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FOOD CONSUMPTION PATTERNS AND PARAMETERS IN SRI LANKA: THE CAUSES AND CONTROL OF MALNUTRITION

by

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Research Report (forthcoming)

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FOREWORD

This report presents the results of analyses of a series of issues which influence the performance of the Sri Lankan food stamp program, such as food consumption, expenditure patterns, income sources, price and income elasticities for major foods and calories and estimated impact of changes in food prices and incomes on calorie consumption for various population groups. The extent to which intra-household distribution of income control affects spending behavior is also treated because of its importance for the question of how food stamp incomes are spent. A good understanding of these issues is essential for analyses of how the nutritional status is affected by the food stamp program and alternative policy options.

The research reported here was funded by the Office of Nutrition of the Agency for International Development through the Nutrition Economics Group, Office of International Cooperation and Development of the United States Department of Agriculture, under grant DAN-1275-G-SS-2124-00. Parts of the report are based on earlier work by the author the results of which were submitted to AID and the government of Sri Lanka in several reports. This earlier work was funded partly by the above grant and partly under AID contracts with IFPRI and the Community Systems Foundation.

On the basis of the results reported here as well as additional data obtained from a joint FNPPD/IFPRI household survey in the Kandy district and several other sources, research under the above grant is being continued with emphasis on how food stamps influence incomes,

calorie consumption, and nutritional status of children of households at various income levels and with various socio-economic characteristics. Potential impact of alternative policy measures is also being analyzed.

Difficulties in obtaining the required data and strong demands by the government of Sri Lanka for assistance on the food sector strategy study and the nutrition plan made it necessary to modify the sequence of the various research tasks as stated in the proposal. Preliminary results on the contribution of food stamps to household incomes by various income strata and other socio-economic population groups will be submitted by the end of January 1985.

Per Pinstrup-Andersen

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INTRODUCTION

This research report examines patterns and relationships which guide food consumption behavior in Sri Lanka. It is organized into six chapters. Following these introductory remarks, Chapter I embarks upon identifying the extent and nature of malnutrition in Sri Lanka based on the surveys, one conducted in 1975/76 and the other in 1980/82.[1] The lack of reliable socioeconomic data to compliment the anthropometric indicators limits the scope of this analysis. This is followed in Chapters II and III with the results of the analysis of the nationally representative 1980/81 Labour Force and SocioEconomic Survey conducted by the Sri Lankan Department of Census and Statistics, Ministry of Plan Implementation.[2] Compelling questions addressed in the second chapter include identifying who is not consuming an adequate diet and what are the associated demographic and economic factors and behavioral characteristics. This first involves examining consumption and expenditure patterns and then transforming these data on household outlays into data on nutrient intake and dietary adequacy. Answers are sought to questions such as: what is the percent of hungry households? How do expenditure patterns in rural and urban households condition dietary inadequacy? And, how do the poor and

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[1] The Center for Disease Control of the U.S. Public Health Service and the Food and Nutrition Policy Planning Division of the Ministry of Plan Implementation generously provided this author with the 1975/76 and 1980/82 data sets, respectively.

[2] The Department of Census and Statistics generously provided this author with raw, uncleaned data tapes which were used for the analysis which follows.

malnourished distinguish themselves in terms of their consumption bundle and other socioeconomic characteristics.

The third chapter continues the disaggregated analysis of consumption patterns. It is focused on the food consumption and expenditure patterns of different occupational groups, as well as the occupational characteristics of the poor in contrast to the better-off households. In addition, the production and consumption characteristics of farm households are examined. The dual role of these households as producers and consumers is considered.

The central theme of the descriptive analysis in Chapters II and III is disaggregation. This is fundamental in order to understand relationships between household demographics, poverty and hunger. The detailed analysis, however, raises some compelling questions which may only be answered by resorting to econometric modeling. Most important is the need to determine how consumers respond to marginal changes in the micro-food economy and their household environment. Similarly, predicting changes in the consumption bundle in response to marginal changes in incomes provides insight into the nutritional consequences of income growth and distribution. It also elucidates the scope and magnitude of short-term efforts to raise the level of consumption among those at greatest risk.

Thus, Chapter IV uses a two-stage probit/ordinary least squares procedure, to estimate the consumption functions. The models are presented, as well as the parameter estimates. Once again, emphasis is placed on estimating market demand parameters disaggregated by income class so as to distinguish between how consumers in different strata

of the population respond to changes in food prices and income. This is followed in Chapter V by some simple simulations to determine the consumption consequences of price changes and income shifts. Special attention is given to modeling the impact of price changes on farm households in their dual role as producers and consumers. This will enable policymakers to better appreciate and predict the effect of food policy on the nutritional status of the poor.

In the sixth chapter, some comparisons of findings from the consumption analysis with previous household budget surveys are made. Inferences are drawn concerning the change in nutritional levels during the past decade.

Finally, the last chapter summarizes important policy issues and conclusions of the research. It also identifies the need for further research based on the findings of this study.

I. THE EXTENT OF MALNUTRITION

The measurement of malnutrition in a population is traditionally performed using anthropometric data on weight and height of children. Three indicators are employed in this regard. The first is height-for-age which is an indicator of stunting. It reveals how many children have suffered from chronic undernutrition in the past. The second, weight-for-height, is an indicator of wasting. Weight-for-height is used to estimate the extent of acute malnutrition, suggesting the need for immediate attention. The percentage of the population with low weight-for-age is a composite indicator, reflecting simultaneously the extent of linear growth retardation (stunting) and acute wasting.

Anthropometric data collected from a survey performed between 1980 and 1982 on 33,582 children were analyzed.[1] The National Center for Health Statistics reference population is used as a standard of comparison.[2] In addition, in accordance with the recommendations of the World Health Organization,[3] the analysis employs cut-off points of -2 standard deviations (SD) of a given indicator, alternatively referred to as -2 Z-scores, as the distinction below which a child is

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1 The national survey was designed and carried out by the Food and Nutrition Policy and Planning Division of the Ministry of Plan Implementation, Government of Sri Lanka, Colombo.

2 United States Public Health Service, Health Resources Administration, "NCHS Growth Charts" (Rockville, MD: 1976).

3 World Health Organization, Measuring Change in Nutritional Status (Geneva, 1983).

classified as malnourished.[1] This is done acknowledging that for any set of a cut-off point and an anthropometric indicator there will inevitably be false positives (Type I error) and false negatives (Type II error). However, it is felt that a cut-off point of -2 Z-scores for any indicator, below which there is a probability of less than 0.025 percent of finding an individual from the healthy reference population, will effectively maximize the sensitivity (the proportion of those who are malnourished who are classified as malnourished) and specificity (the proportion of those well-nourished, classified as well-nourished) of a given combination of indicator and cut-off point.

In Sri Lanka 37 percent of the children have a ratio of height-for-age below -2 standard deviations of the reference standard (see Table 1.1). In the reference population, a child has a probability of less than 0.025 of being below this cut-off point. Thus, 37 percent is considered a conservative estimate of the percentage of children whose growth is stunted due to malnutrition.

While stunting of growth is indicative of sustained periods of

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[1] Z-scores are calculated as follows:

$$Z_i = \frac{W_i - M_j}{S_j}$$

where:

Z_i = the standard deviation score of individual i

W_i = the measurement (e.g., weight-for-height or height-for-age) of individual i

M_j = the median value of the measurement in the reference population, j

S_j = one standard deviation above the median for the measurement, derived from the reference population, j.

Table 1.1 -- National Estimates of the Percent Malnourished, by Sex[a]

	Actual No. of Children	Stunted	Wasted	Stunted and Wasted Concurrently
Boys	16,931	37.0	11.7	4.8
Girls	16,651	37.5	14.4	6.1
		$t=0.99$	$t=7.67$	$t=5.48$
		$p>.05$	$p<.005$	$p<.005$

[a] Percentages based on the use of <-2 Z-score cut-off point.

dietary inadequacy and/or infectious disease in the population, the problem of wasting, which reflects acute inadequacies at present, is also serious in Sri Lanka. According to the survey data, 13 percent of the population has a proportion of weight-for-height below the -2 Z-scores' cut-off point. Children with this ratio of weight-for-height have a probability of less than 0.025 of being found in the reference population.

The fourth column in Table 1.1 reports that 5.4 percent of the children are concurrently wasted and stunted. This category is a subset (i.e., intersection) and not mutually exclusive of the sets of wasted and stunted children. It is noted that there is a statistically significant difference between the percentage of girls and boys who are wasted, and concurrently wasted and stunted.

The findings for the extent of stunting and wasting among the different age cohorts of the preschool population also show significant variation (see Table 1.2). As expected, the number of children with retarded linear growth, an indicator of previous and persistent undernutrition, increases steadily from lowest to highest age group. This reflects the cumulative effect of episodes of malnutrition among children, coupled with the fact that children often do not catch up in length, despite the physiological possibility for catch-up growth. This is an indication of continued and long-term marginal intake. Despite that the amount of chronic undernutrition increases steadily with each age cohort, this does not indicate increasing nutritional at-riskness. The truth is quite to the contrary, as observed by examining the data on the prevalence of wasting.

Table 1.2 -- National Estimates of the Percent Malnourished By Age Group

Age Groups (months)	Actual No. of Children	% Stunted[a]	% Wasted[b]	% Concurrent Stunting and Wasting[c]	Mean Z-scores Height (age)	Mean Z-scores Weight (age)	% Underfed[d] in the past and adequately fed at present	% Adequately fed in the past and underfed at present
6-12	4,348	17.7	13.2	1.5	-0.93	-0.87	13.6	7.9
13-24	8,017	35.3	23.1	9.1	-1.60	-1.27	17.7	8.0
25-36	7,751	36.6	14.9	8.0	-1.61	-1.07	21.0	3.7
37-48	7,176	42.7	6.2	3.9	-1.79	-0.93	31.0	1.5
49-60	6,290	48.0	5.6	2.2	-1.95	-1.0	35.9	2.0
Total	33,582	37.3	13.1	5.4	-1.62	-1.05	24.1	4.5

a Percentages based on height-for-age < -2 Z-score cut-off point

b Percentages based on weight-for-height < -2 Z-score cut-off point

c Percentages based on height-for-age and weight-for-height < -2 Z-score cut-off point; the children in this category are a subset (i.e., intersection) of the sets of stunted and wasted children.

d Height-for-age < -2 Z-scores and weight-for-height > -1.5 Z-scores

e Weight-for-height < -2 Z-scores and height-for-age > 1.5 Z-scores

The percentage of children underfed presently, showing signs of acute malnutrition, is highest in the 13- to 24-month-old age group. In this cohort, 23 percent of the sample have a ratio of weight-for-height in a range that there is less than 0.025 probability of finding a child in the reference population. Using a similar conservative (i.e., low) estimate for the age groups 6 to 12 months and 25 to 36 months, the prevalence of wasting is also high, being 13.2 and 14.9 percent, respectively. Only around six percent of the children between 37 and 60 months can be classified as wasted, a figure almost one-quarter that for the children between the ages of one and two years.

While the above data reveal a high level of prevalence of both stunting and wasting among the Sri Lankan preschool-age population, it is instructive to compare these data from 1980/82 with another national survey from 1975/76.[1] The previous survey was re-analyzed using the identical methodology, including the same NCHS reference population and Z-scores as cut-off points.

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[1] The 1975/76 survey was performed by the Ministry of Health, in cooperation with the U.S. Center for Disease Control. The sampling frame used for this earlier survey was not identical to that used by the Ministry of Plan Implementation. However, they were both designed to be nationally and sectorally representative. Therefore, it is not possible to disaggregate the data geographically below the sectoral level without running the risk of inappropriate comparisons. It is also noted that in the earlier survey, data were not available on the urban sector. Furthermore, the percent of children in age cohorts was markedly different from the present survey. Therefore, all comparisons are limited to those between age groups.

Table 1.3 provides data on mean z-scores and the percent of stunted and wasted children for the rural and estate sectors.[1] First, it is conspicuous how severe the problem of stunting is in the estate sector, in both surveys. In 1980/82 there is less stunting than in the mid-1970s. This finding is not surprising. The height-for-age data from the 1975/76 survey would have captured the effects of the stunting which resulted from dietary shortfalls in 1972-1974, a period of poor domestic harvests and the world food crises. The recent data on stunting, on the other hand, reflects the nutrition situation during the period 1976-1980, a period of relative food security for the poor in Sri Lanka. During the 1977-1980 period, either the quantity rationing scheme was still in effect or the marked erosion of the value of food stamps had yet to transpire.

The level of wasting tells a story of worsening nutritional status in 1980/82 than in 1975/76, for both sectors (see Table 1.3). This is

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[1] The sectoral distinction that is made throughout the text is worthy of discussion at this point. Specifically, it is customary to distinguish between urban and rural households. One would expect them to manifest different consumer behavior and be affected differentially by various policy instruments. The distinction between rural and estate, however, deserves further comment. In Sri Lanka, the estate sector, comprised primarily of ethnic Tamils, includes workers on rubber and tea plantations. These agricultural laborers, who live in communities attached to their work place, comprise 7.3 percent of the households in Sri Lanka. Their economic and social well-being is primarily tied to the performance of the export sector and international markets for the primary products they produce. This is contrasted with the rural sector who produce primarily for the domestic economy and are much more subject to the vagaries of domestic policy formation. In addition, the Tamil heritage of the estate workers, as juxtaposed with the Singhalese who represent the vast majority of the rural population, is characterized by different tastes and preferences, most important of which is their favoring wheat products.

Table 1.3 -- Comparison of the Extent of Stunting, 1980/82 and 1975/76

Age Group	Year	Mean Z-Scores: Height-for-Age		Mean Z-Scores: Weight-for-Height		% Stunted		% Wasted		% Underfed in the Past and Adequately Fed at Present		% Adequately Fed in the Past and Underfed at Present	
		Rural	Estate	Rural	Estate	Rural	Estate	Rural	Estate	Rural	Estate	Rural	Estate
6-11	1980/82	0.90	-1.56	-0.84	-0.90	15.8	41.5	13.4	14.2	12.1	31.3	8.1	7.6
	1975/76	-1.12	-1.89	-0.78	-0.70	19.3	44.3	5.2	3.8	14.2	35.1	2.7	0
12-23	1980/82	-1.57	-2.23	-1.31	-1.37	33.9	59.6	24.3	24.6	16.7	28.3	8.8	5.0
	1975/76	-1.76	-2.58	-1.32	-1.40	38.6	67.4	18.1	23.6	18.3	34.4	5.1	2.3
24-35	1980/82	-1.56	-2.44	-1.10	-1.10	34.8	64.3	16.1	18.0	19.5	39.7	4.1	3.1
	1975/76	-1.85	-2.76	-1.05	-1.26	43.2	74.2	9.8	12.6	26.1	42.4	1.5	0.5
36-47	1980/82	-1.79	-2.33	-1.00	-0.88	42.5	62.6	6.7	6.7	30.2	48.6	1.7	1.2
	1975/76	-2.06	-2.90	-0.92	-1.03	50.3	79.0	4.4	8.1	38.0	55.6	3.5	0
48-60	1980/82	-1.96	-2.49	-1.03	-0.91	48.5	68.0	5.5	5.1	35.3	56.7	2.2	1.3
	1975/76	-2.25	-3.13	-0.97	-0.99	60.1	85.1	3.1	4.6	47.7	64.7	5.8	0

especially true in the rural sector, where there is a statistically significant difference between the level of wasting in the age cohorts.

Finally one last comparison, using weight-for-age data according to the Gomez classification, is found in Table 1.4. Making comparisons with these figures is considered reasonable despite that the data are not presented by sector. In both samples the ratio of rural to estate sector population was not significantly different, thereby removing the bias of combining two population groups. The data, like that for height-for-age, present a picture of an improving situation between the surveys. Given that weight-for-age is a composite of the weight-for-height and height-for-age, it is entirely possible that the improvement between surveys captures the improvement noted above in terms of the level of stunting, and therefore reflects the relatively better nutritional status during 1977 to 1980 than the 1972 to 1975 period.

Table 1.4 -- Comparison of Nutritional Status Using the Gomez Classification, 1975/76 and 1980/82

Age Group (months)	Year	Gomez Classification			
		Normal	First Degree	Second Degree	Third Degree
6-12	1981/82	27.3	51.2	19.5	2.0
	1975/76	22.0	51.8	22.0	3.4
12-24	1981/82	14.0	53.7	30.4	1.8
	1975/76	10.8	50.0	35.0	4.2
24-36	1981/82	12.6	54.6	30.9	1.7
	1975/76	9.9	53.8	33.8	2.5
36-48	1981/82	9.7	53.2	35.5	1.8
	1975/76	9.0	47.5	36.9	3.3
48-60	1981/82	7.2	49.8	40.8	2.2
	1975/76	5.8	39.3	43.2	3.5

II. FOOD CONSUMPTION AND EXPENDITURE PATTERNS

BACKGROUND

In this and the following three chapters of the report, results from the 1980/81 Labour Force and SocioEconomic Survey, conducted by the Department of Census and Statistics of the Ministry of Plan Implementation, are presented. The survey was conducted in four rounds between May 1980 and April 1981. It was designed to be nationally, sectorally, and regionally representative. The consumption and expenditure data, the nexus of this paper, were only collected during a seven-month period, from the beginning of October to the end of April. Depending on the item, consumption expenditures were collected for a reference period of one week (e.g., food), one month (e.g., fuel and light), six months (e.g., semi-durables), to one year (e.g., durables). The nature of the sampling frame still assured its national coverage and representability.[1]

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[1] In the cleaning process, some household records were eliminated from the sample of 5,181. The major reason was that the imputed prices of major commodities (i.e., rice, bread, sugar, coconut) determined by dividing expenditures by quantity consumed, were greater than three standard deviations from the mean, although both the actual expenditures and quantities were within plausible boundaries for these households. It was therefore impossible to distinguish which was misreported or mis-entered, thereby resulting in non-sensical prices. The other major reason for eliminating records was that the data reported in one section of the survey on home production, and the value consumed, sold, and retained during (continued next page)

The survey indicates that there are 3,058,000 households in Sri Lanka. Seventy-four percent are in the rural sector, 19 percent in the urban areas, and seven percent residing in the estate sector; although an even larger share of the population of approximately 15 million reside in the rural sector and a smaller share in the estate sector. This is because the average household size for the entire island is 5.2 persons, while the figures are 5.2, 5.3, and 4.5 for the rural, urban, and estate sectors, respectively.

FOOD EXPENDITURE PATTERNS

One of the most basic consumption statistics is the ratio of food expenditures to total expenditures. This ratio is labeled the food share. Table 2.1 presents data on the food share stratified by sector, as well as by 10 expenditure groups. Food accounts for 74 percent of the total expenditures for the entire population. Of greater interest, however, is that this figure approaches 80 percent for the poorest 20 percent of the households. It only falls significantly below 75 per-

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(footnote continued)
the year were completely unreconcilable with the data on reported monthly consumption found in another section of the survey. A check was performed to determine whether the process of data cleaning affected significantly the composition of per capita expenditure levels and other demographic variables in the population. Cell means of the sample, by sector and expenditure groups, were compared before and after cleaning. In all three sectors, the mean values for the variables examined were nearly identical. In total, the cleaning process did not alter the composition of the sample.

Table 2.1 -- Average Ratio of Food Expenditures to Total Expenditures (Food Share), by Expenditure Group and Sector, 1980/81[a]

Per Capita Expenditure (Deciles)[b]	Food Share			
	Urban	Rural	Estate	All-Island
1	0.799	0.798	0.782	0.797
2	0.802	0.800	0.795	0.800
3	0.791	0.791	0.791	0.791
4	0.777	0.777	0.810	0.782
5	0.774	0.770	0.772	0.771
6	0.748	0.758	0.790	0.760
7	0.727	0.749	0.785	0.749
8	0.704	0.716	0.774	0.719
9	0.666	0.700	0.771	0.697
10	0.516	0.597	0.646	0.561
Total	0.697	0.751	0.779	0.743

a Figures include liquor, tobacco and betel.

b The expenditure deciles are determined on the basis of All-Island figures. See Appendix A for data on how the population shares are distributed across the urban, rural, and estate sectors by decile.

cent for the three upper deciles of the income distribution, with the top decile of the population spending around half of their income on food, liquor, tobacco and betel. This general pattern holds for all sectors; although the urban sector outlays relatively less, and the estate sector relatively more on food commodities.

The data on food share are of great interest for a number of reasons. First, the extremely high percent of total expenditures devoted to food is in keeping with patterns of acute poverty and hunger observed in the poorest countries. The declining ratio of food to non-food expenditures commensurate with economic development is well documented. The high food share observed in Sri Lanka clearly falls at the end of the spectrum. This suggests a serious struggle to achieve dietary adequacy.

A second interesting point from Table 2.1 is the relatively stable and high food share across rising expenditure levels. As intimated above, one of the best observed and documented economic relationships is Engel's Law. It states that the proportion of the total budget spent on food declines as household income rises, as illustrated by curve AB in Figure 2.1. Interestingly, this well-substantiated relationship is only partially applicable to the Sri Lankan context.[1]

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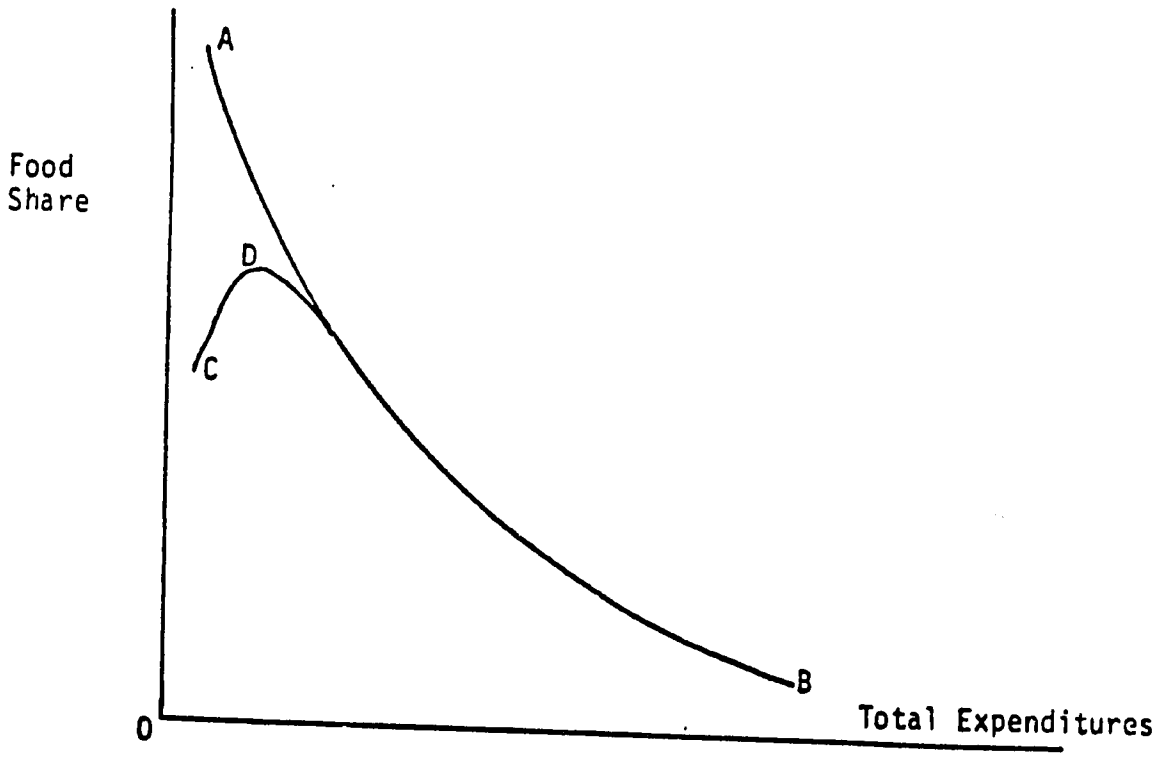
[1] This is shown by regressing food shares on per capita expenditures, one gets the following (t-statistics in parenthesis):

$$\begin{aligned} LFDSHR = 7.27 &+ \underset{(28.5)}{1.968172LPCEXP} - \underset{(31.5)}{0.135874LPCEXP2} + \underset{(3.5)}{0.06LAEURAT} \\ &- \underset{(9.11)}{0.04LHHSIZE} + \underset{(4.3)}{0.30URB} - \underset{(4.2)}{0.63EST} - \underset{(4.5)}{0.04URBX} \\ &+ \underset{(4.4)}{0.09ESTX} \qquad R^2 = 0.51 \end{aligned}$$

(continued next page)

Figure 1 -- Engel Curves



Adapted from: Neville Edirisinghe, "The Implications of the Change from Ration Shops to Food Stamps in Sri Lanka for Fiscal Costs, Income Distribution, and Nutrition" (Washington, D.C.: International Food Policy Research Institute, 1984) Mimeograph.

