production or by imports. Policies relating to production, imports, and food prices will all interact to equate supply with demand for food. The answer to the question of what the final mix will be -- of what foods are consumed and where they will come from -- is as much political as determined by economic and cultural patterns.

# APPENDIX--SUPPLEMENTARY TABLES

## Table 25--Specification of regression variables

| Variable | Specification |
|---|---|
| LQRICE | Log of quantity of rice per week. |
| QRICE | Quantity of rice per week. |
| LTX | Log of total expenditures in Rp/month. |
| LTX2 | $(LTX)^2$. |
| INVTX | 1/TX. |
| URBAN | Dummy valued at 1 if urban, 0 otherwise. |
| UTX | URBAN x LTX. |
| PTX | LTX x dummy valued at 1 if Java and total expenditures are less than Rp 1,000. |
| LPRI | Log of rice prices. |
| WJAVA | Dummy valued at 1 if observation from West Java or Jakarta. |
| CJAVA | Dummy valued at 1 if observation from Central Java or Yogyakarta. |
| EJAVA | Dummy valued at 1 if observation from East Java. |
| SUMATRA | Dummy valued at 1 if observation from Sumatra. |
| KALIMAN | Dummy valued at 1 if observation from Kalimantan. |
| SULAWESI | Dummy valued at 1 if observation from Central or Southeast Sulawesi or East Nusatengara or Maluku. |
| LQCASS | Log of quantity of cassava consumed per capita per week. |
| LQGAP | Log of quantity of gaplek consumed per capita per week. |
| LQSPOT | Log of quantity of sweet potatoes consumed per capita per week. |
| LQCORN | Log of quantity of corn consumed per capita per week. |
| ROUND 1 | Dummy valued at 1 if the sample is from round 1 of Susenas V, 1976. |
| ROUND 2 | Dummy valued at 1 if the sample is from round 2 of Susenas V, 1976. |
| LPCORN | Log of price of corn. |
| LPCASS | Log of price of cassava. |
| LPGAP | Log of price of gaplek. |
| LPSPOT | Log of price of sweet potatoes. |
| | Log of the price of cassava. |
| $X_1 \ldots X_4$ | Dummy variables. $X_1$ = 1 if TX <2,000; $X_2$ = 1 if 2,000 <TX <3,000; $X_3$ = 1 if TX <3,000; $X_4$ = 1 if TX >5,000. |
| $RX_1 \ldots RX_4$ | $X_j$ x LPRI. |
| $CSX_1 \ldots CSX_4$ | CXSj = $X_j$ x LCSSP. |
| KCAL | Log of kilocalories. |
| LPCAL | Log of price of kilocalories computed from the sum of the expenditures on three food items divided by kilocalories. |
| LPROT | Log of protein from rice, cassava, and maize. |
| $PCAL_1 \ldots PCAL_4$ | $PCAL_j = X_j$ x LPCAL. |
| $PPROT_1 \ldots PPROT_2$ | $X_j$ x LPROT. |
| UPCAL | Urban x LPCAL. |
| UPRT | Urban x LPROT. |

Source: Harold Alderman and C. Peter Timmer, "Food Price Policy and Protein Calorie Intake: Estimating Consumption Parameters for Indonesia," Cambridge, Mass., August 1979.

Table 26--Proportion of population at or below specified expenditure levels

| Total Expenditures Per Capita Per Month | Rural Java | Rural Off Java | Urban Java | Urban Off Java | All Indonesia Sample | All Indonesia Weights |
|---|---|---|---|---|---|---|
| Rp 1,000 | 0.015 | 0.012 | 0.001 | 0.001 | 0.009 | 0.01 |
| 2,000 | 0.232 | 0.092 | 0.018 | 0.032 | 0.106 | 0.15 |
| 3,000 | 0.547 | 0.275 | 0.099 | 0.126 | 0.291 | 0.39 |
| 4,000 | 0.748 | 0.477 | 0.239 | 0.279 | 0.470 | 0.58 |
| 5,000 | 0.859 | 0.640 | 0.384 | 0.438 | 0.612 | 0.71 |
| 8,000 | 0.966 | 0.885 | 0.678 | 0.757 | 0.839 | 0.89 |
| 10,000 | 0.983 | 0.942 | 0.785 | 0.856 | 0.902 | 0.94 |
| 20,000 | 0.999 | 0.995 | 0.953 | 0.980 | 0.983 | 0.99 |
| 30,000 | 1.000 | 0.999 | 0.983 | 0.994 | 0.995 | 0.99 |
| >30,000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Population weights from 1971 census | 0.531 | 0.296 | 0.111 | 0.062 | 1.000 | 1.00 |

Source: Harold Alderman and C. Peter Timmer, "Food Price Policy and Protein Calorie Intake: Estimating Consumption Parameters for Indonesia," Cambridge, Mass., August 1979.