One can determine that the expenditure elasticity of food share is in fact positive among the poorest of the poor, and actually corresponds to a curve of the shape CDB. Engel's curve does not become negative until per capita yearly household expenditures reach around Rs. 1400 in the rural sector. This inflection point (point D in Figure 2.1) at which the Engel function assumes its expected form, is lower for the urban sector and higher for the estate sector. The numbers are Rs. 1200 and Rs. 1900, respectively, confirming that marginal increases in expenditure levels will result in a relatively higher amount of additional food expenditures in the estate than rural sector, and a rela-

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where:

LFDSHR = logarithm of the food share,

LPCEXP = logarithm of the per capita expenditures on food and non-food items,

LPCEXP2 = (LPCEXP),

LHHSIZE = logarithm of the household size,

LAEURAT = logarithm of the ratio of adult equivalency units to household size,

URB = dummy variable to shift the intercept of the Engel curve which equals one when an observation is from the urban sector, and zero otherwise,

EST = dummy variable to shift the intercept of the Engel curve, which equals one when an observation is drawn from the estate sector, and zero otherwise,

URBX = URB * LPCEXP

ESTX = EST * LPCEXP

The use of the log-log quadratic functional form allows for considerable flexibility in the shape of the Engel curve and allows the elasticity to be negative at one expenditure level and positive for another.

tively smaller increment in food expenditures in the urban than rural sector. In total, nearly 10 percent of the population defy Engel's Law.

Similar findings have been reported for India and Nigeria.[1] There are two explanations for such an observation. The first is that there are certain fixed expenditures, such as rent, transport to work, health care, and clothing which even the poorest families must purchase. These are non-compressible. Thereafter, as more income becomes available, poor households can and do allocate most additional resources to purchase food in order to achieve unmet dietary requirements.

The second reason revolves around choice of calorie sources. Specifically, a modifying factor to Engel's Law is a shift in sources of calories to higher quality protein and refined foods commensurate with the rise in income. This is referred to as Bennet's Law.[2] The result is a higher price paid per calorie. This is illustrated in Table 2.2, which depicts how the calorie price rises with total expenditures, even between the first and second decile of the income distribution. In addition, one can note that in the urban sector the calorie price is higher than the rural or estate sectors. This higher calorie price, as will be discussed below, reflects largely a shift in the consumer bundle towards higher cost and more prestigous foods,

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1 M. Lipton, "Poverty, Undernutrition and Hunger," World Bank Staff Working Paper No. 597 (Washington, D.C., 1983) pp. 35-49.

2 Thomas Poleman, "Quantifying the Nutrition Situation in Developing Countries," Food Research Institute Studies 18, No. 1 (1981).

Table 2.2 -- Average Calorie Price by Expenditure Group and Sector

Per Capita Expenditure (Deciles)	Calorie Price (Rs./Calorie x 1000)			
	Urban	Rural	Estate	All-Island
1	2.31	2.10	2.14	2.14
2	2.54	2.22	2.14	2.24
3	2.62	2.33	2.34	2.37
4	2.65	2.39	2.38	2.42
5	2.90	2.43	2.42	2.51
6	2.85	2.50	2.33	2.54
7	2.97	2.58	2.56	2.65
8	3.28	2.76	2.46	2.84
9	3.52	2.86	2.83	3.03
10	4.45	3.70	3.58	4.01
Total	3.24	2.55	2.46	2.67

although it does to some extent pick up the fact that consumers face slightly higher prices in the urban than rural marketplace.[1]

Commodity Aggregation

There was an obvious need to aggregate the more than 220 food commodities reported in the survey into groupings in order to perform further analysis. The object of such aggregation is to group, as closely as possible, the 220 foods into homogeneous goods. This was done by placing together commodities which were assumed to be close substitutes and which have similar nutrient value. The importance of the commodity aggregation will be most obvious when estimating consumption functions. However, since estimation techniques will not depend on the assumption of an additive utility function, the major potential pitfall of aggregation is mitigated.

Fourteen food groups were created which will be used not only to examine consumption patterns but also to estimate parameters in the following section. They are: rice, wheat, coconut, bread, condiments, pulses, other grains, meat, fish, sugar, oils, yams, fruits, milk products, and vegetables. Because of the assumed poor reporting of liquor consumption and meals consumed away from home, these as well as some other incidental commodities were grouped in a final category, others. Commodity groups were generally aggregated by adding unit weights consumed of the goods. In some cases, such as milk products,

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[1] See Appendix D, Table 2, for prices of major commodities.

the various goods that make up the group (e.g., whole milk, milk powder, yogurt) were aggregated on the basis of calorie equivalents.

Given the commodity groups, the first issue to be examined concerns the general composition of the food basket. It is imperative to understand the structure of consumption in order to understand the potential for commodity policy to influence overall food and nutrient consumption.

Tables 2.3, 2.4, and 2.5 provide data on the mean budget share that each commodity group comprises, the value (in Rupees) of yearly expenditures on the commodity, and the percent of households consuming the individual good. In addition, Tables 2.6, 2.7, and 2.8 show data on the quantities consumed and the share of calories and protein by commodity groups. A number of important findings, which will condition the remainder of the analysis, are apparent. First, Sri Lanka is an example of a food economy in which a single staple plays an overwhelming role. Rice is the major food in the diets of all Sri Lankans, regardless of sector or income levels. In the rural sector, where nearly 80 percent of the population lives, the next most important commodity in terms of budget share and calorie contribution is coconuts. Like rice, coconut is included in the food basket of virtually all Sri Lankan households. The importance of this finding concerning the dietary importance of rice and coconuts is emphasized because policy concerning these commodities will not only determine overall levels of nutrient intake, but because rice and coconuts are the two most important agricultural commodities produced in Sri Lanka. Thus, they directly link the production and consumption ends of the

food system. Their dual role in policy formation is therefore emphasized, and will be discussed in greater detail in the next section.

Besides rice and coconuts, some other commodities make up important proportions of the household food basket. Amongst these are bread (especially for the urban sector), wheat flour (especially for the estate sector), and sugar, which along with rice and coconuts represent more than 80 percent of the household calorie intake (see Tables 2.6 to 2.8). Note, however that these commodities make up a much smaller share of total food expenditures (see Tables 2.3 to 2.5). This indicates that while they are the major source of calories, other food commodities, whether it be protein-rich animal foods or vitamin and mineral-rich condiments and fruits, also play an important role in the Sri Lankan diet. The sole consideration in food purchases is obviously not just to consume an adequate number of calories.

Despite the fact that previous analyses of food consumption parameters in Sri Lanka have aggregated bread and wheat into a single commodity group,[1] the fact is that the patterns of consumption of these commodities are different. Wheat flour, which is used to make thosai/chapatis among the ethnic Tamils, represents an important expenditure item in the estate sector. This is not the case in the urban sector, where bread is an increasingly important staple commodity and wheat is of marginal importance. The move to the city is also accompanied by an increase in bread consumption relative to rice.

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[1] M. Yetley and S. Tun, "Household Demand Analysis for Assessing Nutritional Impact of Development Programs," IED Staff Report (Washington, D.C.: USDA, 1981), pp. 35-50.

Table 2.3 -- Budget Shares, Percent of Consuming Households and Value of Expenditures Annually for 15 Food Commodity Groups, Urban Sector

Food Category		Expenditure Deciles: Below 1414**	1414-1739	1739-2037	2037-2270	2270-2583	2583-2919	2919-3389	3389-4048	4048-5202	Above 5202	Average
Rice	MB*	26.6	23.3	23.2	21.8	19.8	19.5	17.5	15.5	12.7	7.8	16.8
	%H	100.0	100.0	100.0	100.0	98.8	100.0	100.0	100.0	99.2	96.1	98.9
	Rs.	308.4	370.0	440.5	468.6	475.7	531.5	543.6	562.8	572.5	583.4	507.4
Wheat	MB	1.43	1.95	1.5	1.8	1.9	1.1	.9	.9	.8	.5	1.1
	%H	26.3	26.8	22.5	26.9	36.0	22.6	20.5	25.0	21.4	26.8	25.4
	Rs.	16.4	30.4	29.3	39.1	48.7	29.1	29.7	31.7	34.9	35.2	32.9
Coconut	MB	7.32	6.51	6.3	5.7	5.7	5.6	5.3	4.9	4.2	2.7	5.0
	%H	97.5	98.5	94.4	100.0	97.6	98.8	98.8	99.0	98.4	95.4	97.4
	Rs.	85.3	103.7	118.9	122.0	139.3	152.8	166.1	181.0	190.3	207.1	158.9
Bread	MB	8.5	8.1	6.5	7.0	5.7	5.0	5.3	4.7	4.3	2.9	5.3
	%H	91.3	85.1	80.3	90.5	81.4	77.4	90.9	91.3	86.3	91.7	87.3
	Rs.	101.3	130.4	124.2	150.5	140.0	137.4	165.8	174.4	192.9	229.7	167.3
Condiments	MB	6.0	6.0	5.8	5.3	4.9	5.3	5.1	4.6	4.1	2.9	4.6
	%H	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5	99.2
	Rs.	71.4	96.2	109.3	113.2	119.9	144.6	158.7	169.0	186.4	234.6	156.8
Pulses	MB	1.3	.9	1.6	1.6	1.6	1.6	1.4	1.9	1.4	1.3	1.4
	%H	32.5	49.3	52.1	65.1	69.8	60.7	62.5	79.8	72.5	77.1	65.3
	Rs.	15.1	15.5	29.7	33.4	37.9	43.5	42.2	70.2	63.9	98.5	54.1
Other Grains	MB	0	0	0	.1	0	.1	.1	.01	.02	.07	.03
	%H	0	0	0	1.6	0	1.2	2.2	.9	1.5	6.3	2.1
	Rs.	0	0	0	.9	0	.2	2.8	.5	1.1	6.7	1.9
Meat	MB	.8	1.3	.6	1.5	1.9	1.3	1.9	2.0	1.8	2.3	1.7
	%H	13.7	25.3	15.5	33.3	37.2	32.1	35.2	41.3	45.0	58.5	37.9
	Rs.	9.4	20.9	12.8	33.3	47.1	34.7	61.6	72.9	81.3	200.7	78.6
Fish	MB	5.0	5.6	6.2	6.8	6.2	7.8	7.3	6.8	7.4	5.3	6.4
	%H	82.5	89.5	90.1	95.2	93.0	96.4	93.2	92.3	95.4	91.2	92.0
	Rs.	60.0	89.8	117.7	145.9	150.4	212.3	226.5	249.4	335.7	431.1	242.4
Sugar	MB	6.3	6.8	6.5	6.2	7.2	6.3	6.4	5.8	5.6	3.8	5.7
	%H	96.2	100.0	98.6	98.4	98.8	100.0	100.0	100.0	100.0	99.5	99.3
	Rs.	76.4	108.4	124.4	132.3	173.9	171.8	198.4	213.4	251.4	299.4	198.0
Oils	MB	1.5	1.8	1.8	1.6	1.9	1.4	1.6	1.6	1.8	1.7	1.7
	%H	67.5	85.0	84.5	85.7	88.3	85.7	94.3	91.3	93.8	92.2	88.1
	Rs.	18.8	28.1	35.1	34.4	48.6	39.7	50.2	61.6	83.1	146.1	68.6
Yams	MB	.8	.9	.8	.8	.8	.8	.9	1.0	1.0	.8	.9
	%H	33.7	46.2	42.3	60.3	52.3	60.7	64.7	73.1	79.4	80.9	63.8
	Rs.	9.3	15.5	16.1	18.3	20.2	23.5	30.8	37.6	47.6	66.7	35.0
Fruits	MB	.1	.2	.3	.4	.5	.6	.7	1.2	1.2	1.5	.9
	%H	6.2	20.8	21.1	31.7	33.7	44.0	47.7	65.3	63.3	79.5	48.6
	Rs.	1.5	4.4	6.5	9.3	12.3	16.5	21.2	45.3	56.6	131.3	45.8
Milk Products	MB	1.3	2.1	2.8	2.5	2.7	2.4	2.6	3.3	3.6	3.1	2.8
	%H	18.7	38.8	46.5	47.6	51.2	53.5	64.8	74.0	78.6	85.8	61.9
	Rs.	17.1	34.4	54.7	55.5	66.6	67.9	81.6	122.6	163.9	256.9	119.1
Vegetables	MB	4.7	4.7	4.6	4.7	4.8	5.2	4.5	4.6	4.3	2.9	4.3
	%H	98.7	98.5	98.6	100.0	97.7	97.7	96.6	100.0	99.3	96.1	98.0
	Rs.	-	-	-	-	-	-	-	-	-	-	-
Other	MB	8.3	9.8	10.5	9.9	12.0	10.8	11.2	11.6	12.4	9.3	11.1
	%H	-	-	-	-	-	-	-	-	-	-	-
	Rs.	-	-	-	-	-	-	-	-	-	-	-

* MB = Mean Budget Share (%)
%H = Percent of Household Consuming This Good
Rs. = No. of Rupees Per Capita Per Year on This Commodity

** Rupees per Capita Per Year

Table 2.4 -- Budget Shares, Percent of Consuming Households and Value of Expenditures Annually for 15 Food Commodity Groups, Rural Sector

Food Category		Expenditure Deciles: Below 1414**	1414-1739	1739-2037	2037-2270	2270-2583	2583-2919	2919-3389	3389-4048	4048-5202	Above 5202	Average
Rice	MB*	31.6	30.0	27.9	26.9	25.6	24.9	22.9	20.9	18.5	12.8	24.7
	%H	99.7	100.0	100.0	99.7	100.0	99.7	99.7	99.7	99.7	97.7	99.6
	Rs.	365.9	476.5	530.6	580.6	621.8	682.4	718.5	764.9	832.3	901.7	635.3
Wheat	MB	1.5	1.5	1.5	1.7	1.5	1.4	1.3	.9	1.0	.5	1.3
	%H	24.9	30.2	29.1	29.4	27.4	24.2	27.3	22.7	29.7	20.5	26.7
	Rs.	17.0	24.8	29.2	35.9	36.7	37.1	41.7	32.7	44.2	32.5	32.9
Coconut	MB	8.3	7.4	7.1	6.8	6.9	6.5	6.3	5.7	5.5	4.2	6.6
	%H	96.8	96.6	97.6	96.3	98.0	98.5	96.9	100.0	94.8	96.5	97.3
	Rs.	95.2	118.9	135.1	148.5	167.9	179.4	198.6	210.3	249.6	292.7	174.7
Bread	MB	3.2	3.1	3.6	2.9	3.1	2.7	2.4	2.7	2.2	2.1	2.9
	%H	53.7	54.6	60.7	60.1	61.0	59.3	54.9	62.3	64.8	69.6	59.7
	Rs.	38.5	50.1	68.4	64.3	77.3	76.1	78.2	100.1	101.9	139.6	77.1
Condiments	MB	6.0	6.5	5.8	6.0	6.2	5.9	5.9	5.4	5.3	4.3	5.7
	%H	100.0	100.0	100.0	99.8	100.0	100.0	99.7	99.2	99.4	96.9	99.7
	Rs.	70.1	102.9	111.0	129.8	149.3	162.7	185.0	198.8	238.4	296.8	158.9
Pulses	MB	.9	1.4	1.4	1.5	1.6	1.6	1.8	1.6	1.9	1.7	1.5
	%H	30.3	48.3	54.9	55.5	61.6	63.2	68.1	71.1	78.3	81.7	60.3
	Rs.	11.4	22.9	27.5	33.3	40.0	44.4	57.3	60.4	85.2	119.2	47.5
Other Grains	MB	.3	.4	.3	.2	.2	.04	.2	.05	.03	.04	.18
	%H	5.8	7.8	3.9	4.5	5.1	2.2	3.9	3.2	1.8	3.8	4.3
	Rs.	3.7	6.0	5.7	4.8	3.6	1.2	7.0	2.2	1.3	3.0	3.9
Meat	MB	.3	.4	.4	.5	.6	.6	.8	.8	1.[illegible]	1.2	.7
	%H	6.2	7.1	9.4	10.2	15.3	15.2	15.7	17.7	24.1	29.6	14.5
	Rs.	3.8	5.8	8.1	11.7	16.4	18.5	25.9	31.1	53.2	93.1	24.4
Fish	MB	3.7	4.5	5.1	5.2	5.4	5.4	6.0	6.2	6.6	5.9	5.4
	%H	76.6	87.9	93.4	92.6	91.8	92.9	92.6	94.2	98.2	95.0	91.3
	Rs.	43.8	72.5	97.0	113.1	133.5	148.7	189.5	228.9	301.4	425.1	165.7
Sugar	MB	6.0	6.4	6.3	6.3	5.9	6.4	5.9	5.6	5.[illegible]	4.4	5.[illegible]
	%H	98.1	99.7	99.4	98.5	99.7	100.0	99.7	99.2	99.3	96.9	99.[illegible]
	Rs.	70.2	101.8	120.4	136.4	144.7	177.7	188.5	204.3	249.9	312.5	165.[illegible]
Oils	MB	1.2	1.4	1.5	1.4	1.7	1.7	1.6	1.5	2.1	1.4	1[illegible]
	%H	60.3	70.3	77.7	71.7	83.0	81.7	82.0	82.5	82.1	86.6	77[illegible]
	Rs.	14.8	22.5	29.3	31.6	40.8	46.9	51.2	58.6	73.5	102.4	4[illegible]
Yams	MB	1.3	1.2	1.1	1.2	1.1	1.2	1.2	1.3	1.4	1.2	[illegible]
	%H	43.6	46.3	56.0	57.3	59.6	62.4	62.4	70.8	76.5	77.2	[illegible]
	Rs.	15.4	18.9	21.3	25.6	27.4	32.7	40.5	48.0	62.7	89.1	[illegible]
Fruits	MB	.3	.3	.4	.4	.5	.5	.7	.7	1.0	1.2	
	%H	15.8	23.6	26.2	29.0	34.7	38.2	40.7	44.6	54.7	66.2	
	Rs.	3.6	5.6	7.4	10.4	13.9	14.8	22.9	25.4	43.7	94.8	
Milk Products	MB	.9	1.2	1.5	1.7	1.5	1.8	2.1	2.4	2.4	2.3	
	%H	16.3	21.8	27.7	33.3	32.4	38.2	42.4	50.4	52.9	64.6	
	Rs.	11.2	19.7	28.9	36.7	36.7	51.4	67.1	87.5	109.9	170.7	
Vegetables	MB	6.5	5.9	5.6	5.9	5.6	5.3	5.4	5.2	4.9	4.[illegible]	
	%H	98.7	99.5	99.7	99.7	99.2	99.7	99.4	99.4	99.4	96.[illegible]	
	Rs.	-	-	-	-	-	-	-	-	-	-	
Other	MB	7.8	13.4	9.5	9.1	9.6	9.9	10.4	10.6	10.5	12.[illegible]	
	%H	-	-	-	-	-	-	-	-	-		
	Rs.	-	-	-	-	-	-	-	-	-		

* MB = Mean Budget Share (%)
%H = Percent of Household Consuming This Good

Table 2.5 -- Budget Shares, Percent of Consuming Households and Value of Expenditures Annually for 15 Food Commodity Groups, Estate Sector

Food Category		Expenditure Deciles										
		Below 1414**	1414-1739	1739-2037	2037-2270	2270-2583	2583-2919	2919-3389	3389-4048	4048-5202	Above 5202	Average
Rice	MB*	28.2	26.7	31.0	25.7	26.2	23.5	23.1	20.3	18.1	13.4	24.2
	%H	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Rs.	339.7	422.1	588.4	554.3	646.8	648.1	726.3	744.6	831.4	946.8	630.5
Wheat	MB	9.3	13.7	6.5	9.9	5.9	7.3	7.2	8.4	6.3	1.7	8.0
	%H	71.9	84.3	61.4	77.7	55.9	76.4	75.4	75.5	76.9	48.2	71.6
	Rs.	113.3	211.8	124.1	214.0	146.5	200.9	225.7	309.4	290.2	116.9	199.7
Coconut	MB	7.3	6.7	5.9	6.2	6.3	5.7	6.3	5.7	6.4	4.6	6.1
	%H	100.0	100.0	95.4	100.0	86.4	100.0	100.0	99.3	94.1	96.5	97.5
	Rs.	35.4	105.8	111.1	133.3	154.0	159.7	196.3	213.3	300.0	345.0	170.2
Bread	MB	2.3	.4	.6	2.4	1.2	3.2	1.9	2.9	1.8	1.4	1.9
	%H	20.5	11.7	18.2	45.7	33.9	72.7	57.8	55.1	38.4	62.1	[illegible]
	Rs.	24.8	6.7	12.8	51.7	29.1	89.5	59.4	104.4	83.8	93.7	54.1
Condiments	MB	5.4	5.1	5.6	5.5	5.7	5.4	6.3	6.2	7.4	4.6	5.7
	%H	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Rs.	64.2	80.5	107.0	119.4	142.6	146.9	197.1	230.3	346.5	336.4	165.5
Pulses	MB	1.1	2.4	1.4	2.6	2.3	2.6	1.6	1.9	3.4	1.5	2.2
	%H	48.7	68.6	50.0	62.9	72.8	87.3	87.7	65.3	92.3	68.9	70.8
	Rs.	13.9	38.8	27.4	55.7	59.7	70.8	49.0	71.6	159.1	102.7	61.9
Other Grains	MB	0	0	0	0	0	.2	0	.03	0	0	.02
	%H	0	0	0	0	0	5.5	0	2.0	0	0	.8
	Rs.	0	0	0	0	0	6.2	0	1.2	0	0	.8
Meat	MB	.3	0	.8	.6	1.3	.6	.8	.9	1.3	.9	.8
	%H	5.1	0	15.9	8.6	18.6	12.7	15.7	12.2	15.3	17.4	11.9
	Rs.	5.1	0	16.1	13.4	32.4	16.8	25.4	33.3	56.0	60.9	23.5
Fish	MB	2.1	2.4	2.5	3.6	3.9	3.3	3.5	5.4	4.6	6.6	3.7
	%H	71.8	74.5	54.5	82.7	89.8	81.8	87.7	91.8	87.1	93.1	81.7
	Rs.	23.5	37.2	47.9	78.7	97.7	92.8	112.0	201.2	217.8	496.4	121.9
Sugar	MB	5.2	5.2	5.6	5.6	6.1	5.8	6.3	5.6	4.8	5.7	5.5
	%H	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Rs.	61.2	81.7	106.7	120.4	151.3	159.7	165.3	204.3	225.5	420.1	157.3
Oils	MB	1.3	1.8	2.1	2.6	1.5	2.5	2.5	2.6	2.0	1.6	2.2
	%H	74.4	90.2	79.5	86.4	79.7	98.2	94.7	91.8	82.0	72.4	86.0
	Rs.	15.7	29.0	40.8	57.5	38.7	70.1	80.4	97.5	93.7	111.5	51.5
Yams	MB	.4	.4	.8	.6	.4	.9	.8	1.2	.6	.8	.7
	%H	15.4	37.3	54.5	40.7	33.8	69.1	45.6	55.1	35.9	55.2	44.3
	Rs.	5.0	6.9	15.4	12.5	10.6	24.2	26.0	44.4	25.9	57.9	20.9
Fruits	MB	.02	.1	.09	.2	.3	.2	.2	.4	.5	.9	.3
	%H	2.5	21.5	9.1	17.3	27.1	20.0	14.0	20.4	38.5	48.3	20.7
	Rs.	.2	2.6	1.3	3.3	6.5	3.9	5.2	14.0	22.4	68.4	9.8
Milk Products	MB	2.3	.8	1.3	1.2	1.2	2.5	1.1	1.9	1.9	3.7	1.7
	%H	38.4	23.5	29.5	23.4	25.4	60.0	26.3	34.6	51.2	82.7	36.4
	Rs.	27.3	13.2	25.9	27.1	29.9	71.4	36.6	71.9	88.1	288.5	56.0
Vegetables	MB	5.5	5.6	6.3	6.3	5.3	4.7	5.9	5.2	5.7	6.1	5.6
	%H	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Rs.	-	-	-	-	-	-	-	-	-	-	-
Other	MB	7.5	8.1	8.5	8.0	9.6	10.6	12.0	8.8	12.3	11.1	9.4
	%H	-	-	-	-	-	-	-	-	-	-	-
	Rs.	-	-	-	-	-	-	-	-	-	-	-

* MB = Mean Budget Share (%)
%H = Percent of Household Consuming This Good
Rs. = No. of Rupees Per Capita Per Year on This Commodity

**Rupees per Capita Per Year

Table 2.6 — Per Capita Quantities Consumed Annually, and Percent of Total Calories and Protein Provided by 15 Food Commodity Groups, Urban Sector

Food Category	Expenditure Deciles: Below 1414**	1414-1739	1739-2037	2037-2270	2270-2583	2583-2919	2919-3389	3389-4048	4048-5202	Above 5202	Average
Rice											
Qty (lb)	124.8	157.1	178.9	188.7	191.4	218.4	216.3	221.9	226.4	223.9	201.8
%CAL	47.2	46.6	47.4	45.8	43.1	46.4	42.9	42.0	39.6	33.4	41.8
%PRO	44.0	43.0	42.8	40.4	37.7	40.6	37.2	35.8	33.8	27.5	36.5
Wheat											
Qty (lb)	7.2	13.2	11.8	17.8	20.3	11.6	12.7	13.2	13.8	14.5	13.7
%CAL	2.7	3.5	2.9	3.6	4.1	2.3	2.3	2.3	2.2	2.1	2.6
%PRO	3.6	4.6	3.7	4.5	5.6	2.9	3.0	2.9	2.7	2.5	3.3
Coconut											
Qty (no)	45.9	55.0	60.4	67.4	72.5	79.8	84.7	90.3	96.7	101.1	80.8
%CAL	16.8	16.1	15.4	15.7	15.8	16.6	16.5	16.6	16.4	15.0	15.9
%PRO	7.5	6.9	6.7	6.5	6.5	6.8	6.7	6.7	6.6	5.6	6.5
Bread											
Qty (lb)	46.7	59.9	56.8	70.5	65.4	63.5	76.9	[illegible]	89.1	105.5	77.3
%CAL	13.0	13.4	11.1	12.7	11.5	10.2	11.4	[illegible]	12.0	12.4	11.9
%PRO	17.3	17.4	14.6	16.2	14.4	12.5	14.4	[illegible]	14.6	14.6	14.8
Condiments											
Qty (oz)	269.3	324.6	381.4	384.0	391.0	466.2	537.9	533.0	567.7	697.2	497.9
%CAL	2.0	2.1	2.3	1.9	2.1	2.2	2.3	2.4	2.2	2.4	2.2
%PRO	3.8	4.0	4.1	3.6	3.6	4.0	3.9	4.0	3.9	3.9	3.9
Pulses											
Qty (lb)	2.3	2.3	4.5	5.1	6.2	6.7	6.1	11.1	9.5	14.0	8.0
%CAL	0.9	0.7	1.2	1.3	1.6	1.4	1.2	2.0	1.6	2.0	1.5
%PRO	2.4	1.8	3.1	3.2	4.1	3.8	3.1	5.2	4.3	5.1	3.9
Other Grains											
Qty (lb)	0.0	0.0	0.0	0.4	0.0	0.62	0.53	0.17	0.17	1.55	0.49
%CAL	0.9	0.9	0.6	0.9	0.6	1.4	1.8	1.5	2.0	3.1	1.6
%PRO	0.7	0.9	0.6	0.9	0.6	1.4	1.8	1.4	1.9	3.2	1.6
Meat											
Qty (lb)	1.7	2.9	1.7	4.7	5.7	4.5	8.3	9.8	10.1	23.0	9.6
%CAL	0.3	0.3	0.2	0.6	0.7	0.6	0.9	1.0	1.0	2.0	1.0
%PRO	1.9	2.5	1.4	3.4	4.2	2.8	4.6	5.1	5.4	9.3	.9
Fish											
Qty (lb)	14.8	17.5	25.1	25.1	27.4	36.7	38.4	35.8	41.4	45.0	33.5
%CAL	2.6	2.7	3.1	2.9	2.9	3.6	3.4	3.0	2.8	2.5	2.9
%PRO	11.7	11.0	12.7	12.4	12.9	15.15	14.5	12.7	13.2	11.5	12.7
Sugar											
Qty (oz)	174.9	240.9	267.9	298.2	374.4	371.2	439.2	453.6	533.1	641.7	427.5
%CAL	5.2	5.7	6.3	6.6	7.8	6.9	7.2	7.2	8.5	9.9	7.6
%PRO	0.4	0.3	0.8	0.9	0.7	0.6	0.4	0.4	0.9	1.3	0.8
Oils											
Qty (26 oz)	2.0	3.1	3.5	3.9	4.7	4.2	5.2	5.6	7.0	9.1	5.5
%CAL	3.1	4.2	4.0	3.7	4.6	3.8	4.6	4.6	5.1	5.9	4.6
%PRO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yams											
Qty (lb)	6.9	8.3	7.6	8.4	9.5	9.4	12.9	13.5	14.1	18.9	12.3
%CAL	1.0	0.7	0.6	0.6	0.7	0.6	0.8	0.7	0.7	0.8	0.7
%PRO	0.4	0.4	0.31	0.3	0.3	0.3	0.4	0.4	0.4	0.45	3.8
Fruits											
Qty (lb)	3.0	3.6	2.9	5.1	8.0	11.1	12.7	24.5	21.0	69.1	23.7
%CAL	0.2	0.1	0.3	0.3	0.4	0.6	0.5	1.0	1.0	2.5	1.0
%PRO	0.1	0.11	0.2	0.2	0.2	0.3	0.3	0.6	0.5	1.4	0.5
Milk Products											
Qty	-	-	-	-	-	-	-	-	-	-	-
%CAL	0.9	1.3	1.7	1.4	2.0	1.8	2.1	2.5	3.0	3.9	2.6
%PRO	2.4	3.5	5.2	4.6	6.1	5.4	6.2	7.7	8.8	10.6	6.9
Vegetables											
Qty (lb)	32.1	36.5	44.9	46.8	55.6	65.5	62.9	68.1	80.7	89.1	64.2
%CAL	2.0	1.0	1.7	1.3	1.4	1.0	1.3	1.2	1.3	1.3	1.3
%PRO	2.0	1.6	2.0	1.6	1.2	1.9	5.4	1.8	1.8	1.8	1.8
Others											
Qty	-	-	-	-	-	-	-	-	-	-	-
%CAL	1.1	0.8	1.0	0.7	0.8	0.7	0.8	0.6	0.7	0.9	0.8
%PRO	1.6	1.6	1.5	1.2	1.5	1.3	1.3	1.0	1.1	1.1	1.3

** Rupees per capita per year

Table 2.7 -- Per Capita Quantities Consumed Annually, and Percent of Total Calories and Protein Provided by 15 Food Commodity Groups, Rural Sector

Food Category	Expenditure Deciles: Below 1414**	1414-1739	1739-2037	2037-2270	2270-2583	2583-2919	2919-3389	3389-4048	4048-5202	Above 5202	Average
Rice											
Qty (lb)	155.4	201.2	218.4	234.1	254.2	274.3	294.1	307.4	340.5	354.1	258.8
%CAL	53.9	53.3	51.6	51.0	50.8	50.5	48.8	48.3	46.8	41.3	50.0
%PRO	54.6	52.8	50.1	48.9	48.7	48.4	45.6	45.0	42.9	37.3	47.8
Wheat											
Qty (lb)	7.6	10.6	12.6	15.2	15.3	15.9	17.7	13.8	18.5	13.9	14.0
%CAL	2.7	2.7	2.8	3.1	3.0	2.8	2.8	2.2	2.6	1.6	2.7
%PRO	3.7	3.7	3.8	4.3	4.0	3.7	3.7	2.9	3.3	2.1	3.6
Coconut											
Qty (no)	56.2	71.4	81.3	87.6	97.1	105.1	116.6	122.7	144.7	168.4	102.3
%CAL	18.9	18.4	18.5	18.3	18.7	18.7	18.7	18.7	19.1	18.8	18.7
%PRO	9.1	8.6	8.6	8.3	8.5	8.4	8.3	8.2	8.3	8.0	8.4
Bread											
Qty (lb)	17.7	23.1	31.5	29.4	35.1	34.7	35.9	45.8	46.8	63.3	35.3
%CAL	4.5	4.6	5.7	4.9	5.3	4.8	4.5	5.6	4.9	6.2	5.0
%PRO	6.4	6.3	7.8	6.6	7.1	6.5	5.9	7.2	6.3	7.7	6.8
Condiments											
Qty (oz)	255.5	342.6	375.3	430.3	484.3	524.4	583.9	624.9	738.4	913.5	511.1
%CAL	1.7	2.0	1.9	2.0	2.1	2.1	2.2	2.2	2.3	2.4	2.1
%PRO	4.0	4.3	4.1	4.3	4.2	4.5	4.4	4.4	4.5	4.5	4.3
Pulses											
Qty (lb)	2.2	4.3	5.0	5.9	6.9	7.9	10.3	10.5	14.1	19.0	8.2
%CAL	0.7	1.2	1.2	1.2	1.3	1.4	1.7	1.6	1.9	2.2	1.4
%PRO	2.2	3.3	3.5	3.5	3.8	4.1	4.6	4.5	5.2	5.9	4.0
Other Grains											
Qty (lb)	3.4	3.5	3.8	4.5	2.3	0.85	6.3	1.0	0.57	1.7	2.9
%CAL	1.3	1.3	1.2	1.3	1.0	0.7	1.7	1.0	0.9	2.1	1.2
%PRO	1.3	1.3	1.2	1.3	1.0	0.7	1.6	1.1	0.8	2.3	1.2
Meat											
Qty (lb)	.71	.91	1.4	1.8	2.5	2.8	3.8	4.8	7.5	12.4	3.5
%CAL	.1	.2	0.2	0.3	0.4	0.4	0.5	0.6	0.7	1.1	0.4
%PRO	.7	.7	1.0	1.1	1.5	1.6	1.9	2.5	3.1	4.4	1.8
Fish											
Qty (lb)	9.4	14.3	17.6	21.1	23.5	25.6	33.4	33.4	44.6	55.0	26.6
%CAL	1.5	2.0	2.0	2.2	2.2	2.1	2.6	2.3	2.6	2.6	2.2
%PRO	8.1	9.4	10.6	11.3	11.1	11.4	12.7	12.4	13.5	13.5	11.3
Sugar											
Qty (oz)	150.9	220.6	269.5	297.9	316.8	379.5	433.1	439.3	539.9	681.3	360.0
%CAL	4.3	4.9	5.6	6.1	5.6	6.3	6.1	6.4	6.8	7.8	5.9
%PRO	0.5	0.5	0.7	1.0	0.7	0.9	0.8	0.9	0.9	1.3	0.8
Oils											
Qty (26 oz)	1.6	2.3	3.0	3.2	4.0	4.7	5.0	5.7	7.1	9.2	4.4
%CAL	2.4	2.6	3.2	3.0	3.5	3.7	3.6	4.0	4.3	4.6	3.4
%PRO	-	-	-	-	-	-	-	-	-	-	-
Yams											
Qty (lb)	19.0	18.7	16.3	19.3	17.7	20.0	21.4	21.4	25.8	30.8	20.7
%CAL	2.0	1.7	1.2	1.2	1.1	1.1	1.2	1.0	1.0	1.1	1.3
%PRO	1.1	0.8	0.6	0.7	0.6	0.6	0.5	0.6	0.6	0.6	0.8
Fruits											
Qty (lb)	4.9	5.5	9.0	8.4	10.9	12.1	19.5	24.0	32.2	52.9	16.6
%CAL	0.4	0.3	0.4	0.5	0.5	0.5	0.6	0.9	1.0	2.1	0.7
%PRO	0.3	0.2	0.3	0.3	0.3	0.3	0.4	0.5	0.6	1.1	0.4
Milk Products											
Qty	-	-	-	-	-	-	-	-	-	-	-
%CAL	0.5	0.7	0.9	1.0	0.9	1.1	1.3	1.5	1.7	2.2	1.1
%PRO	1.7	2.4	2.8	3.1	3.1	3.8	4.0	4.7	5.2	6.3	3.6
Vegetables											
Qty (lb)	46.2	62.5	67.6	74.2	78.9	84.1	99.2	95.0	111.3	148.4	84.3
%CAL	1.9	1.6	1.3	1.4	1.4	1.4	1.1	1.4	1.3	1.7	1.5
%PRO	2.8	2.8	2.5	2.4	2.5	2.4	2.4	2.4	2.4	2.7	2.5
Others											
Qty	-	-	-	-	-	-	-	-	-	-	-
%CAL	2.4	3.0	2.1	2.1	2.1	2.2	2.5	2.2	2.0	2.1	2.2
%PRO	3.3	3.0	2.6	3.0	2.8	2.7	2.9	2.7	2.4	2.2	2.7

** Rupees per capita per year

Table 2.8 -- Per Capita Quantities Consumed Annually, and Percent of Total Calories and Protein Provided by 15 Food Commodity Groups, Estate Sector

Food Category	Expenditure Deciles: Below 1414**	1414-1739	1739-2037	2037-2270	2270-2583	2583-2919	2919-3389	3389-4048	4048-6202	Above 6202	Average
Rice											
Qty (lb)	140.7	181.8	236.3	222.5	264.9	282.7	289.5	332.5	299.6	415.5	259.1
%CAL	48.7	49.1	55.8	46.7	49.8	47.1	47.0	43.6	38.1	42.6	47.5
%PRO	44.6	45.8	54.6	43.6	46.4	43.7	44.6	39.2	33.8	38.2	54.6
Wheat											
Qty (lb)	51.2	73.4	46.9	75.5	62.1	78.1	77.0	120.9	124.3	36.7	75.2
%CAL	17.0	29.6	10.3	15.3	11.6	12.9	11.4	14.8	14.6	4.5	13.6
%PRO	22.4	25.4	13.9	20.0	15.4	16.7	15.7	19.1	18.4	5.7	3.9
Coconut											
Qty (no)	45.9	54.1	68.1	71.3	86.4	87.7	103.7	113.3	128.8	171.9	87.7
%CAL	15.6	14.2	15.1	14.4	15.0	14.1	16.0	15.0	16.3	17.4	15.1
%PRO	6.7	6.3	7.1	6.4	6.9	6.1	7.1	6.3	7.1	7.1	6.7
Bread											
Qty ('	9.7	5.1	7.6	22.7	16.5	29.7	26.8	47.9	38.1	54.7	23.9
%CAL	2.4	0.9	1.2	3.6	2.3	3.7	3.3	6.7	3.4	4.9	3.0
%PRO	3.3	1.3	1.8	4.6	3.1	4.9	4.5	4.9	4.7	6.1	4.0
Condiments											
Qty (oz)	232.2	302.3	326.6	386.7	436.5	478.9	514.8	580.0	774.3	903.1	462.2
%CAL	1.9	1.7	1.9	1.7	1.9	1.8	1.8	1.9	2.4	2.2	1.9
%PRO	3.9	3.5	3.9	3.4	3.6	3.7	3.6	3.7	4.4	4.0	3.7
Pulses											
Qty (lb)	2.0	7.3	4.5	8.7	8.7	10.5	8.6	15.5	18.5	19.0	9.7
%CAL	0.6	1.8	1.0	1.9	1.7	1.8	1.4	1.9	2.3	2.0	1.6
%PRO	1.7	4.9	3.0	4.9	4.6	5.0	3.8	5.1	6.0	5.6	4.5
Other Grains											
Qty (lb)	0.0	0.0	0.0	0.0	0.0	0.75	0.0	0.41	0.0	0.0	0.13
%CAL	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.1
%PRO	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.4	0.0	0.0	0.2
Meat											
Qty (lb)	1.4	0.0	0.99	1.8	1.5	2.8	3.8	6.1	9.3	5.2	2.9
%CAL	0.3	0.0	0.1	0.2	0.2	0.3	0.3	0.4	0.7	1.0	0.3
%PRO	1.9	0.0	7.3	1.3	1.1	1.8	2.2	2.2	3.8	3.4	1.6
Fish											
Qty (lb)	3.9	5.5	7.3	11.4	16.6	14.5	19.4	2.0	26.3	54.3	15.9
%CAL	0.8	0.7	0.8	1.3	1.8	1.1	1.3	1.5	1.6	2.4	1.3
%PRO	3.6	5.1	5.0	6.4	8.6	6.1	7.3	7.9	9.3	13.5	7.0
Sugar											
Qty (oz)	140.8	172.1	226.1	249.7	306.4	345.3	371.8	433.3	494.4	870.0	328.6
%CAL	3.6	3.4	4.2	4.2	4.3	4.7	5.4	5.9	6.6	10.0	4.9
%PRO	0.1	0.1	0.3	0.3	0.1	0.5	0.8	1.3	1.3	2.4	0.6
Oils											
Qty (26 oz)	2.4	2.9	3.3	5.3	4.4	7.6	7.3	7.8	10.8	13.8	5.9
%CAL	2.2	3.2	3.3	4.8	3.5	5.4	4.8	4.4	5.8	6.0	4.3
%PRO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yams											
Qty (lb)	14.0	5.3	14.8	9.9	9.3	18.1	15.3	24.5	22.4	18.5	14.5
%CAL	1.2	0.4	1.1	0.7	0.6	1.0	0.8	1.0	1.0	0.5	0.8
%PRO	0.5	0.2	0.5	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4
Fruits											
Qty (lb)	3.5	3.1	3.1	8.1	14.0	2.5	9.4	4.5	14.2	28.8	8.0
%CAL	0.2	0.1	0.1	0.2	0.2	0.1	0.2	0.1	0.4	0.1	0.2
%PRO	0.2	0.1	0.1	0.1	0.2	0.0	0.1	0.1	0.3	0.4	0.1
Milk											
Qty	-	-	-	-	-	-	-	-	-	-	-
%CAL	1.6	0.7	0.8	1.2	0.6	1.8	1.4	1.1	1.6	2.6	1.2
%PRO	5.2	1.8	2.8	2.9	2.7	5.2	3.8	3.3	3.9	7.9	3.6
Vegetables											
Qty	51.0	60.2	73.0	93.9	91.3	98.5	112.9	81.5	135.5	175.2	92.6
%CAL	1.9	1.3	1.6	1.6	4.1	1.6	1.4	0.7	2.1	1.2	1.8
%PRO	2.9	2.1	2.8	2.8	4.1	2.5	2.7	1.5	2.8	2.2	2.7
Others											
Qty	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%CAL	1.7	2.6	2.7	2.1	2.3	2.3	3.2	2.4	2.3	1.6	2.4
%PRO	2.9	3.4	3.5	3.0	2.9	2.7	3.3	2.7	2.8	2.5	3.0

** Rupees per capita per year

Changing tastes and preferences which accompany urbanization is due to a combination of factors. These include the convenience of ready-to-eat bread, emulation of Western diets, and greater access to baked products.

Condiments, including chillies, onions and garlic are also an especially interesting food group because they are the fourth largest food expenditure item on an All-Island basis (behind rice, coconuts, and sugar). However, relative to their share of total food expenditures, they provide a disproportionately small share of calories and protein to the diet. Culturally determined patterns of highly seasoned food remains an important food policy consideration in Sri Lanka.

Other important findings include the fact that with rising income there is an expected increase in the quantity of consumption, as well as budget shares, of high-quality protein-rich foods (meat, milk, and most important, fish). For example, notice how the consumption of meat products increased almost thirty-fold over the income range in the rural sector; or how the budget share increased by 400 percent. Similarly, the budget share for milk increases by nearly 200 percent from the lowest to highest income groups in the urban areas, as the percent of households which are consumers rises from less than 20 to almost 90. Similarly, at all levels of income, more of these high quality, low calorie efficient foods (based on calories provided per rupee) are consumed in the urban areas. For example, three times more meat is consumed in the urban than rural sector. The partial exception is fish consumption, which is only slightly higher in the urban areas than rural areas. This once again explains the higher calorie

price observed earlier, and portends a greater risk of calorie inadequacy for low-income urban consumers.

A further point to be made in regard to the data is that for virtually all commodity groups a larger absolute quantity is consumed by households at the higher end of the income distribution. Thus, any moderation of commodity prices for major staple foods (e.g., rice, flour, oil, sugar, etc.) will in fact result in a larger absolute transfer of income to the rich than the poor. Although the po will be helped more, relative to their needs, there would be a high economic cost in reaching those in need through an untargeted food subsidy. This suggests searching for self-targeting commodities, such as low-quality wheat flour or a mixture with cassava which will only be acceptable by the poor.

Some potentially disconcerting findings in regard to the consumption of "poor people's food" are also noted. First is the extremely low level of consumption of pulses, a potentially low-cost protein source. Likewise, yams (i.e., roots and tubers), which represent a potentially low-cost calorie source with inferior properties which are self-targeting to the poor, are consumed in only small quantities. In fact, if costly white potatoes, which are rapidly becoming a favored commodity, are excluded from this category, its value in terms of dietary contribution and budget share becomes negligable, even among the poor. Also, there are only minute amounts of other cereals (i.e., corn, millet, sorghum) consumed in the rural sector and virtually none in the urban and estate sectors. This leads one to conjecture that the potential for coarse grains, both as an income source to poor far-

mers on marginal lands and as a self-targeting poor people's food, has not been exploited.

An examination of the relative prices of starchy staples and the calories per rupee they supply, however, makes it apparent that consumers are acting wisely in terms of nutrition by not diversifying their diet to other starchy staples such as coarse grains and roots and tubers (see Table 2.9). It is unreasonable to expect or suggest that a consumer choose to consume manioc or sweet potato over rice or wheat, given the nature of their preference ordering, especially when rice and wheat supply more calories per rupee expended. In fact, when one considers the low amount of protein per rupee from sweet potato and manioc, it is apparent that consumers are making the correct decision based on nutritional considerations. Therefore, any diversification of the diet or introduction of self-targeting subsidy schemes will clearly have to be preceded by an adjustment in relative market prices.

To amplify, during the early 1970s the performance of the subsidiary food crop sector was aided by protectionist policies which embargoed imports of these commodities. One of the consequences of the liberalization of the economy in the late 1970s was to allow imports of cheaper minor food crops. Eroding profit margins coupled with other factors such as non-availability of institutional credit for small farmers (partially due to the withdrawal of Central Bank guarantees to commercial banks lending to small farmers), and the conversion of existing chena (unirrigated highland) into paddylands as a result of the Mahaweli development scheme have discouraged produc-

Table 2.9 -- Calories per Rupee Supplied by Starchy Staples

	Price[a] (Rs./100 gms) 1981	Calories per 100 grams	Protein (gr.) per 100 gms.	Calories /Rupee 1981	Protein (gr.)/Rupee 1981
Rice	0.62	346	7.5	563	12.10
Wheat	0.58	348	11	600	18.97
Kurakkan (Millet)	0.53	341	9.5	643	17.92
Sweet Potato	0.37	102[b]	1.02	271	2.74
Manioc	0.249	133[b]	1.10	534	4.44
Cowpea	1.22	323	24	267	19.67
Green Gram	1.62	348	24	215	14.81

[a] Calculated from prices given in: Bulletin of Selected Retail Prices, 1979-1981, Department of Census and Statistics, Ministry of Plan Implementation, Colombo, Sri Lanka, 1982.

[b] Assumes only 85 percent of original weight is edible.

tion of subsidiary food crops. In addition, almost all agricultural research has been focused on rice, neglecting other food crops. In combination, these factors had a deleterious impact on the production of coarse grains and roots and tubers during the late 1970s and early 1980s, the period covered by the survey.[1] There is some preliminary evidence that trends such as a halving of the tons of cassava produced between 1977 and 1980 are reversing. However, the paucity of information on this crop is considered another example of the "benign neglect" that policy makers have exhibited towards this sector.[2]

There is a need to explore more fully the potential for subsidiary crops as a source of income for the poor. Also of importance is the need to consider the possibility of subsidizing potentially self-targeting foods such as cassava or other roots and tubers as a way of reaching the hungry; although the low budget shares for these commodities limit the effects of such policies. Measures to encourage increased production through price support schemes for such commodities as well as agricultural research and extension to enhance the economic viability of their production need further exploration.

NUTRIENT INTAKE

This section examines the implications of consumption patterns on dietary intake. Before doing so, two important limitations are empha-

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[1] R. Ratnayake, Subsidiary Food Crops in Sri Lanka (Colombo, Sri Lanka: Department of Treasury, 1980).