Table 27--Summary of starchy staple consumption data from Susenas V, 1976

| Expenditure Group | Monthly Total Expenditures (Rp) | Share of Population: Susenas Sample | Share of Population: Census | Rice: Weekly Consumption (kg/capita) | Rice: Average Implicit Price[a/] (Rp/kg) | Rice: Calorie Price[a/] (Rp/1,000 kcal) | Rice: Budget Share (percent) |
|---|---|---|---|---|---|---|---|
| Poor | | | | | | | |
| Urban | 1,601 | 0.01 | 0.01 | 1.288 | 124.0 | 34.7 | 0.418 |
| Rural | 1,543 | 0.10 | 0.15 | 1.107 | 120.9 | 33.9 | 0.364 |
| Total | 1,548 | 0.11 | 0.15 | 1.122 | 121.1 | 33.9 | 0.369 |
| Low | | | | | | | |
| Urban | 2,567 | 0.08 | 0.01 | 1.748 | 129.9 | 36.4 | 0.380 |
| Rural | 2,501 | 0.15 | 0.22 | 1.787 | 123.2 | 34.5 | 0.376 |
| Total | 2,513 | 0.18 | 0.23 | 1.780 | 124.5 | 34.9 | 0.377 |
| Middle | | | | | | | |
| Urban | 4,019 | 0.12 | 0.05 | 2.071 | 132.2 | 37.0 | 0.297 |
| Rural | 3,876 | 0.21 | 0.28 | 2.338 | 127.8 | 35.8 | 0.333 |
| Total | 3,927 | 0.32 | 0.33 | 2.243 | 129.3 | 36.6 | 0.320 |
| High | | | | | | | |
| Urban | 10,075 | 0.23 | | 2.341 | 139.8 | 39.2 | 0.171 |
| Rural | 7,606 | 0.16 | 0.18 | 3.040 | 132.9 | 37.2 | 0.243 |
| Total | 9,085 | 0.39 | 0.28 | 2.621 | 137.0 | 38.4 | 0.200 |
| Indonesia | | | | | | | |
| Urban | 7,443.3 | 0.39 | 0.17 | 2.187 | 136.3 | 38.2 | 0.232 |
| Rural | 4,114.4 | 0.62 | 0.83 | 2.185 | 126.9 | 35.5 | 0.326 |
| Total | 5,412 | 1.00 | 1.00 | 2.185 | 130.6 | 36.6 | 0.289 |

a/The price was calculated for the consuming population only. Unlike budget share or weekly consumption, no zeroes were averaged in.

Table 27, continued

| Expenditure Group | Fresh Cassava: Weekly Consumption (kg/capita) | Fresh Cassava: Average Implicit Price[a] (Rp/kg) | Fresh Cassava: Calorie Price[a] (Rp/1,000 kcal) | Fresh Cassava: Budget Share (percent) | Shelled Corn: Weekly Consumption (kg/capita) | Shelled Corn: Average Implicit Price[a] (Rp/kg) | Shelled Corn: Calorie Price[a] (Rp/1,000 kcal) | Shelled Corn: Budget Share (percent) | Rice, Corn, and Cassava: Total Daily Kilocalories Consumed | Rice, Corn, and Cassava: Average Calorie Price (Rp/1,000 kcal) |
|---|---|---|---|---|---|---|---|---|---|---|
| Poor | | | | | | | | | | |
| Urban | 0.168 | 33.6 | 33.4 | 0.014 | 0.050 | 76.7 | 22.0 | 0.011 | 707.3 | 34 |
| Rural | 0.395 | 25.9 | 25.7 | 0.026 | 0.324 | 70.3 | 20.1 | 0.065 | 783.1 | 30 |
| Total | 0.377 | 26.4 | 26.2 | 0.025 | 0.302 | 70.4 | 20.2 | 0.061 | 777.3 | 30 |
| Low | | | | | | | | | | |
| Urban | 0.181 | 34.2 | 34.0 | 0.009 | 0.032 | 74.6 | 21.4 | 0.004 | 933.6 | 36 |
| Rural | 0.461 | 25.9 | 25.7 | 0.019 | 0.247 | 71.1 | 20.4 | 0.031 | 1,101.1 | 32 |
| Total | 0.409 | 27.4 | 27.2 | 0.017 | 0.208 | 71.4 | 20.5 | 0.026 | 1,070.1 | 33 |
| Middle | | | | | | | | | | |
| Urban | 0.152 | 37.9 | 37.6 | 0.005 | 0.012 | 72.1 | 20.7 | 0.001 | 1,084.4 | 37 |
| Rural | 0.595 | 25.4 | 25.2 | 0.015 | 0.188 | 71.6 | 20.5 | 0.016 | 1,371.1 | 34 |
| Total | 0.437 | 29.8 | 29.6 | 0.012 | 0.125 | 71.7 | 20.5 | 0.011 | 1,269.0 | 35 |
| High | | | | | | | | | | |
| Urban | 0.140 | 43.9 | 43.6 | 0.003 | 0.012 | 74.6 | 21.4 | 0.000 | 1,220.0 | 39 |
| Rural | 0.725 | 31.5 | 31.3 | 0.011 | 0.133 | 70.4 | 20.2 | 0.006 | 1,720.1 | 36 |
| Total | 0.374 | 38.9 | 38.6 | 0.006 | 0.060 | 72.7 | 20.8 | 0.003 | 1,420.0 | 38 |
| Indonesia | | | | | | | | | | |
| Urban | 0.148 | 41.0 | 40.7 | 0.004 | 0.015 | 74.2 | 21.3 | 0.001 | 1,143.7 | 38 |
| Rural | 0.563 | 27.1 | 26.9 | 0.017 | 0.210 | 71.0 | 20.3 | 0.025 | 1,300.0 | 35 |
| Total | 0.401 | 32.5 | 32.3 | 0.012 | 0.134 | 71.8 | 20.6 | 0.016 | 1,239.1 | 37 |