[2] E. Thorbecke and J. Svejnar, "Effects of Macroeconomic Policies on Agricultural Performance in Sri Lanka," prepared for the OEDC Development Center (Paris, 1984), pp. 100-103.

sized. First, the level of analysis will be the household. Throughout it will be assumed that nutrients available will be distributed in proportion to each family member's dietary requirement. The shortcomings of this approach, however, must be acknowledged.[1]

A second limitation of the data which follow is that there is considerable inter- and intra-individual variation in the requirement for nutrients. Some of this is a function of genetic factors; other variation results from exogenous factors such as level of physical activity, health status, climate, and so forth.[2] Despite this known variability, it will once again be assumed that certain population norms can be applied to all households. These standards may not be appropriate for judging the well-being of an individual. They are useful, however, for examining and comparing the status of population groups.

The first step in the analysis involves the conversion of the quantities of commodities into nutrient equivalents (see Appendix E). Household calorie intake is then often divided by household size to determine per capita values. This method will provide a biased value to the extent that the age and sex composition of the households are

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1 In fact, households often favor certain members who have preferential access to food. There is evidence of systematic patterns within cultures which dictate which household members are likely to be favored or discriminated against in the distribution of scarce food resources. See B. Rogers, "The Internal Dynamics of Households: A Critical Factor in Development Policy," (Medford, MA: Tufts University, 1983), pp. 18-20, and Lipton, op. cit., pp. 50-57.

2 World Health Organization, Energy and Protein Requirements, Draft Report of a Joint FAO/WHO/UNU Meeting (Geneva, forthcoming), pp. 46-71.

not the same. Given that poorer households are larger and have a greater number of children relative to adults, the use of per capita calorie and protein estimates would result in a bias which overstates the population variance in nutrient distribution. Poor households would look worse off then they are, and wealthy households relatively better off than in reality. The solution was to compute adult equivalency units (AEUs) for each household.[1]

The use of the calorie and protein intake data per adult equivalent unit (AEU) is instructive for the purpose of making comparisons among population groups. For example, calories and protein intake per AEU, by expenditure deciles and sector, are reported in Tables 2.10 and 2.11. There is a marked increase in calorie and protein intake with rising per capita expenditures. For a given expenditure group, the estate sector has the highest level of calorie and protein intake, followed by the rural sector, with the urban sector having the lowest average level of intake. These findings are mediated by the data presented above that indicates the food share is highest in the estate areas, and that the price paid per calorie is highest in the cities because they consume a different bundle of goods.

It is also worthwhile considering that this inter-sectoral difference in calorie intake reflects an adaptation to the relatively

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[1] Each family member was transformed into a fraction of an adult equivalent unit (AEU) based on their age and sex. The basis for doing so were the 1973 FAO/WHO recommended calorie requirements for moderately active persons. These AEU values are found in P. Trairatvorakul, The Effects on Income Distribution and Nutrition of Alternative Rice Price Policies in Thailand, Research Report 46 (Washington, D.C.: IFPRI, 1984), p. 49.

Table 2.10 -- Average Daily Calorie Consumption per Adult Equivalency Unit, by Expenditure Group and Sector

Per Capita Expenditures (Deciles)	Average Calories Consumed Per Adult Equivalency Unit			
	Urban	Rural	Estate	All-Island
1	1477	1613	1564	1587
2	1853	2076	2088	2047
3	2099	230	2322	2280
4	2282	252:	2717	2525
5	2375	2696	2864	2661
6	2517	2914	3314	2890
7	2678	3211	3272	3124
8	2816	3339	3935	3286
9	3082	3765	4269	3627
10	3372	4248	4104	3877
Total	2629[a]	2807[a]	2994[a]	2791[a]

[a] If household size rather than AEUs were used as the denominator, the mean calorie intake for the urban, rural, estate, and all-island populations would be 2096, 2257, 2400, and 2240, respectively (see Appendix D, Table 1). As a general rule of thumb, AEU values are 25 percent higher than per capita values. In cases where data on household composition are not available, this conversion factor can be used instead.

Table 2.11 -- Average Daily Protein Consumption per Adult Equivalency Unit, by Expenditure Group and Sector

Per Capita Expenditures (Deciles)	Average Proteins (gms) Consumed Per Adult Equivalency Unit			
	Urban	Rural	Estate	All-Island
1	34.7	34.9	37.3	35.1
2	44.2	46.3	49.9	46.4
3	50.9	52.2	52.4	52.0
4	56.1	57.8	65.7	58.9
5	59.5	61.9	68.0	62.2
6	63.2	66.7	78.2	67.4
7	67.6	75.8	74.8	74.3
8	72.6	78.5	54.1	78.8
9	78.9	90.3	104.3	88.9
10	90.0	103.4	103.5	97.9
Total	67.0	65.0	71.0	66.1

higher energy needs of the estate sector, and is not to be interpreted as their being better nourished. To amplify, it was shown in the previous chapter that the prevalence of malnutrition, especially stunting, is markedly higher in the estate sector. This is not necessarily incongruous with the fact that the estate population has a higher level of calorie intake. There are a variety of possible hypotheses why this may be the case. First, almost all workers on the plantations are engaged in occupations with high levels of physical activity. Second, the number of laborers per household is higher than the other sectors. Third, the higher altitude and colder climate in the estates also increases energy requirements significantly. And finally, the evidence of a poor sanitary environment and lower levels of education than in other sectors, combined with less access to and utilization of primary health care services, result in a greater sharing of nutrients with parasites and poorer absorption and utilization of available nutrients in the diet.[1] Although the data do not permit the testing of these hypotheses, the situation in the estate sector illustrates the importance of using caution when interpreting the health and nutritional consequences of the consumption data.

It is also interesting to note (from Tables 2.10 and 2.11) that the rate of increase in protein intake that accompanies higher expenditure levels is more rapid than for calories. This is supported by the simple log-log quadratic calorie and protein demand functions in Appendix F. These models illustrate that increases in expenditure levels are accompanied by a larger increase in protein than calorie intake, and that lower-income households have considerably higher nutrient elasticities than those at the high end of

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[1] Maria Tagle, "The Food and Nutrition Situation of Plantation Women Workers and Their Families," (Rome: FAO, 1983) mimeographed; and G. Gunatilleke and G.I.O.M. Kurukulasuria, "The Global Crisis and the Impact on Children in Sri Lanka," in The Impact of the World Recession on Children, ed. R. Jolly and G.A. Cornia (New York: Pergamon Press, 1985) pp. 139-158.

the income distribution. Specifically, this is indicated by computing the expenditure elasticities of demand for calories and proteins for five income levels and three sectors (see Table 2.12). For both equations, the elasticities for the lowest expenditure group are high and fall dramatically at the upper end of the income distribution. However, the protein elasticities are higher than the calorie elasticities for all expenditure groups in all sectors.[1] Thus, any marginal increases in income will be accompanied by a relatively greater increase in protein than calorie intake.

As a consequence of the higher marginal propensity to consume protein than calories, any additional food expenditures will bring about a faster rate of increase in protein than calorie consumption. Therefore, the remainder of the analysis will be centered around the effects of food consumption behavior on calorie intake, understanding fully well that protein deficits cannot be ignored; although it is presumed they too will disappear in the course of raising levels of energy intake.

Dietary Adequacy

To begin the process of examining the adequacy of diets in Sri Lanka, cut-off points which delineate deficient households are required. As intimated above, these cut-off points are a source of

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[1] The significance of the ESTX and URBX dummy variables indicate that the calorie intake of those in the estate sector is significantly more, and the urban sector is significantly less, responsive to income changes than the rural sectors. These data further add credence to the fact that the urban poor are more nutritionally vulnerable than those in the rural and estate sectors.

Table 2.12 -- Expenditure Elasticities for Calories

	Expenditure Class					
	Lowest[a]	Low[b]	Middle[c]	High[d]	Highest[e]	Average
Urban	0.82	0.67	0.59	0.52	0.21	0.58
Rural	0.90	0.75	0.67	0.60	0.29	0.66
Estate	1.00	0.85	0.77	0.64	0.39	0.76

Expenditure Elasticities for Protein

	Expenditure Class					
	Lowest	Low	Middle	High	Highest	Average
Urban	0.93	0.82	0.73	0.59	0.30	0.71
Rural	1.01	0.90	0.81	0.6[illegible]	0.38	0.79
Estate	1.08	0.98	0.89	0.75	0.58	0.87

[a] 1st decile of the expenditure distribution.

[b] 3rd decile of the expenditure distribution.

[c] 5th decile of the expenditure distribution.

[d] 7th decile of the expenditure distribution.

[e] 10th decile of the expenditure distribution.

considerable controversy.[1,2,3,4]. Given the need to avoid becoming embroiled in such a debate, both 100 and 80 percent of the requirement are used as cut-off points in the analysis which follows.[5]

In Figures 2.2 through 2.4 and Table 2.13, the percent of households not consuming adequate amounts of calories are presented by expenditure levels. Virtually all the households in the lower range of outlays do not consume an adequate level of calorie intake according to both of these standards. This figure falls dramatically in all three sectors with rising per capita expenditure levels. However, in the urban sector it remains close to 20 percent for even the wealthiest households.

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1 The significance of the ESTX and URBX dummy variables in Appendix 2 indicate that the calorie intake of those in the estate sector is significantly more, and the urban sector is significantly less, responsive to income changes than the rural sectors. These data further add credence to the fact that the urban poor are more nutritionally vulnerable than those in the rural and estate sectors.

2 Lipton, op. cit., pp. 4-34.

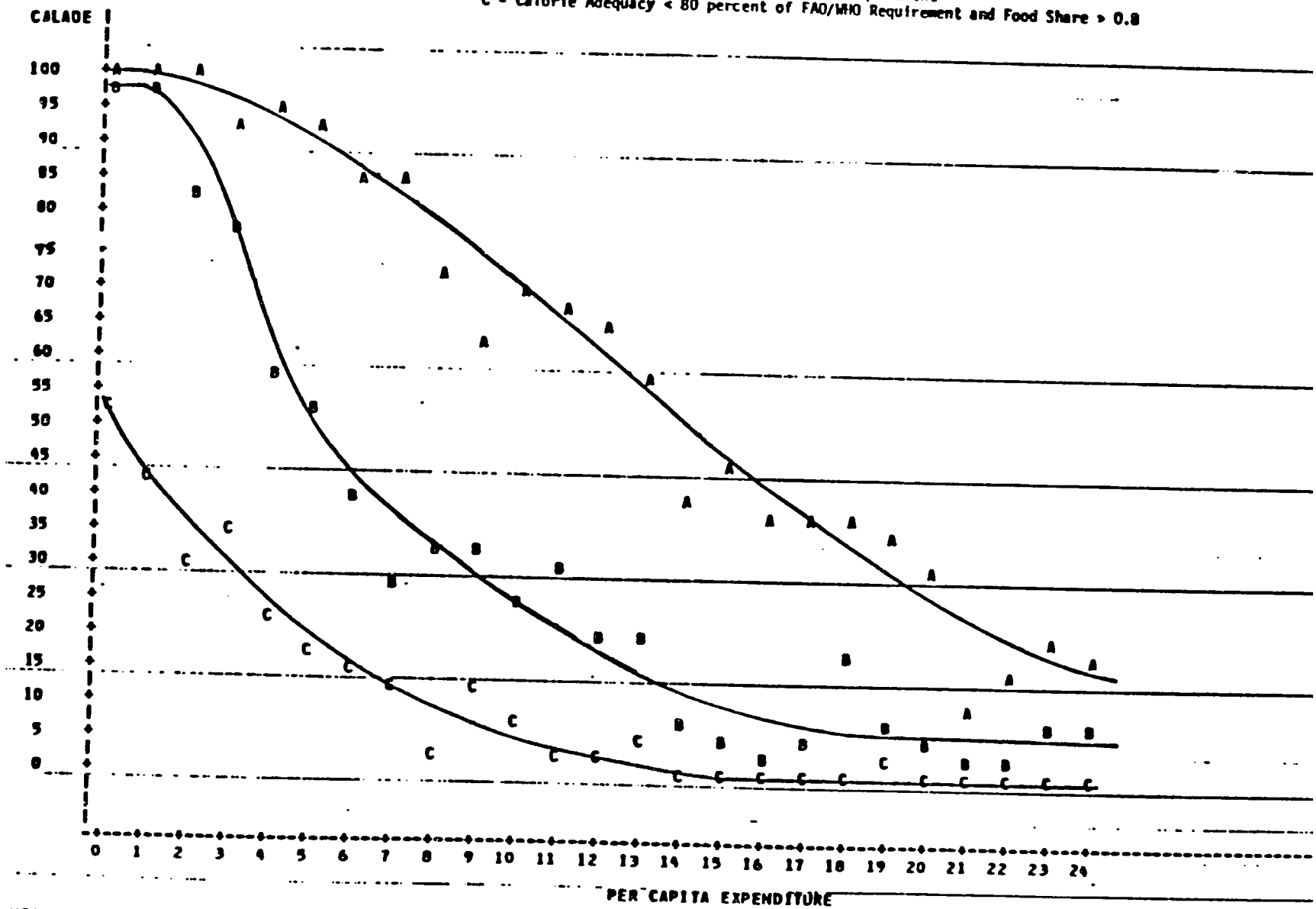
3 T. Srinivasen, "Malnutrition: Some Measurement and Policy Issues," World Bank Staff Working Paper No. 373 (Washington, D.C., 1980); and P. Sukhatme and S. Margen, "Autoregulatory Homeostatic Nature of Energy Balance," American Journal of Clinical Nutrition 35 (1982), pp. 355-365.

4 G. Beaton, "Energy in Human Nutrition: Perspectives and Problems, Nutrition Reviews 41, No. 11 (1983), pp. 325-340.

5 The 1973 FAO/WHO requirement of 2,530 calories for an adult male assumes that there has been no stunting of growth in the population. Since that is unrealistic, the 100 percent threshold undoubtedly overstates real needs in Sri Lanka. It is not possible to quantify real requirements because of lack of data on weights. Therefore, the 80 percent cut-off point should be considered an equally valid point of reference. It is expected that in reality, the true requirements fall somewhere in between. But once again, the main purpose herein is to enable comparisons between population groups, not to provide an unambiguous number on the percent of hungry people.

Figure 2.2 -- CALORIE ADEQUACY VS. PER CAPITA EXPENDITURE
URBAN SECTOR

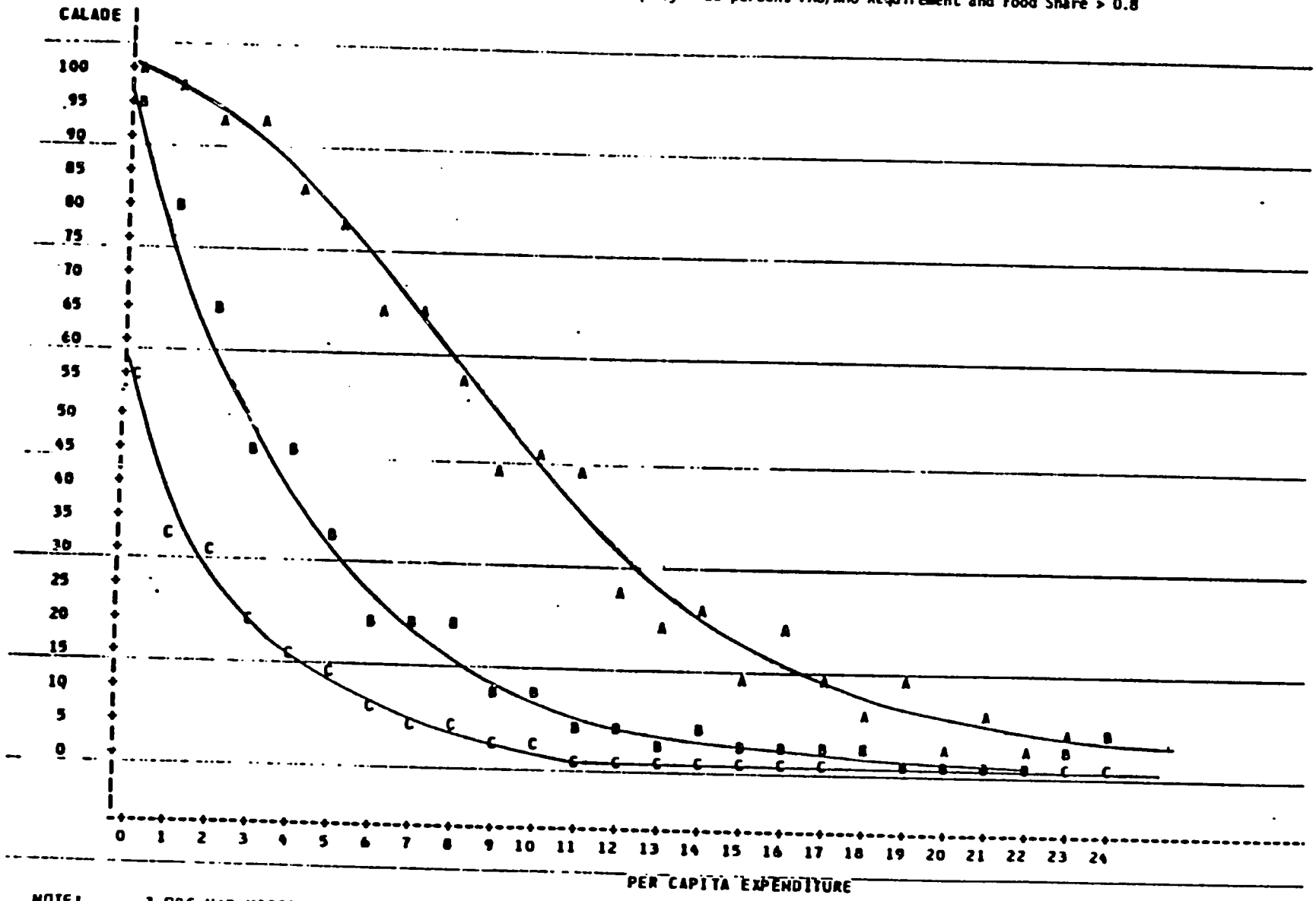
A = Calorie Adequacy < 100 percent FAO/WHO Requirement
B = Calorie Adequacy < 80 percent FAO/WHO Requirement
C = Calorie Adequacy < 80 percent of FAO/WHO Requirement and Food Share > 0.8



NOTE: 3 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

Figure 2.3 -- CALORIE ADEQUACY VS. PER CAPITA EXPENDITURE
RURAL SECTOR

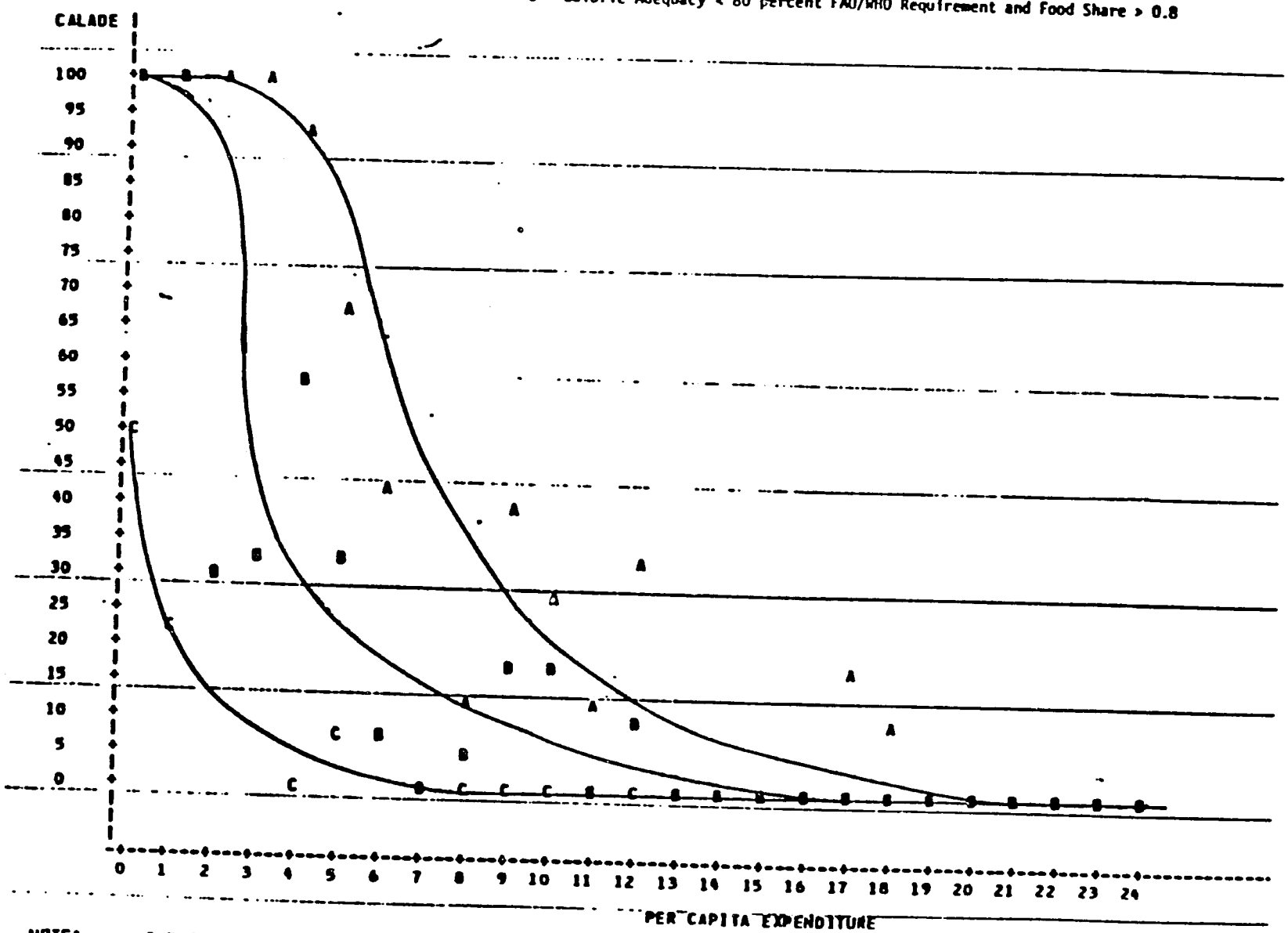
A = Calorie Adequacy < 100 percent FAO/WHO Requirement
B = Calorie Adequacy < 80 percent FAO/WHO Requirement
C = Calorie Adequacy < 80 percent FAO/WHO Requirement and Food Share > 0.8



NOTE: 3 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

Figure 2.4 -- CALORIE ADEQUACY VS. PER CAPITA EXPENDITURE
ESTATE SECTOR

A = Calorie Adequacy < 100 percent FAO/WHO Requirement
B = Calorie Adequacy < 80 percent FAO/WHO Requirement
C = Calorie Adequacy < 80 percent FAO/WHO Requirement and Food Share > 0.8



NOTE: 3 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

Table 2.13 -- Percent Households Not Achieving 80 and 100 Percent FAO/WHO Dietary Requirements[a]

Per Capita Expenditure (Deciles)	URBAN			RURAL			ESTATE		
	<100% Reqs.	<80% Reqs.	<80% Reqs. and Food Share >0.8	<100% Reqs.	<80% Reqs.	<80% Reqs. and Food Share > 0.8	<100% Reqs.	<80% Reqs.	<80% Reqs. and Food Share > 0.8
1	100	95.0	45.0	97.9	83.6	41.4	100	84.6	28.2
2	95.5	67.2	26.9	88.6	48.1	19.7	94.1	31.4	11.8
3	88.7	43.7	18.3	72.8	24.9	8.5	61.4	18.2	4.5
4	70.3	31.3	6.3	48.7	14.8	3.4	28.4	6.2	0
5	65.9	24.7	5.9	40.5	7.1	1.4	39.0	6.8	0
6	54.8	16.7	2.4	22.5	4.8	0.6	1.8	1.8	0
7	44.3	5.7	0	15.6	2.6	0.3	3.5	0	0
8	33.0	11.3	0.9	10.2	1.8	0.6	2.0	0	0
9	17.8	3.1	0	4.3	0.3	0	0	0	0
10	16.5	5.9	0	5.7	3.1	0.7	0	0	0
Total	49.9	24.5	8.07	42.9	20.4	3.7	32.6	13.3	3.8

[a] Based on 1978 FAO/WHO Recommended Daily Allowances

Nationally, less than half the percentage of households with calorie adequacy below 100 percent are also consuming less than 80 percent of the recommended allowances. What is interesting, however, is that among poorer households, the number below 100 percent and 80 percent of calorie requirements is similar; as expenditures increase, these figures diverge. The rate of decrease in households achieving less than 80 percent adequacy is much more rapid. This once again suggests that rising expenditures are accompanied by strenuous efforts to increase calorie consumption above the 80 percent threshold. The drive for households to reach FAO/WHO requirements does not seem nearly so powerful. This intimates that either households do not behave in a way that's best for their nutritional well-being, that other expenditures on shelter, clothing, and transport are of comparable importance, or that the estimated dietary requirement for energy may in fact be too high.

Traditionally, economists use a food adequacy standard (FAS) to measure poverty.[1] The FAS is normally set at a level of income or outlay which enables the household to purchase a diet which will be sufficient for growth, work, recreation, immunological competance, and basal metabolic activities. Nonetheless, poverty and malnutrition are not synonomous. Some poor households do achieve calorie adequacy by a combination of extremely efficient expenditure patterns and food choices and/or reducing requirements through less infection, fewer

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[1] N. Ahluwala et. al., "Growth and Poverty in Developing Countries," Journal of Development Economics (September 1979), p. 459.

pregnancies, and other measures. Conversely, there are many households which have adequate resources but expend them inefficiently in terms of achieving dietary adequacy. Lipton[1] discusses the complex relationship between dietary adequacy and poverty. He proposes a new distinction between "moderately poor" and "ultra-poor." The latter is of special interest. It provides an index of households which are unambiguously and seriously undernourished with little recourse given their resources. Specifically, "ultra-poverty" is defined as households who spend 80 percent of their incomes on food (i.e., food share > 0.8) and achieve less than 80 percent of the daily calorie requirements. Given that a household faces other fixed expenditures, this group of households spend virtually all available resources on food. Despite such efforts, they do not achieve a sufficient number of calories. These are the households which not only suffer the discomfort of hunger pains, reduced working capacity and mental alertness, but also suffer serious health consequences. Moreover, they have virtually no short-term recourse other than assistance from outside the household to resolve their situation.

Eight percent of the Sri Lankan households in the urban and rural sectors fall in this category of the ultra-poor (see Table 2.13). The figure is around four percent in the estate sector. Interestingly, considerably less than half of those households that consume below 80 percent of the requirement spend greater than 80 percent of their resources on food (see Figures 2.2, 2.3, and 2.4). Some of the house-

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[1] Lipton, op. cit., pp. 35-49.

holds with calorie adequacy of less than 80 percent and food share less than 80 percent may have fixed non-food expenditures which are higher than usual and vital to their well-being (e.g., health care costs, transport to work). However, many others could reduce their level of hunger by increasing outlays on food, if tastes and preferences could be influenced.

Among the interesting questions concerning the ultra-poor is how they are distinguished from what we will label as the nutritionally at-risk or moderately poor -- those households consuming less than 80 percent of their calorie requirements, but spending less than 80 percent of their incomes on food. The purpose in doing so is to explore whether there are true discontinuities between the two groups, and whether in fact it is a useful distinction.

In Table 2.14, one can note the significant differences between the two populations in regard to a number of economic, demographic, and social variables. The level of per capita expenditures among the moderately poor is nearly a third higher than the ultra-poor, as is the number of households falling in the lowest quartile of per capita expenditures. As expected, the food share is markedly higher for the ultra-poor, averaging around 84 percent. The moderately poor who are nutritionally at-risk use on the average only 71 percent of their total expenditures for food. The ultra-poor pay less rupees per calorie, although the difference between them and other nutritionally at-risk households is not statistically significant. The ultra-poor also have significantly larger families, more children under five

Table 2.14 -- Differences of Means Tests for the Ultra-Poor and the Moderately Poor Who are Nutritionally At-Risk

Variable	Ultra-Poor N=381		Nutritionally At-Risk (moderately poor) N=613		T-Statistic
	Mean	Std	Mean	Std	
1. Calorie per AEU	1629.4	291.98	1613.5	302.04	0.042
2. Per Capita Yearly Expenditure	1482.93	649.15	1942.25	1279.83	-7.32*
3. Household Size	6.36	2.30	5.92	2.49	2.83*
4. Mother's Education	1.69	0.88	1.92	1.05	-3.69*
5. Father's Education	1.83	0.97	2.06	1.16	-3.42*
6. Amenities Index	5.72	1.82	7.11	2.31	-10.55*
7. P.C. Food Expenditure	1251.60	590.99	1329.40	712.73	-1.86
8. Foodshare	.84	.03	.71	.08	13.54*
9. Total Land Holdings	.78	2.80	.73	1.44	0.33
10. Paddy Land Holdings	.23	1.62	.24	.94	-0.09
11. Highland Holdings	.55	1.38	.49	.83	0.75
12. Percent Households Headed by Female	0.15	0.36	0.17	0.38	-0.91
13. Percent Households with PCEXP < R.167/month	88.98	31.36	69.17	46.22	8.04*
14. Food Expenditures/ Calories	.98	.60	1.06	0.87	-1.75
15. Household Size/ Income Earners	4.49	2.32	4.14	2.25	2.34*
16. Number of Children < 5 Years Old	.70	.81	.60	.85	1.94*

* Significant at 5 percent level.

years of age, and score lower on an amenities index.[1] They also have a larger dependency ratio (i.e., household members/income earners) than the moderately poor who are nutritionally at-risk.

Of perhaps the greatest interest, however, is that there is no significant difference between the mean calorie intake of the two groups. It therefore appears that there is a minimum calorie level below which households will do everything possible given their resources to raise their intake. Once th' level is achieved there indeed may be a slackening of efforts to increase calorie intake, despite that it is insufficient according to accepted standards. This inference corroborates the concept of an inflection point in the food-share Engel function discussed earlier. From a policy perspective, this suggests the need to distinguish between the ultra-poor and moderately poor who are nutritionally at-risk. In the case of the former, income and price-related interventions are clearly required. For the latter, there may be considerable scope for education- and behavior-related projects.

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[1] The amenities index was created on the basis of the household's floor area, source of drinking water, type of cooker (e.g., gas, kerosene, or electric), access to toilet facilities, and household appliances (e.g., radios and refrigerators). Scores were assigned according to these amenities, which were summed up for individual households.

III. OCCUPATION GROUPS AND LANDHOLDERS

The analysis of food consumption and expenditure patterns is continued in this section of the report. Attention is focused, however, on exploring the occupational and income characteristics of households, and examining which groups are at greatest nutritional risk.

To begin, an important way to disaggregate households is according to occupation. For a given household, there may be one or more income earner. Each income earner may in turn have one or more occupations. In order to facilitate the analysis, the individual within the household who earns the largest share of household income was identified as the major income earner. This individual is not necessarily the head of the household, nor always male. The primary occupation of the major income earner will be most often referred to in the text which follows. However, it is important to note that there are, on the average, 1.63 income earners per household. This figure is 1.65, 1.54, and 2.17, in the urban, rural, and estate sectors, respectively.

Of equal interest is that there is no trend in the number of income earners with rising per capita expenditures. However, there is a marked reduction in household size with rising per capita expenditure levels. This decline is much more rapid in the estate sector than in the rural sector, which in turn shows a faster rate of decline than the urban sector. These factors combine to point out some interesting figures on the ratio of household members to income earners (see Table 3.1). Most important is that this dependency ratio

Table 3.1 -- Household Size, No. of Income Earners, and Ratio of Household Size to Income Earners by Sector and Expenditure Class

Per Capita Expenditure Group (Deciles)	Household Size			No. of Income Earners			Ratio of Household Size to No. of Income Earners			% Mothers Who Are Literate			% Fathers Who Are Literate		
	Urban	Rural	Estate	Urban	Rural	Estate	Urban	Rural	Estate	Urban	Rural	Estate	Urban	Rural	Estate
1	6.4	6.5	7.3	1.5	1.6	2.6	4.3	4.1	2.8	61.3	51.2	54.5	71.3	63.8	81.8
2	6.6	6.2	5.6	1.4	1.5	2.1	4.7	4.1	2.7	72.7	61.4	29.0	81.8	76.2	61.3
3	6.1	5.8	5.7	1.7	1.6	2.6	3.6	3.6	2.2	73.2	68.6	46.9	80.3	74.3	68.7
4	5.9	5.3	4.6	1.6.	1.5	2.1	3.7	3.4	2.2	77.3	67.0	55.8	81.8	75.4	76.7
5	6.0	5.3	4.2	1.5	1.6	2.1	4.0	3.3	2.0	78.6	70.2	57.5	70.2	75.4	77.5
6	5.5	4.9	4.7	1.6	1.6	2.4	3.4	3.1	2.0	75.6	66.7	48.4	70.9	75.4	83.9
7	5.2	4.6	4.9	1.6	1.5	2.5	3.3	3.1	2.0	79.5	65.6	40.0	84.1	74.0	56.7
8	5.4	4.4	3.6	1.7	1.4	2.0	3.2	3.1	1.8	82.1	69.4	43.3	81.1	81.2	53.3
9	5.1	4.0	2.6	1.7	1.4	1.5	3.0	2.9	1.7	81.7	72.5	50.0	74.8	81.2	60.0
10	4.5	3.7	2.2	1.8	1.6	1.2	2.5	2.3	1.8	87.1	67.2	40.0	81.1	83.4	100.0
Total	5.5	5.1	4.6	1.7	1.5	2.2	3.2	3.4	2.1	78.7	65.8	47.3	77.9	75.7	71.1

declines markedly with higher income. It is also more than one-third lower for the estate sector than the urban and rural sectors.

The high percentage of literate mothers and fathers is also noted, regardless of expenditure group. Those in the urban sector have higher literacy rates, although inter-sectoral differences are greater for the mothers than fathers. In Table 3.2, calorie intake by education levels are also presented. It can be seen that there is a major increase in per capita calorie intake, and rapid decline in the percentage of ultra-poor households as the education of the primary income earner increases. This is directly attributable to the greater income which accompanies higher levels of education. Also, notice that a larger percentage of urban major income earners are more educated than rural and estate workers; although for a given education level, those in the estate and rural areas have greater calorie intakes and a smaller percentage of households falling in the ultra-poor category.

In order to examine the specific occupational characteristics of the income earners, the households were divided into fourteen categories. The basis for doing so was the primary occupation of the major income earner. These categories are identified in Figure 3.1. Some, such as cultivators and farmers and agricultural and animal husbandry workers, include relatively more households. However, they represent the highest degree of disaggregation permissable given the raw data. Other groups, such as sales workers, were the result of aggregating a number of occupational categories with too small of a sample to have any meaning.

In Table 3.3, it can be seen that occupational groups composed of agricultural and animal husbandry workers, non-specific laborers, and the group

Table 3.2 -- Calories/AEU, % Ultra-Poor and Mean Per Capita Expenditures by Education Group, by Sector

Education of Major Income Earner	N	Calories/AEU Daily	Mean Per Capita Expenditures (Yearly)	% Ultra-Poor
No Schooling	517	2696	2465	12.6
Urban	56	2682	2953	14.3
Rural	397	2638	2372	13.9
Estate	64	3065	2610	3.1
Primary (Grade 1-5)	1743	2650	2573	11.8
Urban	258	2357	2697	16.3
Rural	1336	2681	2552	11.8
Estate	149	2883	2544	4.7
Middle Grade (Grade 6-10)	1647	2776	3122	5.9
Urban	364	2537	3451	7.1
Rural	1220	2834	3037	5.3
Estate	63	3035	2874	9.5
Passed G.C.E. (O.L.)[1]	651	3063	4546	1.5
Urban	223	2926	5569	1.3
Rural	413	3128	3986	1.7
Estate	15	3286	4763	0
Passed G.C.E. (A.L.)[2]	119	3278	5094	2.5
Urban	38	3042	6766	0
Rural	78	3343	4227	3.8
Estate	3	4591	6458	0
Post Degree & Post Graduate Degree	74	3318	7300	0
Urban	39	3117	8873	0
Rural	35	3542	5546	0
Estate	0	0	0	0

[1] Refers to General Certificat Exam (ordinary level) which corresponds approximately to Grade 10 in the U.S. educational system.

[2] Refers to General Certificate Exam (advanced level) which corresponds to 12 years of education.

Figure 3.1 -- Categories of Occupational Groups[a]

1. Professional, Technical and Related Workers. Administrative and Managerial Workers.

2. Clerical and Related Workers.

3. Sales Workers.

4. Service Workers.

5. Cultivators and Farmers.

6. Agricultur , Animal Husbandry, and Forestry Workers.

7. Farm Mana s, Estate Superintendants, and Supervisors. Livestock Farmers, F hermen and Related Workers, Hunters and Related Workers.

8. Production and Related Workers and Transport Equipment Operators.

9. Military Personnel. Bricklayers, Carpenters and Construction Workers. Stationary Engine and Related Equipment Operators. Material - Handling and Related Equipment Operators, Dockers, Freight Handlers.

10. Non-Classified Laborers.

11. Houseworkers and retired Workers.

12. Unemployed or Other.

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[a] These correspond to the "Standard Occupational Classifications for Sri Lanka, 1971," prepared by the International Labor Organization of the United Nations, Geneva, Switzerland.

Table 3.3 -- Per Capita Expenditures, Per Capita Calories, and Extent of Poverty, by Primary Occupation of Major Income Earner

Occupational Group	No. of Households	Mean Per Capita Expenditure (Rs/Year)	Households in Lowest Quartile of Expenditure District (percent)	Mean Calorie per AEU	Nutritionally at-Risk (Consuming <80% Calorie Requirements and Food Share <0.8)	Ultra Poor	Residing in Rural Sector (percent)	Residing in Urban Sector	Residing in Estate Sector
1	294	5456	3.7	3181	6.2	1.4	61	38	1
2	282	4265	8.1	2961	9.6	2.5	60	36	4
3	393	3988	13.0	2835	15.7	6.1	60	38	2
4	193	3342	14.0	2699	11.8	6.7	55	25	20
5	947	2838	19.1	2917	9.7	6.8	96	2	2
6	844	2459	28.4	2763	12.3	10.2	56	3	41
7	113	3537	24.5	2878	15.3	8.8	34	41	25
8	414	3012	17.9	2720	15.8	5.3	74	25	1
9	397	2934	21.2	2586	15.9	8.8	74	24	2
10	601	2387	30.1	2472	13.4	16.5	71	26	3
11	396	3451	16.2	2929	12.9	7.6	70	27	3
12	89	2761	28.6	2541	18.4	11.2	64	29	7

comprised of unemployed,[1] missing, and others appear economically worse off based on per capita expenditure levels. The figures for non-classified laborers with a mean per capita expenditure level of Rs. 2387, with 30 percent of the households falling in the bottom 20 percent of the income distribution, are of special concern given their numbers in the total labor force. The other highest risk group, agricultural and animal husbandry workers, are approximately half rural farm workers, with the other half being estate workers on plantations.

The high percent of low-income households in certain occupational groups has the expected implication for calorie intake. Based on calories per EU and the percent of households falling in the category of the ultra-poor, non-classified laborers once again distinguish themselves. However, the range and variation of calorie intake among occupation groups is considerably less than expenditure levels. Engel's and Bennet's Laws once more are operable.

Another interesting approach to exploring the occupational characteristics of different types of households is found in Table 3.4. In the first column, there is the occupational distribution of the major income earner. For example, 19.1 percent of the primary occupations of the major income earners are farmers and cultivators. This serves as a benchmark. In columns two and three, respectively, are the percent of major income earners with various occupations in the lower and upper quartile of the per capita expenditures.

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[1] The small percentage of unemployed major income earners is not to be confused with the unemployment rate. The national unemployment rate is figured as follows: Unemployment Rate = Unemployed Population/Economically Active Population X 100. This figure was computed to be 14.3 percent nationally for men and 31.1 percent for women. If the head of household, for example, is another family member, she is regarded as the major income earner if she is earning the largest share of the household income. Only if the major earner is also unemployed will they be in Group 12 in Figure 3.1. See Appendix G for data on activity and employment rates.

Table 3.4 -- Percent of Households in Which the Major Income Earner Falls in Different Occupation Groups

Occupation Group	Distribution by Occupations in Total Population	Distribution by Occupations Among Households in Lower Exp. Quartile	Distribution by Occupations Among Households in Upper Exp. Quartile	Distribution by Occupations Among the Ultra-Poor[a]	Distribution Occupations Among Households Nutritionally At-Risk[b]
			(percent)		
1	5.9	1.1	14.6	0.8	3.1
2	5.7	1.9	10.8	1.6	4.6
3	7.9	5.5	11.7	6.0	10.1
4	3.9	2.9	4.9	2.9	3.6
5	19.1	18.8	15.3	15.5	15.7
6	17.0	23.8	9.3	20.5	14.8
7	2.3	2.5	0.3	2.6	2.4
8	8.3	7.3	7.5	5.5	10.9
9	8.0	8.3	7.8	9.2	10.1
10	12.1	17.9	11.0	24.2	13.5
11	8.0	7.2	9.7	7.6	8.5
12	1.8	2.6	1.2	2.1	2.3
Total	100.0	100.0	100.0	100.0	100.0

[a] Defined as calorie intake < 80% of requirement and food share > 0.8.
[b] Defined as calorie intake < 80% of requirement and food share < 0.8.

The contrast is often sharp. For example, 15 percent of the major income earners in the upper expenditure quartile fall in the category of professional, technical, and related workers, and administrative and managerial workers. The comparable figure for the lowest expenditure quartile is one percent. Similarly, more than twice the percentage of primary income earners in the lower end of the income distribution are agricultural and animal husbandry workers, and 50 percent more fall in the category of non-classified laborers than are found in the quartile r resented by the wealthiest households.

The households in column fc are defined as the ultra-poor. The only difference of significance concerning the occupational characteristics of these households, as opposed to the poorest quartile of the population (column two) and other nutritionally at-risk households (last column), is that nearly one-quarter of the major income earners among the ultra-poor are non-classified laborers.

The data in the previous tables do not account for the fact that there is often more than one income earner per household, and that the major income earner may be employed in a secondary occupation. Nearly half of the households report an occupation for a second income earner. Only a third of the major income earners report being involved in a secondary occupation. In households where the primary income earner falls in one of the three major occupations (i.e., farmers and cultivators, agricultural and animal husbandry workers, and laborers), the highest percentage of secondary income earners conveniently falls in either the same occupation as the primary income earner or in one of the other two major occupations found in Table 3.5. With the exception of the few households where the major and secondary income earner is a non-classified laborer, the expenditure levels of households with the

Table 3.5 -- Occupation of Second Income Earners, by the Occupation of the Major Income Earner

Occupation of Major Income Earner		Occupation of Second Income Earner: Cultivators and Farmers	Agriculture and Animal Husbandry	Laborers	Other	None
Cultivators and Farmers	Cal/AEU	2681	2765	2595	--	2982
	PCEXP	2454	2580	2471	--	2896
	Ultra Poor (%)	10.8	7.0	8.3	--	6.2
	Moderately Poor (%)	9.7	11.6	25.0	--	8.8
	Row (%)	8.8	4.5	2.5	12.5	71.7
		n=83	n=43	n=24	n=108	n=689
Agriculture and Animal Husbandry Workers	Cal/AEU	2567	2794	2437	--	2821
	PCEXP	2124	2376	2215	--	2611
	Ultra Poor (%)	5.0	7.2	23.8	--	11.7
	Moderately Poor (%)	35.0	10.9	14.2	--	10.3
	Row (%)	2.4	44.7	2.5	10.3	40.1
		n=20	n=377	n=21	n=85	n=341
Laborers	Cal/AEU	2875	2597	2319	--	2528
	PCEXP	2769	2356	2283	--	2374
	Ultra Poor (%)	5.6	20.6	20.2	--	16.0
	Moderately Poor (%)	0	4.9	11.1	--	12.1
	Row (%)	3.0	5.7	16.5	15.8	59.0
		n=18	n=34	n=99	n=87	n=356

second income earner engaged as a cultivator, agricultural and animal husbandry worker, or laborer, is lower than households where there is only one person engaged in the labor force. In combination, these data strongly suggest that a second household member in the labor market is a necessary adaptive mechanism for economic survival.

In reference to households where the major income earner is engaged in a secondary occupation, the only finding of significance is that non-classified laborers who are engaged as farmers and cultivators as a secondary occupation have markedly higher calorie intakes than the population of laborers as a whole, despite their expenditure levels not being significantly different. This further supports the data presented earlier that households which grow their own food may be better off nutritionally. This will be tested econometrically in the next section of this chapter.

The discussion above concerning households with second income earners and secondary occupations has one other implication which is noteworthy. Specifically, this relates to the fact that most households earn income from a number of sources, despite one usually being predominant. In Table 3.6, the percent of income from a variety of sources, and the percent of households earning income from that source are provided. This is stratified by the occupation of the major income earner. Of particular interest are the occupation groups in which most of the population, especially those at greatest risk, are included.

The situation for agricultural and animal husbandry workers and non-classified laborers is relatively more straightforward. Three-

Table 3.6 -- Source of Household Income by Primary Occupation of Major Income Earner

Occupation Groups	Wages		Pensions, Remittances, and Food Stamps		Net Sale of Profit from Business		Sales of Agricultural Commodities		Net Home Consumption of Agricultural Commodities		Other Periodic Cash Receipts		Rents, Dividends & Interest Payments		Other Non-Money Income[c]	
	Share of Income[a]	% Households Earning from Source[b]	Share of Income	% Households Earning from Source	Share of Income	% Households Earning from Source	Share of Income	% Households Earning from Source	Share of Income	% Households Earning from Source	Share of Income	% Households Earning from Source	Share of Income	% Households Earning from Source	Share of Income	% Households Earning from Source
1	70	(95)	5	(20)	8	(17)	3	(20)	4	(53)	2	(9)	1	(7)	8	(84)
2	76	(100)	4	(18)	3	(13)	2	(21)	4	(56)	2	(9)	1	(5)	8	(88)
3	26	(44)	7	(46)	48	(70)	4	(19)	5	(55)	1	(7)	1	(6)	8	(90)
4	67	(94)	6	(30)	8	(19)	2	(15)	5	(64)	2	(8)	1	(4)	9	(90)
5	15	(36)	10	(55)	12	(28)	33	(80)	20	(97)	2	(10)	0.5	(2)	7	(99)
6	72	(97)	10	(48)	3	(9)	2	(18)	6	(80)	2	(9)	0.5	(2)	5	(98)
7	45	(64)	8	(42)	26	(40)	3	(10)	5	(69)	2	(6)	0.5	(3)	5	(96)
8	57.4	(80)	8	(49)	17	(34)	1.5	(14)	4	(55)	3	(12)	1	(3.5)	7	(88)
9	70	(91)	7	(44)	10	(22)	1	(15)	4	(58)	1	(8)	0	(2)	6	(91)
10	72	(98)	11	(62)	3	(11)	1	(13)	5	(60)	1	(8)	0	(1)	6	(93)
11	12.7	(28.8)	31.5	(72.4)	6.2	(11.6)	7.8	(28.7)	7.3	(61.4)	14.6	(36.9)	4.5	(13.2)	14.1	(96)
12	36	(53)	18	(71)	7	(17)	4	(21)	7	(57)	15	(35)	2	(5)	10	(95)

a These figures represent the mean percent of total income that a given income source comprises.
b These figures represent the percent of households which earn a portion of their income from that given source (i.e., so although, on the average, 70 percent of the income is from wages for households where the major income earner is in Group 1, 5 percent of those households do not earn any income from that source).
c This includes food, clothing, housing, and medical care provided free of charge, usually provided by an employer, which are above and beyond services rendered by public authorities free to everyone in the community (e.g., education).

quarters of total income is from wages among households falling in these two occupational groups. In the estate sector these figures are above 80 percent, while in the rural sector they are slightly below 70 percent. Increasing wages or hours employed will clearly enhance the incomes of these households, and therefore must be the focus of policy makers. In addition, employing a means test for participation in welfare programs such as food stamps will clearly work to the disadvantage of salaried workers, such as those in the estate sector, who have less opportunity to disguise or underreport income.