Source: Harold Alderman and C. Peter Timmer, "Food Price Policy and Protein Calorie Intake: Estimating Consumption Parameters for Indonesia," Cambridge, Mass., August 1979.

a/The price was calculated for the consuming population only. Unlike budget share or weekly consumption, no zeroes were averaged in.

Table 28--Consumption functions for rice, Susenas V, 1976

| Independent Variables | Regressions on LQRICE | | |
|---|---|---|---|
| | RI5 | RI5a | RI5b |
| LTX | 6.226 | 6.716 | 6.732 |
| | (9.962) | (10.694) | (10.686) |
| LTX2 | -0.320 | -0.346 | -0.347 |
| | (9.143) | (9.886) | (9.901) |
| PTX | 0.098 | 0.112 | 0.114 |
| | (3.379) | (3.862) | (3.931) |
| UTX | -0.149 | -0.171 | -0.180 |
| | (3.104) | (3.717) | (4.000) |
| URBAN | 1.182 | 1.370 | 1.452 |
| | (3.000) | (3.504) | (3.585) |
| RX1 | -1.125 | -1.913 | -1.921 |
| | (8.588) | (7.085) | (7.089) |
| RX2 | -1.143 | -1.468 | -1.475 |
| | (8.792) | (4.943) | (4.933) |
| RX3 | -1.180 | -1.162 | -1.156 |
| | (9.077) | (5.164) | (5.115) |
| RX4 | -1.213 | -0.741 | -0.743 |
| | (9.331) | (3.984) | (3.973) |
| CSX1 | --- | --- | -0.073 |
| | | | (0.760) |
| CSX2 | --- | --- | -0.004 |
| | | | (0.040) |
| CSX3 | --- | --- | -0.082 |
| | | | (1.155) |
| CSX4 | --- | --- | -0.005 |
| | | | (0.100) |
| X1 | --- | 3.921 | 6.445 |
| | | (2.385) | (3.983) |
| X2 | --- | 2.239 | 3.971 |
| | | (1.652) | (2.368) |
| X3 | --- | 6.169 | 2.472 |
| | | (3.937) | (1.816) |
| WJAVA | 0.052 | 0.049 | 0.049 |
| | (1.000) | (0.942) | (0.942) |
| CJAVA | -0.066 | -0.065 | -0.068 |
| | (1.200) | (1.204) | (1.259) |
| EJAVA | -0.154 | -0.155 | -0.158 |
| | (2.483) | (2.279) | (2.590) |
| SUMATRA | 0.159 | 0.156 | 0.146 |
| | (2.789) | (3.391) | (3.042) |
| KALIMAN | 0.139 | 0.118 | 0.115 |
| | (2.439) | (2.070) | (2.018) |
| SULAWESI | -0.358 | -0.360 | -0.361 |
| | (6.281) | (6.429) | (6.446) |
| ROUND 1 | -0.038 | -0.040 | -0.046 |
| | (1.118) | (1.212) | (1.353) |
| ROUND 2 | -0.106 | -0.103 | -0.105 |
| | (3.029) | (2.943) | (3.000) |
| Constant | -23.043 | -27.603 | -27.680 |
| $R^2$ | 0.70 | 0.71 | 0.71 |

Source: Harold Alderman and C. Peter Timmer, "Food Price Policy and Protein Calorie Intake: Estimating Consumption Parameters for Indonesia," Cambridge, Mass., August 1979.

Notes: The numbers in parentheses are t-statistics.

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John A. Dixon is a research associate at the East-West Environment and Policy Institute, Honolulu, Hawaii.