Among households where the primary income earner is a farmer or cultivator, only 33 percent of their income is from the sale of home-produced products. Combined with the additional 20 percent of their income represented by home consumption, slightly over half of their household income is from directly productive agricultural activities. Earning from wages, businesses, and pensions, remittances, and food stamps all make significant contributions to total earnings. These data exemplify the complexity of understanding the impact of economic policy on the well-being of farmers due to the diversity in their sources of income. For example, raising farmgate prices will undoubtedly transfer some income to producers, but as will be shown below, this will mainly benefit the wealthier producers. However, the indirect effect of higher prices increasing labor demand and creating employment opportunities, both as farm workers and in business enterprises, may prove a more fruitful and direct means of helping the rural poor than raising producer prices. This is supported by the data in Table 3.7, which illustrates that the ultra-poor, like the

Table 3.7 -- Sources of [illegible] for Entire Population, the Ultra-Poor, the Nutritionally-at-Risk, and for Those Consuming More Than 80% of Their Calorie Requirements

	Entire Population		Ultra-Poor		Nutritionally-at-risk		Consuming > 80% of Calorie Requirements	
	Share of Total Income	Households Earning from Source	Share of Total Income	Households Earning from Source	Share of Total Income	Households Earning from Source	Share of Total Income	Households Earning from Source
Wages & Salaries	51.1	(72)	52.8	(77)	50.0	(72)	49.2	(70)
Business Profits	11.4	(24)	9.8	(21)	11.5	(25)	12.2	(25)
Pensions, Remittances and Food Stamps	10.4	(50)	18.3	(75)	14.6	(64)	9.4	(47)
Net Sale of Home Production (i.e, Agricultural Products)	8.4	(30)	4.5	(17)	6.3	(24)	9.6	(33)
Other Periodic Cash	3.0	(11)	2.7	(12)	3.0	(12)	3.1	(12)
Rents, Dividends, and Interest Payments	0.7	(4)	0.1	(1)	0.4	(3)	0.9	(4)
Home Consumption	7.8	(69)	6.2	(67)	7.1	(65)	8.3	(69)
Other Non-Money Sources	7.2	(94)	5.6	(95)	7.0	(89)	7.3	(93)

entire population (of which they comprise eight percent), receive over half their incomes in the form of wages and salaries, with business profits (i.e., small scale enterprise) being the second most important source of earnings. It is also noteworthy that pensions, food stamps, and remittances represent a disproportionately large share of the ultra-poor's income. This further supports the contention that their well-being and improvements thereof are subject to external influences such as food stamp policy, pensions from government, and remittances from abroad.

LANDHOLDERS AND FARMING HOUSEHOLDS

In the previous sections of the report, the large number of impoverished and malnourished households were identified. The fact that rice and coconuts represent the largest expenditure items in the food budget, and as will be shown in the following chapters, that consumers are extremely price responsive both in terms of commodity consumption and nutrient intake, leads one inevitably to explore the dual role of pricing policy in reducing hunger. The question is made interesting by two facts. First, rice is the staple food for all households in Sri Lanka, with coconuts being the second most important staple. Concurrently, according to survey data being analyzed, 27 percent of the total households in Sri Lanka produce paddy and around 33 percent grow coconut. In the rural sector, those figures are 35 and 41 percent, respectively. Therefore, a compelling issue is that prices of the two most important staple foods are a double-edged sword --

they affect consumers on the one hand and producers on the other. The issue to be addressed in this section revolves around linking the consumption and production ends of the food sector. The purpose is to begin to answer the question of how changing paddy and coconut prices will prove helpful or harmful to the vulnerable households.

Before embarking on tnis effort, an important qualification is necessary. The data on the production side from the SocioEconomic Survey have serious limitations. The survey was not designed as a complete agricultural census. Despite this, a fair amount of data on agricultural production and landholding patterns provides an opportunity to observe the dual role of the household as producers and consumers among population groups. However, it is not possible either to extrapolate supply figures to the national level or to examine supply response and farm behavior on the basis of the information in the survey.

General Landholding Characteristics

According to the most recent agricultural census in Sri Lanka, there are 1,807,697 operational holdings in the country, excluding estates.[1] Given that there are 3,058,043 households in Sri Lanka, this translates into approximately 60 percent of Sri Lankan households being landholders. Of the nearly 5,000 households in the two rounds of the 1980/81 SocioEconomic Survey being analyzed in this study,

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[1] Census of Agriculture, 1982, Small Holding Sector, Department of Census and Statistics, Ministry of Plan Implementation (Colombo, Sri Lanka, 1983), p.9.

almost 70 percent of the households reported owning land. This discrepancy can be attributed to a number of factors. First is that the Agricultural Census excludes holdings greater than 20 acres. Second is that the Agricultural Census excludes the estate sector. A third possible explanation is the lesser number of small landholding reported in the present survey relative to the 1982 Agricultural Census: 54 percent of the holdings are less than one acre in the former, as opposed to 42 percent in the Agricultural Survey. Fourth, from the data reported her assuming that the Agricultural Census is truly representative, it app s that the SocioEconomic Survey is biased toward small operational holdings. Since these are often the poorer households and the focus of interest of this report, this is not considered problematic. A fifth problem concerns the definition of agricultural holdings. In the agricultural census, an agricultural holding is clearly defined as being irrespective of whether the land is owned or not. In the SocioEconomic Surveys, holdings were initially defined in terms of ownership. While there are indications that tenants also reported ownership, this discrepancy limits the scope of analysis which follows. Specifically, the reader is admonished not to extrapolate actual values to a national level, although characteristics and behavior of households who own different size holdings are considered meaningful.

In the sample, around 70 percent of the households report owning land. In the rural sector, this figure is 81.5 percent, while in the urban and estate sectors, 26 percent and 13 percent of the households own land, respectively. Some of these urban landholders are absentee landlords, while others reside in urban areas while maintaining a plot of land either

on the periphery of the city or in a proximal rural areas. The data do not allow us to distinguish between these types of urban landowners. Two-thirds of the landholdings consists of highland only; and one-third own highland and paddy land. Less than two percent of the landholders have paddy land only. Highland includes land where crops other than paddy are planted (e.g., coconuts, condiments, coarse grains, pulses, vegetables), as well as home gardens. Paddy land consists of all land, irrigated or rainfed, where paddy is cultivated. Before distinguishing among types of landholdings and focusing on growers of paddy and coconuts, the two most important food crops, some general findings concerning households which produce agricultural commodities and own farmland are presented.

One can divide the population of landowners into four nearly equal size groups, according to the acreage of their holdings. For the smallest group of landowners, virtually all their holdings are in the form of highland (see Table 3.8). In contrast, the large landholders (greater than two acres) on the average have 40 percent of their holdings in the form of paddy land. This is reflected in the value share of total home production of goods (including firewood and other miscellaneous items) which comes from paddy and coconut production. Among the smallest half of the landholders, paddy represents less than 10 percent of the value of home-produced goods. Subsidiary food crops, such as condiments, coarse grains, roots and tubers, and pulses are clearly of great importance to small farmers. To the extent that research, extension and price support for these commodities has been neglected, the major loss is born by the small and marginal farmer. For households with operational holdings greater than two

Table 3.8 -- Value of Production and Share of Income by Landholding Size

	No. of Households	Average Paddy Land	Average High Land	Share of Value of Total Production: Paddy	Share of Value of Total Production: Coconuts	Share of Income From Different Sources: Agricultural Sales	Share of Income From Different Sources: Home Consumption	Share of Income From Different Sources: Business Profits	Share of Income From Different Sources: Wages and Salaries	Share of Income From Different Sources: Pensions, Remittances and Stamps
Size of Holding (ACRES)										
0 - 0.24										
Urban	262	0.001	0.101	1.11	11.96	0.20	[illegible]	20.01	50.76	10.28
Rural	454	0.003	0.114	4.09	15.87	1.78	[illegible]	11.06	54.49	15.63
All-Island[a]	744	0.002	0.108	2.89	13.90	1.46	2.81	13.82	54.18	13.16
0.25 - 0.72										
Urban	120	0.020	0.348	2.36	28.29	1.84	2.10	18.25	44.92	13.16
Rural	807	0.032	0.354	9.96	26.17	3.62	7.09	10.75	55.76	12.68
All-Island[a]	936	0.030	0.354	8.89	26.31	3.38	6.43	11.67	54.55	12.68
0.73 - 2.0										
Urban	52	0.316	0.890	13.77	40.78	3.93	5.69	11.03	50.80	9.31
Rural	876	0.273	1.044	27.18	22.76	12.10	13.41	11.64	41.13	11.53
All-Island[a]	931	0.274	1.035	26.34	23.70	11.76	12.95	11.59	41.70	11.37
2.0 or more										
Urban	42	3.525	6.278	36.70	35.40	15.57	7.64	16.91	31.17	5.87
Rural	754	2.039	2.950	52.41	17.31	30.75	18.24	13.16	21.44	7.14
All-Island[a]	797	2.116	3.126	51.61	18.24	29.91	17.66	13.36	21.99	7.06

[a] Includes 41 estate holdings.

acres (see Table 3.8), over half their share of production is from paddy.

The percent of income from goods produced at home also reveals that agricultural sales and home production make up a relatively small share of the total income of landholders. Among the small landholders, less than five percent of their income is based on agricultural production. This rises to close to 50 percent for large landowners in the rural areas. Wages and salaries remain the major source of income among all but the landholders with greater than two acres in the rural area. It is also noteworthy that among small landholders a larger share of income is in the form of home consumption than agricultural sales. As the size of holdings increase, this trend reverses itself.

These data on sources of income is also reflected in the occupational characteristics of households with different size landholdings (see Table 3.9). Among the smallest landholders in the rural sector, only about one-quarter report occupations directly related to agriculture as their primary occupation. An additional 18 percent are engaged as non-classified laborers, many of which may be finding a portion of their work as seasonal or occasional agricultural laborers. As farm sizes increase, there is a commensurate rise in the percent of households in which farming is the primary occupation. It is not surprising that these percentages are lower for urban landowners, many of which are absentee landlords, or own a plot of land tanget to an urban sector.

A further question is whether land ownership is a good predictor of nutritional risk, especially in rural areas where only 15 percent

Table 3.9 -- Primary Occupations of Major Income Earners Among Landowning Families, by Farm Size

		% Households Where the Primary Occupation of the Major Income Earner Is:			
m Size		Cultivator and Farmer	Agricultural and Animal Husbandry Worker	Farm and Estate Manager, Livestock, Fisherman, and Hunter	Laborer
0-0.24	Urban	0.8	0.8	8.4	11.1
	Rural	5.5	18.5	0.9	13.3
5-0.72	Urban	1.7	2.5	2.5	10.8
	Rural	11.4	16.1	2.2	14.7
3-2.0	Urban	7.7	7.7	1.9	1.9
	Rural	29.6	14.6	0.9	11.2
> 2	Urban	11.9	0.0	0.0	0.0
	Rural	63.2	4.9	0.9	2.1

of the households are totally landless. This is of particular relevance given that consideration is being given to employing landholdings as a criterion for the receipt of food stamps or other transfer payments. In Table 3.10 it can be seen that calorie intakes rise with the size of landholdings. This mostly reflects higher income levels among larger landowners. Interestingly, the calorie intake of non-landholders in the rural areas is 2729 per adult equivalency unit. This is attributable to the fact that there are relatively fewer landless households in the lower end of the income distribution than households who own holdings less than one-quarter of an acre; and there is a greater percent of households in the upper quartile of the income distribution among the rural landless than among those having holdings of less than one-quarter of an acre. It is evident that landlessness alone is not an adequate predictor of poverty and under-nutrition, even in the rural sector. Ownership of only a small amount of land (i.e., one-half an acre) does not portend low levels of food consumption since off-farm employment and earnings are of equal if not greater importance to rural landholders and non-landholders alike.

Paddy and Coconut Producers

In the short-term, the deleterious effects of a price change can be estimated easily for poor households which are non-producers. But what of the producers? What is the tradeoff between higher income as mediated through higher producer prices for paddy and coconuts and the higher prices they would in turn face as consumers?

Table 3.10 -- Average Calorie Intake per AEU and Per Capita Expenditures by Size of Landholding, Rural Sector

Size of Farm Land Holdings (acres)	n	Calories /AEU	Per Capita Expend-itures	Households in Bottom Quartile of Income Distribution	Households in Upper Quartile of Income Distribution	% Ultra-Poor (Food Share >0.8 and <80% of Calorie Requirements)	% Nutritionally at-Risk (Food Share >0.8 and <80% of Calorie Requirements
				(percent)			
None	589	2729	2690	31	18	9.3	24.1
0 - 0.24	454	2543	2685	42	17	13.7	27.8
0.25 - 0.72	807	2691	2686	31	17	9.4	22.2
0.73 - 2.0	876	2810	2865	27	21	6.8	20.2
> 2	754	3146	3646	17	32	4.5	11.4

To begin, the households which produce paddy were identified. They were stratified into quartiles, as a function of the value of their production. In Table 3.11 one can observe that, as expected, households which produce more paddy have higher calorie intake. This is mostly explained by the fact that larger producers fall in higher expenditure categories. However, energy intake generally rises the higher the production within a given expenditure level.

Among the small paddy producers, it is initially instructive to note that only around one quarter of the major income earners in these households list farming and cultivating as their primary occupation. Fifteen percent of the households respond that they are agricultural or animal husbandry workers. Around 10 percent of the major income earners list farming and cultivating as their secondary occupation. Twelve percent of the second income earners are also farmers and cultivators. This reinforces the fact, as supported by the data above that small paddy producers are engaged in other wage-earning activities off the farm. In contrast, farming is the primary occupation of either the first or second income earner in 85 percent of the families which fall in the highest quartile of the value of paddy output. For these households with large landholdings, agriculture represents not only a commercial enterprise but a lucrative one as well.

Table 3.12 indicates that only 8.2 percent of households which are small producers participate in the market as sellers of paddy. Fully 94 percent of the paddy they produce is consumed at home, and few landholders indicate that farming is their major occupation. As the

Table 3.11 -- Calories Per Adult Equivalency Unit by Value of Paddy Production and Per Capita Expenditures, Rural Sector

Value of Paddy Production (Quartiles)		Per Capita Expenditures (Quartiles)				
		1	2	3	4	Total
1	Cal/AEU	1903 n=94	2548 n=94	3140 n=84	3609 n=47	2670 n=319
2	Cal/AEU	1983 n=91	2483 n=91	3135 n=83	4005 n=64	2807 n=329
3	Cal/AEU	2008 n=60	2611 n=72	3211 n=87	4032 n=91	3080 n=310
4	Cal/AEU	1998 n=28	2569 n=57	3218 n=117	4073 n=117	3310 n=319

Table 3.12 -- Percent of Households Selling Paddy, Sale Price, Ratio of Home Consumption to Total Production, and Occupational Characteristics of Paddy Growers

	Value of Paddy Production (Rs/Year)			
	<787	788-1900	1901-4760	>4760
	n=319	n=329	n=310	n=319
Average paddy land-holding (acres)	0.44	0.63	1.36	3.28
% Households where occupation of major income earner is farmer	26.6	48.6	58.4	74.9
% Households where occupation of second income earner is farmer	12.2	10.3	9.7	11.2
% Households where secondary occupation of major income earner is farmer	10.0	8.2	14.8	7.8
% Households selling paddy	8.2	27.7	64.2	95.0
Mean ratio of home consumption to total production	0.94	0.83	0.60	0.31
% Households which produce more than consume	2.8	23.4	60.6	98.1

level of paddy output rises and the wealth of farmers increase, these trends reverse.

Another perspective in examining this issue of who are net producers and consumers is to disaggregate such an analysis by expenditure levels, and be explicit as to the relationship between production and consumption of rice.

The accounting identities which govern this relationship are as follows:

(1) $C_i = P_i + S_i - M_i - T_i$

(2) $H_i = S_i - M_i - T_i$

where:

C_i = consumption of commodity i net of losses, wastage, seed, and feed

P_i = market purchases of a given commodity i

S_i = total production or supply of foodgrain i

M_i = marketings (i.e., sales)

T_i = net carry over of stocks from one accounting period to the next and/or in-kind payments from the household

H_i = home consumption of commodity i.

In Table 3.13, C, S, and M are reported for rice, as well as H and P which were computed from (1) and (2). Among the interesting points is that, as expected, the small producers are predominantly from poorer households; the large producers are most often from the upper expenditure quartiles.

A second point revolves around the levels of production and its relation to consumption. The farm households producing less than 38

Table 3.13 -- Per capita Production, Consumption, Marketing, and Purchases of Rice by Expenditure Quartiles and Quantity of Paddy Production

Household Paddy Production (Bushels)	Rice Per Capita (lb.)	Per Capita Expenditure Quartiles 1	2	3	4	Total
0	Production = S	0	0	0	0	0
	Home Consumption = H	0	0	0	0	0
	Marketing Surplus = M	0	0	0	0	0
	Market Purchases = P	181	233	271	312	242
	Total Consumption = C	181	233	271	312	242
		n=674	n=593	n=533	n=448	n=2248
< 16	Production = S	46	69	75	100	68
	Home Consumption = H	41	65	69	88	62
	Marketing Surplus = M	5	4	6	12	6
	Market Purchases = P	148	184	212	250	190
	Total Consumption = C	189	249	281	338	252
		n=94	n=90	n=81	n=44	n=309
16-37	Production = S	128	152	201	263	179
	Home Consumption = H	90	123	166	198	139
	Marketing Surplus = M	38	29	35	65	40
	Market Purchases = P	99	118	138	163	126
	Total Consumption = C	189	241	304	361	265
		n=87	n=84	n=79	n=58	n=308
38-90	Production = S	280	320	377	589	405
	Home Consumption = H	123	187	213	299	214
	Marketing Surplus = M	157	133	164	290	191
	Market Purchases = P	74	132	97	96	87
	Total Consumption = C	197	263	310	395	301
		n=60	n=72	n=90	n=87	n=309
> 90	Production = S	735	934	1293	1259	1514
	Home Consumption = H	163	238	345	399[a]	337[a]
	Marketing Surplus = M	572	696	947	860	1177
	Market Purchases = P	52	31	0	0	0
	Total Consumption = C	215	269	345	399	337
		n=28	n=59	n=111	n=108	n=306
TOTAL	Production = S	56	108	223	423	146
	Home Consumption = H	25	49	86	125	52
	Marketing Surplus = M	31	59	137	298	94
	Market Purchases = P	160	191	202	215	195
	Total Consumption = C	185	240	288	340	247
		n=943	n=898	n=894	n=745	n=4753

[a] In reality the quantity of own consumption cannot be greater than total consumption. However, for a number of households in these groups, that was reported to be the case. This either reflects misreporting of one or the other of the variables, which were collected in different sections of the questionnaire, or an error in the formula used to convert own consumption, reported in bushels of paddy, into pounds of rice. To do so, it was assumed that a pound of paddy will be milled into 0.66 pounds of rice.

bushels per year, on the average, cannot produce enough to meet their consumption requirements, even if none of their output entered the market.

The farm households producing more than 38 bushels per year are net producers, regardless of the expenditure group. The households producing between 38 and 90 bushels of paddy per year purchase an average of 87 pounds of rice per capita per year, despite that their market sales are the equivalent of 191 pounds of rice. Thus, these families only consume at home 53 percent of their production, selling the remainder.[1] As a result, they are forced to purchase back from the marketplace approximately 87 of the 301 pounds of rice they consume. This is an indication that a combination of storage costs and constraints (both storage facilities and post-harvest losses), the need for cash (to pay back loans or for other non-food expenditures), and possibly the lack of milling capacity compel households to sell rice at a low price and buy back at some latter time at a price that is upwards of 35 percent higher.

The data in Table 3.13 are limited in that they refer to the average household within each cell. Therefore, of equal interest is a determination of the percent of households which are net consumers or producers. This is found in Table 3.14. Virtually all the smallest producers are net paddy consumers.

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[1] There are some stocks carried over from one year to the next, although the amounts are negligible.

Table 3.14 -- Percent of Households Which Are Net Paddy Buyers, by Amount of Production and Expenditure Quartiles -- Rural Sector

Bushels of Paddy Produced Per Year	Expenditure Quartile 1	2	3	4	Total
0	100	99.8	99.6	98.7	99.6
>16	97.9	98.9	96.3	97.7	97.7
16-37	80.5	76.2	77.2	84.5	79.2
38-90	33.3	44.4	52.2	35.6	42.1
>90	0	3.4	1.8	0	1.3
Total	90.7	86.7	80.4	75.8	83.9

In contrast, 99 percent of those producing more than 90 bushels are net sellers of paddy. In total, only 84 percent of the households in the rural sector are net consumers of paddy.[1]

A similar story can be told for coconut producers. For example, less than 30 percent of the households which are small coconut producers list farming as a primary occupation (see Table 3.15).

Similarly, the marketing behavior of coconut producers is similar to that found for paddy farmers (Table 3.16). It is also generally the case that for a given expenditure level, the larger producers tend to consume more coconut. This probably reflects that the shadow price of home-consumed commodities may not be the same as market purchases.

Finally, Table 3.17 goes beyond the data on the average household to indicate the percent of households which consume more coconuts than they produce. The importance of doing so is illustrated in nearly half of the households producing between 300 and 960 coconuts being net consumers. This is despite the previous table showing that on the average, households in this group produce 90 coconuts per capita and consume only 88, making them net producers. Once again referring to the number of households appearing in each cell (see Table 3.16), it is emphasized that 40 percent of these large producers are from the upper quartile of the income distribution. This is in contrast with less than 20 percent of the small producers, who are net consumers, being from the wealthy group of households.

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[1] All households in the estate sector are net rice consumers, and 97 percent are net consumers in the urban sector, for an All-Island total of 87.6 percent of the population being net consumers.

Table 3.15 -- Percent of Households Selling Coconut, Ratio of Home Consumption to Total Production, and Occupational Characteristics of Coconut Growers

	Value of Coconut Production (Rs/Year)		
	<432	432-1170	>1170
	n=777	n=400	n=411
% Households where occupation of major income earner is farmer	22.10	27.30	36.00
% Households where occupation of second income earner is farmer	5.65	9.50	6.60
% Households where secondary occupation of major income earner is farmer	5.00	8.00	5.80
% Households selling coconuts	5.95	27.75	83.21
Mean ratio of home consumption to total production	0.97	0.87	0.45
% Households which produce more than consume	5.2	44.5	92.0

Table 3.16 -- Per Capita Production, Consumption, Marketing, and Purchases of Coconut by Expenditure Quartiles and Quantity of Coconut Produced, Rural Sector

Household Coconut Production	Per Capita	Per Capita Expenditure Quartiles 1	2	3	4	Total
0	Production = S	0	0	0	0	0
	Home Consumption = H	0	0	0	0	0
	Marketings = M	0	0	0	0	0
	Market Purchases = P	62.2	83.1	100.3	139.9	385.5
	Total Consumption = C	62.2	83.1	100.3	139.9	388.5
		n=619	n=549	n=495	n=383	n=2046
<112	Production = S	11.1	13.7	15.6	22.4	62.8
	Home Consumption = H	10.7	13.2	14.9	22.4	61.2
	Marketings = M	0.4	0.5	0.7	0.0	1.6
	Market Purchases = P	55.2	75.3	91.2	110.9	332.6
	Total Consumption = C	65.9	88.5	106.1	133.3	393.8
		n=117	n=77	n=74	n=60	n=328
113-300	Production = S	38.5	45.1	52.8	72.5	208.9
	Home Consumption = H	37.0	41.9	50.2	68.1	197.2
	Marketings = M	1.5	3.2	2.6	4.4	11.7
	Market Purchases = P	39.6	53.3	67.7	71.8	232.4
	Total Consumption = C	76.5	95.2	117.9	139.9	429.5
		n=101	n=109	n=114	n=92	n=416
301-960	Production = S	90.1	46.4	152.0	217.9	506.4
	Home Consumption = H	74.3	35.1	113.5	160.0	382.9
	Marketings = M	15.8	11.3	38.5	57.9	123.5
	Market Purchases = P	13.3	66.4	20.3	20.8	120.8
	Total Consumption = C	87.6	101.5	133.8	180.8	503.7
		n=69	n=84	n=106	n=62	n=321
>960	Production = S	303.5	395.0	583.8	972.2	2254.5
	Home Consumption = H	103.7	159.5	152.5	209.5	625.2
	Marketings = M	199.8	235.5	331.3	762.7	1529.3
	Market Purchases = P	-4.1	-41.3	-10.4	-32.9	-88.7
	Total Consumption = C	99.6	118.2	142.1	176.6	536.5
		n=37	n=79	n=105	n=148	n=369

Table 3.17 -- Percent of Households Which Are Net Coconut Buyers, by Amount of Production and Expenditure Quartiles, Rural Sector

Coconuts Produced Per Year	Expenditure Quartiles 1	2	3	4	Total
0	100	100	100	100	100
<112	97	95	97	98	97
113-300	95	92	95	88	93
301-960	45	46	42	58	46
>960	0	4	6	1	3
Total	89	84	79	74	82

In sum, the data on agricultural production in general, and paddy and coconuts in particular, reveal that most of the households growing food do so for their own consumption. Sri Lanka's agriculture remains composed mainly of enterprises producing for home consumption. A large percent of the poor households are the small cultivators, which also earn much of their income in the form of wages and salaries. Non-farm employment, partially fueled by the vitality of the agricultural sector, is therefore of equal or greater importance to the welfare of the poor. Based on a comparison of market sales with purchases, it also appears that at least in the short-term the small farm households will be hurt by the raising of producer prices, assuming stable marketing margins. This will be analyzed in greater detail at the end of the following chapter, where a simple model of farm households is developed which takes into account their dual role as consumers and producers.

IV. ESTIMATING PRICE AND INCOME PARAMETERS

Assessment of the impact of income growth and price changes requires moving beyond descriptive analysis and employing econometric techniques which model food acquisition behavior. The intent is to estimate a matrix of own- and cross-price elasticities by income class in order to trace the effects of income and price changes on households with different economic and demographic characteristics.

The theoretical basis for consumption analysis is traditional economic demand theory. Out of this consistent theoretical framework a number of techniques have been employed to estimate food demand parameters.[1] These may be divided into two universes. The first are those indirect techniques for estimating complete systems of demand which employ restrictions on parameters, many of which are properties derived from the constrained maximization problem of the arbitrary utility function.[2] Some of these techniques, such as AIDS, are not considered feasible because for some goods in the 1980/81 SocioEconomic survey, it is not possible to impute prices. In addition the degree

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[1] For a review of these techniques, see H. Alderman, "Theoretical and Methodological Concerns for Measurement of Demand Parameters for Low-Income Consumers," Volume II of Impact of Income and Food Price Changes on Food Acquisition by Low-Income Households," Draft (Washington, D.C.: International Food Policy Research Institute 1984), mimeographed.

[2] Most important in this regard are that the demand equation be homogenous to the degree zero; that the adding-up criterion holds whereby the entire budget is exhausted; and that the Slutsky matrix be symmetric.

of aggregation required to limit the parameters to a manageable number would be considered unacceptable.

With regard to other methods for estimating systems of demand, they employ restrictive assumptions about separability in the utility function, (e.g., Frisch methodology, the linear expenditure system or its variant, the less restrictive quadratic expenditure system). It is felt that these are too strong. Therefore, the alternative of direct estimation is commended. This despite the major drawback of the difficulty in estimating a complete matrix of cross-price elasticities.

The decision to adopt the pragmatic approach of directly estimating demand parameters, however, still portends possible complications and requires a variety of further decisions.[1] Therefore, below there is a discussion of the models to be used and the choice of estimation techniques, which is followed by a presentation of the results.

THE MODEL

In the commodity-by-commodity analysis which follows, the point of departure for Engel curve estimation is finding a functional form

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[1] Most important, in order to estimate price elasticities, there must be real price variation, not just due to quality differences. In the Sri Lanka data, there are such differences. These are due primarily to large spatial differences. The observed spatial variability for homogenous commodities is not only found in the survey being analyzed, but in published data such as: Bulletin of Selected Retail Prices 1979-1981, Department of Census and Statistics, Ministry of Plan Implementation, Colombo, Sri Lanka, 1982, p. 18. As an example, the price per pound of parboiled rice of the same quality varied from Rs. 3.82 in Puttalam District to Rs. 5.15 in Jaffna. In addition, there is also temporal variability partially attributable to the fact that the rate of price increases during the course of the survey was quite different for all the commodities.

with the best goodness-of-fit based on the observed data.

The basic Engel function takes the form:

(3) $$Q_{ij} = Y_j\beta_{1i} + Z_{kj}\beta_{ki} + U_{ij} \text{ and } E(u_i) = 0;\ j=1,2,\ldots N$$

where:

Q_{ij} = quantity consumed of commodity i by household j

Y_j = income of household j

β_1 = coefficient of income to be estimated

Z_k = vector of other independent variables

β_k = vector of coefficients to be estimated

U_j = independently distributed error term between households

N = number of households observed

There is considerable evidence from this data that the income variable is not reported with sufficient accuracy to warrant its use in estimating Engel functions.[1] Similarly, even if the reporting is

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[1] The correlation coefficient between total yearly household income and total expenditures is 0.73. However, when one regresses expenditures on income, the equation is as follows (t-statistics are in parentheses):

$$\underset{(50.11)}{\text{LnTOTEXP} = 3.72} + \underset{(77.02)}{0.63}\ \text{LnTOTINC} \qquad R^2 = 0.54$$

where:

LnTOTEXP = the natural log of total yearly household expenditures

LnTOTINC = the natural log of total yearly household income

At low levels of income, reported expenditures are higher than reported income. This is expected due to disavings among the poor. However, the extent of the discrepancy is much more than could be explained by the possibility of disavings alone. In addition, note that the slope of the regression line is less than unity, indi-

(continued next page)

perfectly accurate, the time horizon over which income data are collected may not be long enough to account for the factors which condition a household's perception of permanent income.[1] Therefore, the estimates which follow employ the currently accepted practice of using total expenditures as the regressor, represented by X_j.

Non-Consuming Households

A theoretical problem in estimating directly consumption functions is that not all households consume all food commodities. For some food groups, e.g., rice, coconut, fish, virtually all households are consumers. For others, e.g., meat, wheat, and milk, around half to two-thirds of the households are consumers.

This problem of non-consuming households arises due to a number of reasons. First, it may be that the period in which the survey collected data on food consumption expenditures (i.e., one week) was too short. If a longer time horizon was used, non-consumers might have been reduced. Seasonal factors not captured by a cross-sectional sur-

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(continued)
cating the extent of under-reporting decreases as income rises. This coincides with savings becoming increasingly important with rising income. However, the income and expenditure curves do not intersect until around Rs. 25,000/year. This is well above the 90th percentile of the income distribution. It implies that only a couple percent of the households are net savers (the remainder being disavers). This is also an unlikely scenario, adding further credence to the under-reporting problem.

1 See Milton Friedman, A Theory of the Consumption Function, (Princeton, N.J.: Princeton University Press, 1957).

vey could also have influenced the consume/not consume decision. Alternatively, households may choose not to consume a commodity because of its price or their limited income. There may also be a variety of social or cultural reasons that households do not consume certain products, regardless of economic considerations, e.g., Jews and Muslims do not eat pork. Regardless of the reason, non-consuming households present some interesting estimation problems.

The simpler problem is when, due to non-consumption, one cannot impute a price for a commodity to be used as an independent variable in a regression analysis. In such cases, mean market prices were determined by region. Non-consuming households were then assigned the mean price of the region in which the household resided.

A less tractable problem occurs when the dependent variable in the function has a zero value, i.e., when the quantity consumed is nil. A large number of zero values will result in biased estimates of the coefficients using ordinary least squares regression. In addition, if one estimates functions using the truncated sample, one does not avoid the bias, and furthermore loses information contained in the sample.[1]

There are a few options to deal with this problem. The first concerns the process of aggregating commodities into broader commodity groups. Take wheat and bread, for example. In a previous attempt to estimate parameters in Sri Lanka, researchers aggregated these two

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[1] This problem was first introduced by J. Tobin, "Estimation of Relationships for Limited Dependent Variables," Econometrica 26 (1958) pp. 24-36; and is reviewed and discussed at length by G. S. Maddala, Limited - Dependent and Qualitative Variables in Econometrics (Cambridge, England: Cambridge University Press), 1983.

foods into a single group.[1] If this was done herein, the problem of non-consuming households would largely be resolved. But at what cost? The fact is that household consumption patterns are extremely different with regard to wheat and bread. As a result, aggregating market goods into broad groups may in fact lead to spurious conclusions. Similarly, if commodities like wheat and bread, or milk and meat, are aggregated, one also reduces the potential degrees of freedom for developing sound food policy.

The second possible solution involves the use of cell mean data. Specifically, one can adopt the approach used by Timmer and Alderman[2] to estimate demand functions, arguing that grouped data smooth out taste variability while simultaneously eliminating the problem of non-consuming households. The obvious problem with such a procedure is that variation is lost in the process of aggregation. Inclusion of variables on occupation and household structure will not be possible with aggregate functions. A considerable amount of price variation will also be lost. This is a big problem in cross-sectional data where price variation is often limited.

A third option revolves around employing estimation methods other than ordinary least squares. Tobin[3] devised a maximum likelihood

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1 M. Yetley and S. Tun, "Household Demand Analysis for Assessing Nutritional Impact of Development Programs," IED Staff Report (Washington, D.C.: USDA, 1981), Appendix.

2 C. Peter Timmer and Harold Alderman, "Estimating Consumption Parameters for Food Policy Analysis," American Journal of Agricultural Economics, 61, No. 5 (1979), pp. 982-987.

3 J. Tobin, op. cit., p. 7.

technique to address this problem (i.e., the "Tobit"). It has been used in consumption analysis by Pitt[1] to estimate elasticities in Bangladesh, and by Kinsey[2] to estimate marginal propensities to consume food away from home in low-income U.S. households.

As an alternative to using the Tobit procedure, there is a two-step approach to estimate demand parameters. The technique, based on Heckman's[3] labor participation work and a paper by Griliches, Hall, and Hausman[4], basically involves combining two separately specified functions. The first involves the use of a binary choice model, such as a probit, which represents a switching function. In this case, one estimates the standardized cumulative normal function F(z) to determine the probability of being in the market as a function of a variety of random variables, X. One can differentiate the function $\partial F(z)/\partial X$. To the extent that $\partial F(z)/\partial X$ is not zero, the probability of consuming commodity Q_i is not equal to zero.

The second function to be estimated in the two-step approach involves performing an ordinary least squares regression (OLS) esti-

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1 M. Pitt, "Food Preferences and Nutrition in a Poor Developing Country," Review of Economics and Statistics LXV (1983), pp. 105-114.

2 J. Kinsey, "Working Wives and the Marginal Propensity to Consume Food Away from Home," American Journal of Agricultural Economics 65 (1983), pp. 10-19.

3 J. Heckman, "The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimation for Such Models," Annals of Economics and Social Movement 5 (1976), pp. 475-93.

4 Z. Griliches, B. Hall, and J. Hausman, "Missing Data and Self-Selection in Large Panels," Annales de L'INSEE 30-31 (1978), pp. 137-76.

mate on the truncated sample of consuming households. However, once again the problem discussed above remains that $E(u) \neq 0$ if the sub-sample of participating households is not random. This pitfall of biased estimators can be addressed by including the inverse of the Mills' Ratio, which is the ratio of the unit normal density to the cumulative normal density, as a regressor in the OLS equation.[1] The Mills' Ratio can be determined from the probit equation discussed above which provides data on the probability that a household has a positive value, Q_i. Thereafter, the probit estimates and the truncated OLS, with the inverse of the Mills' Ratio as a regressor, can be combined as follows to estimate the population parameter:

(4) $\partial Q_i/\partial X_i = F(z)\ (\partial Q^*/\partial X) + E(Q^*)\ (\partial F(z)/\partial X)$

where Q^* is the truncated sample of consumers only. In other words, the expected change in commodity Q_i for a change in x_i (e.g., the marginal propensity to consume Q_i) is determined by summing (1) the expected change in Q_i for a change in x_i given the probability that someone is a consumer, and (2) the expected change in the probability of consuming Q, weighted by the expected value of Q_i, if a household is already in the market.

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[1] As it turned out, for most of the functions estimated in this research, the inverse of the Mills' ratio in the response equations had little effect on the coefficients. There were instances, however, where parameter estimates with and without the Mills' were rather divergent. It is therefore recommended that future researchers estimate all response equations with and without the inverse of the Mills' ratio. Thereafter, if the comparison of the coefficients of the two equations (i.e., with and without the Mills') indicates that there is no bias in the parameters caused by the absence of the Mills' ratio, consideration should be given to leaving it out of the model if it introduces multicollinearity.

The two-step method is most appropriate and required when one does e work ofnot wish to constrain the parameters for entry and quantity response to be the same.[1] When the parameters are the same, the method reduces to a Tobit. However, as remarked by Maddala,[2] "in more complicated models in which ML [maximum likelihood] methods are computationally burdensome, the two-stage methods are worthwhile." For this reason, the research which follows uses the two-stage approach.[3]

In the demand functions which follow, OLS alone will be employed for commodities where more than 90 percent of the households are consumers. This includes rice, coconuts, sugar, fish, condiments, and vegetables. For the other commodities, the two-step approach will be used in order to ensure the accuracy of the parameter estimates.

Choice of Functional Form

A final major consideration in estimating income and price parameters revolves around the choice of functional form. The quest is to find a good fit for the observed data. In this regard, a number of forms were considered before deciding on the log-log quadratic form, which is specified as follows for each commodity function.

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1 See Harold Alderman, "Allocation of Goods Through Non-Price Mechanisms: Implications of Rationing and Waiting Times in Egypt," (Ph.D. Dissertation, Harvard University, 1984), pp. 51-62.

2 Maddala, op. cit., p. 223.

3 The only Tobit procedures available at IFPRI would not converge with more than 500 households, as contrasted with the probit procedure which could handle the entire data set of nearly 5,000 households.

(5) $$LnQ_i = \alpha + \beta_1 LPCEXP + \beta_2(LPCEXP)^2 + \gamma_i LnP_i + \gamma_j LnP_j + \lambda_i LnP_i * LPCEXP + \sum_d \lambda_j LnP_j * LPCEXP + \sum_k \phi_k Z_k + \sum_l \theta_l Z_l * LPCEXP + T_{1i}D_i * LnP_i + T_{2j}D_j * LnP_j$$

for households 1,2,3,...n, where:

n = the number of observations,

LPCEXP = the natural log of per capita expenditures

LnP_i = the natural log of the price of commodity i

LnP_j = the natural log of the price of commodity j

Z_k = the vector of demographic and structural variables

Z_l = a subset of Z_k, and

D = dummy variable which equals 1 when a household is in the bottom 25 percent of the income distribution.

The elasticities can be computed by differentiating the Engel functions. The formula for the income elasticities is:

(6) $$E_i = \beta_1 + 2\beta_2(LPCEXP) + \lambda_i LnP_i + \sum_j \lambda_j LnP_j + \sum_l \theta_l Z_l$$

and the formula for own-price elasticity is:

(7) $$e_{ii} = \gamma_i + \lambda_i(LPCEXP) + T_{1i}D_i$$

and the formula for the cross-price elasticity is:

(8) $$e_{ij} = \gamma_j + \lambda_j(LPCEXP) + T_{2j}D_j$$

This form has a number of clear benefits. For example, the multiplicative interaction terms allow the price and expenditure elasticities to vary over a wide range. The quadratic terms (i.e., $LPCEXP^2$) will allow the latter to have an elasticity above unity for one expenditure group, while being a necessity ($0<E_i<1$) or an inferior good ($E_i>0$) for other expenditure groups. This functional form is

also commended because it does not display some of the shortcomings of other similar forms, such as the semilog quadratic where the own-price response is constrained to rise with levels of consumption, which is not intuitively appealing.

Concerning the cross-price terms in the models, they are included to reduce potential biases in income and own-price parameters. Commodities hypothesized to be important complements or substitutes with the dependent variable were included in the original equations. Subsequently, many which proved insignificant were removed to reduce multicollinearity in the equations. This approach will result in estimating a matrix of elasticities which indicates the major tradeoffs between prices of one commodity and the consumption of the others. As mentioned previously, the alternative of constraining the functions using a system is felt to be less worthy. The fact is that in many instances empty or insignificant cells in the matrix will truly reflect the minimal tradeoffs between one commodity and another. Imposing restrictions which will generate values for these cells is not considered a good solution; it will only obscure the accurate cross-price coefficients which are estimable using a commodity-specific approach.

The vector of other independent variables, Z_k, were included in an attempt to avoid the income and price parameters picking up effects which are in reality attributable to household structure and other demographic characteristics. In this regard, a few variables were selected for inclusion in the Engel function. First is the ratio of adult equivalency units to household size, AEURAT. This variable com-

pensates for the fact that the age and sex composition of a household of a given size effects directly the level of average per capita requirements for the household, and thus the demand for individual commodities. This ratio was found to explain more of the variance in the equation than adding one or two variables such as number of children below five and the number of children of school age.

Just as the adult equivalency index was a vital demographic variable, so is the information on household size, HHSIZE, and an interaction term between households and per capita expenditure, HHSX. Together these capture the effects of economies of scale in food purchases. For example, if HHSX has a negative coefficient, as expected for food commodities, it signifies that as more members are added to the household a smaller amount of any marginal increase in intake will be spent on a given good. Or, in other words, as per capita expenditures rise, there would be an increasing understatement of welfare of the family if one only deflated total household expenditures by household size.[1]

The other demographic variable experimented with in all the models was a dummy variable, D_1, which takes the value one when a household member is a farmer or cultivator and zero otherwise. This variable picks up demographic and cultural differences in the population of farmers which stem from a variety of factors. Most importantly, this variable will account for any difference in prices which they actually

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[1] A. Deaton, "Three Essays on a Sri Lanka Household Survey," Living Standards Measurement Study, Working Paper No. 11 (Washington, D.C.: The World Bank, 1981), pp. 10-20.

pay that might result from their status as producers (i.e., the difference between farm and retail prices due to marketing costs).

The number of income earners, EARNERS, was also included for a variety of reasons. First, major income earners in certain occupations are more likely to be complemented by a second worker in the household; and households where there is a second income earner are more likely to be struggling for dietary adequacy. Furthermore, EARNERS may pick up differences in food preferences which may result from more than one household member working to earn money or in-kind sources rather than being engaged in household activities.

Two other dummy variables were also included in the individual commodity models. The first, URB, took on a value of one when a household resided in an urban area, and zero otherwise. The second, EST, took on a value of one when a household lived in the estate sector, and zero otherwise. These enable the models to pick up how consumption patterns differ in the urban and estate sectors from the rural sector. While these dummy variables when included alone in the equation will pick up most of the variance explained by consumers being in the urban or estate sectors, there is also a compelling policy question that they do not answer: do urban and/or estate households react differently to changes in incomes than those in the rural sector? In order to answer this question, two further dummies were defined as interaction terms formed by multiplying the log of per capita expenditures by URB and EST. The result is the URBX and ESTX dummies, respectively, which are slope shifters. They predict whether

the expenditure elasticities for the urban and estate sectors differ significantly from the rural sector.

A series of other interaction terms were also included in each of the models which follows, although many were removed due to problems of multicollinearity with other variables. Specifically, in addition to including own-price parameters, P_{ii}, and cross-price parameters, P_{ij}, a series of interaction terms were formed by multiplying the log of prices by the log of per capita expenditures $LnP_k * LnPCEXP$, where P_k is the vector of prices for all commodities. This would pick up any curvature in the price function which would not be captured by the log-linear relationship between prices and quantities. In those cases where $LnP_k * LnPCEXP$ proved insignificant, interaction terms between the price and a dummy variable for low-income households were included. This would at least allow a test of whether the poor households are more price responsive than the remainder of the population.

ELASTICITIES

The results of the commodity-specific consumption functions are found in Tables 1 and 2 of Appendix B. The elasticities were calculated and are reported in Tables 4.1 and 4.2.[1]

There are a variety of generalities which apply to the elasticities. First, the significance of the quadratic term in most of the equations reflects that expenditure elasticities decline as income rises. Second, it was possible to estimate income-class specific own-

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[1] For commodities estimated using the two-step approach, the entry and response elasticities are included in Appendix B, Tables 3 and 4.

Table 4.1 — Expenditure Elasticities, Uncompensated and Own-Price Elasticities, and Budget Share by Expenditure Group and Sector

	Expenditure Elasticities			Uncompensated Own-Price			Budget Share		
	Low[a]	Middle[b] (Mean)	High[c]	Low	Middle (Mean)	High	Low	Middle (Mean)	High
Rice									
Urban	.616	.43	.078	-.615	-.58	-.58	23.3	16.8	7.8
Rural	.685	.50	.147	-.703	-.67	-.67	30.0	24.7	12.8
Estate	.685	.50	.147	-.703	-.67	-.67	26.7	24.2	13.4
Coconuts									
Urban	.61	.59	.286	-.55	-.450	-.25	6.5	5.0	2.7
Rural	.67	.65	.346	-.665	-.570	-.37	7.4	6.6	4.2
Estate	.67	.65	.346	-.665	-.570	-.37	6.7	6.1	4.6
Sugar									
Urban	1.023	.82	.337	-.897	-.819	-.633	6.8	5.7	3.8
Rural	1.089	.89	.403	-.837	-.759	-.573	6.4	5.9	4.4
Estate	1.257	1.06	.571	-.669	-.591	-.405	5.2	5.5	5.7
Fish									
Urban	1.79	1.30	.121	-1.68	-1.28	-.35	5.6	6.4	5.3
Rural	2.17	1.68	.501	-1.68	-1.28	-.35	4.5	5.4	5.9
Estate	2.17	1.68	.501	-1.68	-1.28	-.35	2.4	3.7	6.6
Condiments									
Urban	.99	.842	.434	-.57	-.57	-.57	6.0	4.6	2.9
Rural	1.06	.904	.496	-.51	-.51	-.51	6.5	5.7	4.3
Estate	1.06	.904	.496	-.51	-.51	-.51	5.1	5.7	4.6
Vegetables									
Urban	.99	.826	.356	-.791	-.729	-.568	4.7	4.3	2.9
Rural	.96	.788	.318	-.791	-.729	-.568	5.9	5.5	4.1
Estate	.82	.65	.181	-.627	-.566	-.404	5.6	5.6	6.1
Bread									
Urban	.465	.361	.207	-.326	-.326	-.326	8.1	5.3	2.9
Rural	.896	.792	.643	-.806	-.806	-.806	3.1	2.9	2.1
Estate	2.392	2.294	2.140	-.806	-.806	-.806	.4	1.9	1.4
Oil									
Urban	.815	.682	.364	-.514	-.514	-.514	1.8	1.7	1.7
Rural	.936	.803	.485	-.514	-.514	-.514	1.4	1.5	1.4
Estate	1.097	.964	.646	-.514	-.514	-.514	1.8	2.2	1.6
Pulses									
Urban	.89	.712	.249	-1.651	-1.130	-.759	.9	1.4	1.3
Rural	1.47	1.288	.331	-1.651	-1.130	-.759	1.4	1.7	1.5
Estate	1.47	1.288	.331	-1.651	-1.130	-.759	2.4	2.2	1.5
Wheat Flour									
Urban	.148	.066	-.152	-1.33	-1.11	-1.11	1.95	1.1	.5
Rural	.148	.066	-.152	-1.33	-1.11	-1.11	1.5	1.3	.5
Estate	.148	.066	-.152	-1.33	-1.11	-1.11	13.7	8.0	1.7
Milk									
Urban	1.72	1.643	1.512	-1.95	-1.57	-1.161	2.1	2.8	3.1
Rural	1.72	1.643	1.512	-1.87	-1.394	-1.244	1.2	1.8	2.3
Estate	1.72	1.643	1.512	-1.87	-1.394	-1.244	.8	1.7	3.7
Meat									
Urban	.761	.734	.660	-1.127	-1.112	-1.075	1.3	1.7	2.3
Rural	.761	.734	.660	-1.127	-1.112	-1.075	.4	.7	1.2
Estate	.761	.734	.660	-1.127	-1.112	-1.075	-	.8	.9
Root Crops									
Urban	1.067	1.126	1.267	-1.328	-1.242	-1.242	.9	.9	.8
Rural	1.067	1.126	1.267	-1.328	-1.242	-1.242	1.2	1.2	1.2
Estate	.765	.824	.965	-1.328	-1.242	-1.242	.4	.7	.8

[a] Corresponds to 2nd decile where per capita expenditures = Rs 1587/year
[b] Corresponds to mean of population where per capita expenditures = Rs 2583/year
[c] Corresponds to 10th decile where per capita expenditures = Rs 8267/year

Table 4.2 -- Matrix of Uncompensated Own- and Cross-Price Elasticities

	Rice	Coconut	Sugar	Condiments	Vegetables	Fish	Bread	Pulses	Oil	Wheat	Milk	Root Crops	Meat
Rice													
Low	-.70	0	-.11	-.21	-.8	-.25	.09	-.48	-.72	-	-	-	.04
Middle	-.67	-.05	-.11	-.14	-	-.25	.09	-.48	-.07	-	-	-	.04
High	-.67	-.05	-.11	.04	-	-.25	.09	-.48	.16	-	-	-	.04
Coconut													
Low	-.05	-.66	.04	.05	-	-.37	.27	.30	.41	.28	.054	.68	.25
Middle	-.05	-.57	.04	.12	-	-.37	.22	.30	.41	.28	.19	.68	.25
High	-.05	-.37	.04	.28	-	-.37	.11	.30	.41	.28	.19	.68	.25
Sugar													
Low	-.05	-	-.83	-.11	-	-.06	.83	-	-	-	-	-	-
Middle	-.05	-	-.76	-.11	-	-.27	.86	-	-	-	-	-	-
High	-.05	-	-.57	-.11	-	-.79	1.3	-	-	-	-	-	-
Condiments													
Low	-.02	-	-.15	-.51	.07	.22	.25	.10	-.12	-	-	-	-
Middle	-.02	-	-.12	-.51	.07	.22	.25	.10	-.12	-	-	-	-
High	-.02	-	-.05	-.51	.07	.22	.25	.10	-.12	-	-	-	-
Vegetables													
Low	-.001	-	-.05	-.02	-.78	.26	-	-	-	-.34	.04	.57	-
Middle	-.03	-	-.05	-.02	-.72	.26	-	-	-	-.34	.04	.57	-
High	-.10	-	-.05	-.02	-.58	.26	-	-	-	-.34	.04	.57	-
Fish													
Low	-.03	-.05	.06	-.13	.06	-1.67	-.05	-	-.12	-	.48	-	-.23
Middle	-.03	-.05	.06	-.13	.06	-1.28	-.05	-	-	-	.48	-	-.10
High	-.03	-.05	.06	-.13	.06	-.36	-.06	-	-	-	.48	-	-.10
Bread													
Low	.19	-.53	-	-	.40	-1.26	-.81	1.10	.9	.52	-1.1	-.97	-
Middle	.19	-.34	-	-	.40	-1.26	-.81	1.10	.9	.52	-1.1	-.97	-
High	.19	.10	-	-	.40	-1.26	-.81	1.10	.9	.52	-1.1	-.97	-
Pulses													
Low	-	-.08	.06	-	-	.26	.44	-1.65	-	-.47	.2	.08	-
Middle	-	-.08	.06	-	-	.26	.44	-1.39	-	-.47	.2	.08	-
High	-	-.08	.06	-	-	.26	.44	-0.70	-	-.47	.2	.08	-
Oil													
Low	-.06	-.09	-	-	-.04	-.16	.37	-.323	-.25	.05	.18	-.25	.17
Middle	-.06	-.09	-	-	-.04	-.16	.37	-.244	-.25	.05	.18	-.25	.17
High	-.06	-.09	-	-	-.04	-.16	.37	.244	-.25	.05	.18	-.25	.17
Wheat Flour													
Low	-	-	-.05	-.11	-	.77	.27	-	-.72	-1.33	-	-	-
Middle	-	-	-.23	-.11	-	.77	.27	-	-.72	-1.11	-	-	-
High	-	-	-.67	-.11	-	.77	.27	-	-.72	-1.11	-	-	-
Milk													
Low	.02	.16	-	-	.14	.20	-	-	-.249	-1.65	-2.10	-	-
Middle	.02	.10	-	-	.09	.20	-	-	-.249	-	-1.2	-	-
High	.02	-.05	-	-	-.05	.20	-	-	-.249	-	-1.2	-	-
Root Crops													
Low	.01	.04	.04	-.05	.02	-.10	.08	-	-.05	-.249	-	-	.15
Middle	-.02	.04	.04	-.05	.02	.03	.08	-	-.05	-.249	-	-	.15
High	-.09	.04	.04	-.05	.02	.31	.08	-	-.06	-.249	-	-	.15
Meat													
Low	.17	.24	-.88	.14	-.21	1.03	-.67	-.150	.12	.314	.88	-	-.95
Middle	.09	.13	-.12	.05	-.21	.71	-.67	-.072	.12	.73	-	-	-.95
High	-.08	-.12	-.07	-.16	-.21	-.05	-.67	.144	.12	1.04	-	-	-.95
Fruits													
Low	-	-	-	-	-	-	.16	-	.03	-	-	-	-
Middle	-	-	-	-	-	-	.16	-	.03	-	-	-	-
High	-	-	-	-	-	-	.16	-	.03	-	-	-	-
Other Grains													
Low	-.2	-.05	.11	-.16	-.17	-	2.2	-	.09	-	.69	-.06	-
Middle	-.2	-.05	.11	-.16	-.17	-	2.2	-	.09	-	.69	-.06	-
High	-.2	-.05	.11	-.16	-.17	-	2.2	-	.09	-	.69	-.06	-

[1] "-" signifies that no significant cross-price term was estimable.

price elasticities for many of the commodities, such as coconuts, sugar, and fish. These too usually show a decline in absolute value as incomes rise. The poor are more responsive to price and income changes than richer households.

A third generalization is that when it was possible to estimate significant interaction terms between the sectoral dummy variables and the log prices or income, the urban sector was less income- and price-responsive than the rural sector. Similarly, the elasticities of the estate sector generally displayed higher absolute values. However, there were many instances where it was not possible to estimate sector-specific elasticities because of a problem of multicollinearity between the dummy variables themselves (e.g., URB, EST) and the interaction terms between them and the log of income (e.g., URBX, ESTX).[1]

Fourth, in general, the signs of the own- and cross-price elasticities correspond to expectations. For example, in the rice equation, the coefficients for fish, coconut, and oil are negative, indicating that as their prices rise, less rice is consumed. This is reasonable since they are all complements in preparing curries. Among the positive cross-price parameters in the rice equation is that for bread. As expected, the cross-price elasticity of 0.19 indicates it is a substitute for rice in the diet. Interestingly, milk and meat also

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[1] It was decided to leave both the sector dummy variable and interaction between the dummy and the log of income in the same equation for two reasons. First, inclusion of such dummies picks up variance and reduces the bias in the other price and income parameters. Second, constraining the intercept while allowing the slope to vary may result in biased and contrary econometric results.

appear to be substitutes, although the elasticities are small in absolute value. This may be partially due to the fact that whenever the price of a luxury food increases, the household reverts to using its limited resources for favored staple foods. The significant interaction term between meat price and per capita expenditures indicates that as incomes increase, the tradeoffs between commodities decrease. That can be attributed to a combination of the decline in the pure substitution effect and the expected lower income elasticities and budget shares to rice as expenditure levels increase.

Wheat was the only commodity where a priori important tradeoffs were expected with rice (for the estate sector only) and a robust coefficient could not be estimated. The problem might have emanated from the fact that all wheat flour is imported and milled by the government. There is virtually no price variation, which in this instance precludes estimating cross-price elasticities with cross-sectional data.

Among the other major commodities -- coconut, sugar, and bread -- the price elasticities are similarly in accordance with expectation. For coconuts, the significant and positive interaction reflects that as incomes increase, households become less price-responsive. This is attributed to a combination of a decreasing budget share and income elasticity of demand, and that the value of the compensated cross-price term also decreases with income. Rice, fish, bread, pulses, oil, and other grains are all gross complements reflecting the use of coconuts as an ingredient in preparing many recipes.

Concerning sugar, an increase in the price of rice will result in a decline in sugar consumption. The opposite is true of coconut, a gross complement to sugar. In the demand function for bread, the most important of the commodities estimated using the two-stage technique, with the exception of fish and oil, all commodities are gross substitutes. Most important in that regard is the tradeoffs between rice, coconut, sugar, pulses, and wheat flour and bread.

A fifth tendency which runs through the demand equations is that the signs of the demographic variables are generally consistent and as expected. For example, the size of the household, HHSIZE, has a positive coefficient, reflecting that larger households with the same income purchase more rice. The third household structure variable is the interaction term between household size and per capita expenditures, HHSX. Its negative sign reflects economies of scale in rice purchases.

V. INCORPORATING PARAMETERS FOR POLICY ANALYSIS

The estimation of consumption parameters provides the basic instruments for both formulating commodity policy and predicting the consumption consequences of changes in income growth and distribution. In the case of food and agricultural planning, the elasticities estimated in the previous section allow one to make projections of demand for specific commodities under a variety of food price and income growth assumptions. The parameters will permit one to predict the needs for agricultural production, as well as to trace directly the macro-implications of price policy. For example, assuming a switch from a highly subsidized consumer rice price to an open economy in which explicit and implicit subsidies are removed, the price elasticities in the previous section can predict how such a policy shift will dampen overall demand. Thus the reduction in the residual between demand and domestic production, which otherwise would have been purchased using valuable foreign exchange, can be estimated. Similarly, the own- and cross-price effects can be traced through the system to identify the effects on substitute commodities.

Such analyses are fundamental aspects of food policy formulation. They are made feasible given the availability of the elasticities presented above. But of equal importance is to trace the nutritional consequences of such price and income changes. In this regard, the primary concern is the effect of income growth and distribution on the dietary intake in Sri Lanka, as well as the impact of food price changes on the calorie adequacy of different income groups. In the

discussion which follows, the focus will be on the micro-level, concerned primarily with the consumption effects on poor households.

Determining Calorie Elasticities

In the previous section, parameters were estimated which predict how household purchases of individual commodities will shift in the face of changes in incomes and food prices. However, understanding the implications of those changes in terms of calorie intake requires employing elasticities of demand for calories with respect to income and price changes. To estimate these elasticities, one aggregates the individual commodity demand functions by taking a weighted average as follows:

(9)
$$M_c = \frac{\sum_i C_i \, q_i \, M_i}{\sum_i C_i \, q_i}$$

(10)
$$E_{ci} = e_{ii}\alpha_i + \sum_j e_{ji}\alpha_j$$

where:

M_c = the income elasticity of demand for calories

M_i = the income elasticity of demand for commodity i

C_i = per unit calorie content of commodity i

q_i = quantity consumed of commodity i

E_{ci} = calorie elasticity with respect to a change in the price of commodity i,

e_{ii} = own-price elasticity for commodity i,

e_{ji} = cross-price elasticity with respect to a change in the price of commodity i

α_j = the share of total calories from commodity j before an income or price change

It is not intuitively clear nor readily apparent from (10) whether E_{ci} should be negative or positive. This is determined by whether the calorie availability from the gross complements or the substitutes of i is more dominant. Similarly, it is not obvious whether E_{ci} should be higher or lower for households in lower expenditure deciles. Two conflicting forces are working here. On the one hand, it was shown above that e_{ii} is always negative and has a higher absolute value for low-income households. On the other hand, one would intuitively expect that poor households are better substitutors, more efficiently changing their food basket to maintain adequate calorie intake in the face of changing prices.

In Table 5.1 one finds the actual price elasticities of demand for calories. A number of interesting points emerge. First, price elasticities of demand for calories are much lower than the own-price elasticities presented in the previous section. Clearly, households adjust their consumption bundle in ways which mitigate the potentially deleterious consequences of rising prices of food commodities. Second, in general the calorie elasticities are negative, which is also as expected. Exceptions exist, however. For example, despite the own-price elasticity of meat being higher than unity for all income classes, one finds the elasticity of calories with respect to the price of meat to be positive for all but the richest consumers. A rise in meat prices discourages its consumption; the subsequent substitution for more calorie-efficient commodities results in an overall improvement in the household's calorie availability. Among upper income households, the lower own-price elasticity, coupled

Table 5.1 -- Comparison of Income and Price Elasticities of Demand for Calories[1]

Elasticity of Calories With Respect to:	Income Class	Aggregation of Commodity Functions
EXPENDITURES:		
	Low	0.76
	Middle	0.62
	High	0.28
PRICES:		
Rice	Low	-0.41
	Middle	-0.35
	High	0.29
Coconut	Low	-0.08
	Middle	-0.09
	High	-0.04
Sugar	Low	-0.01
	Middle	-0.01
	High	-0.01
Fish	Low	-0.06
	Middle	-0.05
	High	-0.02
Bread	Low	-0.03
	Middle	0.01
	High	0.06
Oil	Low	-0.02
	Middle	-0.01
	High	-0.01
Wheat	Low	-0.03
	Middle	-0.15
	High	-0.30
Milk	Low	-0.02
	Middle	0.01
	High	-0.04
Meat	Low	0.10
	Middle	0.06
	High	-0.09

[1] For the rural sector only.

price elasticity, coupled with their being less effective substitutors and the relatively larger share of the calorie intake derived from meat products, results in the meat price elasticity of demand for calories being negative.

Third, for rice, the elasticity of calorie intake with respect to its price is nearly four times higher in absolute value than its closest rival, coconuts, among low-income households. This suggests that although the negative impact of an increase in rice prices is less than what would be predicted on the basis of the own-price elasticity, it is still of a significant magnitude. The large proportion of the budget devoted to rice coupled with the limited potential for substitution among other goods results in an outstandingly high value for rice, as shown in Table 5.1. It is clear that any price policy concerned with nutrition must revolve around the moderation of rice prices.

Fourth, other than rice and to a lesser extent coconuts, any change in other commodity prices will not seriously jeopardize nutritional well-being. Once again, this can be attributed to a combination of the relatively small share that any other commodity makes up of the total calorie intake, coupled with the fact that a high level of substitution takes place between foods.

Simulating the Effect of Income and Price Changes

The following equation can be used to calculate the expected change in calorie intake from changes in real income and changes in commodity prices:

$$(11) \quad Q_{ci}^{1} = (Q_{ci}^{o} M_{ck}) \left(\frac{Y_i^1 - Y_i^o}{Y_i^o}\right) + (Q_{ci}^{o} E_{ck}) \left(\frac{P_i^1 - P_i^o}{P_i^o}\right) + Q_{ci}^{o}$$

where:

Q_{ci}^{o} = calorie consumption of household i at present

Q_{ci}^{1} = calorie consumption of household i at time 1

Y_i^1 = per capita expenditure level at time 1

Y_i^o = per capita expenditure level at present

P_i = price of commodity i at time 1

P_i^o = price of commodity i at present

M_{ck} = income elasticity of demand for calories

E_{ck} = price elasticity of demand for calories

In Table 5.2 the per capita calorie levels before and after eight scenarios are examined for households in the rural sector.[1] The first four examine the effect of changes in income on calorie consumption within a stable price environment. That is, it is assumed that there is a perfectly elastic supply curve or that the supply curve will shift to meet increases in demand while maintaining prices at the present level. This possibility is especially important because the major consumer-oriented food intervention in Sri Lanka is the food stamp program. The nature of this infra-marginal subsidy makes it, in effect an income transfer program which does not affect commodity prices. Scenario 1 involves a 10 percent increase in real expenditures of each household. The second also involves a 10 percent

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[1] The data are limited to the rural areas for ease of computational tractability, clarity of presentation, and the fact that nearly 80 percent of the population falls in that sector.

Table 5.2 -- The Effect of Changes in Incomes and Prices on Per Capita Calorie Intake -- For All Rural Households

Per Capita Expenditure (Deciles)	Per Capita Calories at Present	Scenario 1 10% Rise in Expenditures	Scenario 2 Rs. 316 Rise in Expenditures	Scenario 3 20% Rise in Expenditures	Scenario 4 Rs. 632 Rise in Expenditures	Scenario 5 20% Decline in Rice Prices	Scenario 6 20% Decline in Rice Prices and a Rs. 316 Rise in Expenditures	Scenario 7 20 Decline in Rice Prices and a Rs. 316 Fall in Expenditures	Scenario 8 20% Decline in Rice Prices an a Rs. 632 Rise i Expenditures
1	1239	1350	1544	1849	1461	1362	1667	1057	1972
2	1617	1744	1872	2129	1871	1757	2014	1499	2271
3	1815	1940	2031	2258	2065	1953	2179	1726	2406
4	1977	2188	2184	2391	2259	2132	2339	1926	2545
5	2144	2292	2335	2522	2440	2307	2494	2119	2681
6	2331	2481	2504	2676	2631	2495	2667	2323	2839
7	2586	2738	2739	2892	2890	2756	2909	2604	3062
8	2716	2870	2849	2975	3021	2886	3012	2760	3138
9	3119	3273	3228	3333	3427	3291	3395	3187	3499
10	3595	3703	3647	3692	3811	3725	3680	3680	3680

increase in real expenditures for the economy as a whole; although the absolute value (as opposed to the percent of a household's income) of this increase is distributed equally to all households. Given that the All-Island mean per capita expenditure is Rs. 3158/year, this translates into an across-the-board increase of Rs. 316.

When the absolute value of income is increased by Rs. 316 among all households, the per capita calorie intake rises from 1239 to 1544 among the poorest expenditure group. Thus, the 305 calorie increment in per capita energy consumption among the lowest decile is three times greater than the 111 calorie increment which results from raising incomes by 10 percent, in proportion to current incomes, throughout the population.

A similar set of findings apply to scenarios 3 and 4 where income rises 20 percent, both in proportion to the present levels of earnings and in equal amounts for all households. Even with a 20 percent rise in total expenditures, which brings about an Rs. 632 increment to all households, the mean per capita intake among the poor remains only 1849. Given the sex and age composition of the typical poor household, this level of intake remains inadequate. However, such averages obscure the fact that a large percentage of households do indeed consume adequate amounts of calories, as will be discussed below.

In scenario 5 one can observe the effect of lowering rice prices by 20 percent in the face of no change in expenditure levels. A 20 percent decline in rice prices has approximately the same effect on calorie consumption as a 10 percent proportional rise in real income (scenario 1). This reflects that the absolute value of the rice price

elasticity of demand for calories is roughly half the income elasticity and also that the rate of decline in the two parameters is comparable. Thus, the policies of a general consumer price subsidy and a proportional rate of income growth will have similar distributional impacts which do not favor low-income households. This clearly indicates the need for effective targeting, whether it be in terms of consumer subsidies which lower prices at the margin or redistribute income through food stamps or an infra-marginal quantity rationing scheme.

Finally, in scenarios 7 and 8, one can observe the effect of a 20 percent decline in rice prices in combination with a decline of Rs. 316 and rise of Rs. 632 in expenditures, respectively. In the former case the negative impact of a marked decline in income, even in the face of lower prices, is illustrated. This reinforces the need for strong economic performance to raise the real income of the poor. In the latter case, average consumption of the lowest expenditure group approaches 2000 calories per capita. This represents a 60 percent increase in calorie intake over the 1239 consumed presently.

The value of the above analysis is limited because it examines the impact on the average calorie intake of a household in a given expenditure group. It obscures the fact that many households already consume diets which meet recommended energy requirements, while others do not. Therefore, one can frame a similar analysis in terms of the number of households which are presently consuming less than the required calorie level and which would no longer fall in that category

if there was an increase in per capita expenditures. In Table 5.3, the percent of households consuming less than 100 and 80 percent of the FAO/WHO requirement, before and after the eight scenarios discussed above, are presented. Given the small stature of most of the Sri Lankan adult population due to previous stunting, the 100 percent of FAO/WHO requirements undoubtedly overstates the dietary needs of the population. This cut-off point is included, however, to approximate the requirements if the population was healthy and the stature of adults reflected their genetic potential.

There are a number of important lessons worth considering. First, even a 20 percent increase in real expenditures, distributed in proportion to current earnings, will not ameliorate the hunger problem among the poorest households in Sri Lanka. Take, for example, rural households in the bottom decile of the population. Only 17 percent of these rural households consume 80 percent of the FAO/WHO standard. After a 10 percent rise in real expenditures, 75 percent still do not consume 80 percent of the standard. A 20 percent rise in real expenditures will have a bigger impact, although 62 percent of the households in the lowest decile will still consume less than 80 percent of the requirements. All of this is despite calorie elasticities approaching unity.

The effect of a 10 or 20 percent rise in real expenditures on the number of households with inadequate intake is once again limited since a proportional rate of growth in income increases the expenditures among the relatively better-off households more than the poor, in absolute terms. Specifically, a 10 percent rise in real

Table 5.3 -- The Effect of Changes of Incomes and Prices on the Percent of Household Consuming Inadequate Calories -- For All Rural Households

Per Capita Expenditure (Deciles)	Based on Percent of Standards	Present	Percent of Households Not Consuming 80 and 100 Percent of FAO/WHO Recommended Dietary Intake After A: 10% Rise in Expenditures	Rs. 316 Rise in Expenditures	20% Rise in Expenditures	Rs. 632 Rise in Expenditures	20% Decline in Rice Prices	20% Decline in Rice Prices and a Rs. 316 Rise in Expenditures	20 Decline in Rice Prices and a Rs. 316 Fall in Expenditures	20% Declin Rice Price a Rs. 632 Ri Expenditu
1	80 (100)	81 (98)	75 (94)	56 (86)	62 (89)	27 (64)	57 (74)	32 (61)	74 (78)	13 (41)
2	80 (100)	48 (89)	33 (78)	16 (64)	16 (65)	8 (38)	24 (61)	9 (40)	52 (75)	4 (17)
3	80 (100)	26 (73)	19 (58)	14 (49)	12 (44)	6 (27)	14 (45)	7 (26)	29 (63)	3 (16)
4	80 (100)	15 (49)	10 (38)	7 (32)	7 (27)	4 (19)	8 (28)	4 (17)	15 (43)	2 (9)
5	80 (100)	7 (40)	4 (26)	4 (23)	3 (17)	2 (13)	3 (19)	1 (10)	5 (33)	1 (5)
6	80 (100)	5 (22)	3 (14)	3 (14)	1 (10)	1 (9)	2 (11)	1 (7)	4 (18)	0 (4)
7	80 (100)	2 (15)	2 (12)	2 (12)	1 (8)	1 (9)	1 (9)	0 (5)	2 (11)	0 (3)
8	80 (100)	2 (10)	2 (8)	2 (9)	2 (6)	2 (7)	1 (6)	1 (4)	1 (7)	1 (3)
9	80 (100)	0 (4)	0 (3)	0 (3)	0 (3)	0 (3)	0 (2)	0 (2)	0 (3)	0 (1)
10	80 (100)	3 (6)	3 (5)	3 (5)	2 (5)	3 (5)	1 (3)	1 (3)	1 (3)	1 (3)

expenditures will increase purchasing power of a rural household in the lowest decile by Rs. 160/year; those in the fifth and tenth deciles increase expenditures by Rs. 243/year and Rs. 781/year, respectively. Despite the large absolute increase in expenditures among upper income households, the low calorie elasticities preclude a few deficient households from achieving calorie adequacy. These households probably represent a structural problem in the data.

The implication of these findings is clear: a proportional, even if rapid, rate of growth across all expenditure groups will not reduce hunger significantly in the near future. Unless there is a change in income distribution the poor will remain hungry for years to come.

To reinforce this point, it is assumed once again that there is a 10 and 20 percent growth in real expenditures in the economy as a whole. This time, however, the absolute value of the increase is distributed equally across all households. As pointed out above, this translates into an across-the-board increase of Rs. 316 and Rs. 632, as presented in scenarios 2 and 4, respectively.

The change in the percentage of households consuming less than 80 percent of the FAO/WHO standard before and after these changes are marked. In fact, after a 20 percent increase in real income, the problem of inadequate consumption affects less than 10 percent of the population for all but the lowest decile of the rural population, based on a cut-off point of 80 percent of the FAO/WHO standards.

The simulations above illustrate that income redistribution, rather than income growth, is the key ingredient to reducing hunger in Sri Lanka. Therefore, it is worthwhile considering two more scenarios

which focus on the implications of improving the targeting of the food stamp scheme. In Table 5.4, the distribution of the food stamps by expenditure is provided. It is possible to determine the effect of redistributing the food stamps from households in the top 60 percent of the income distribution to the bottom 20 percent. This is done assuming that the value of the government transfer equals Rs. 2,000 million, an amount consistent with the actual size of the subsidy programs in 1980/81, the time of the survey.

Assuming that all the households in the lowest two deciles receive an equal share of the value of the food stamps redistributed from the household in the upper three quartiles of the income distribution, the average calorie intake and percent of households achieving 80 and 100 percent of the requirements is presented in Table 5.5. Such redistribution will raise calorie levels by 203 and 163 calories per capita in the first and second income deciles, respectively. If, however, the share of food stamps consumed by the third and fourth deciles are also transferred to the lowest two deciles, the increment received will be 356 and 305 calories. The problem with following this strategy is that there are a sizeable number of nutritionally deficient households in the second quintile of the income distribution. In fact, the average calorie intake in the third and fourth decile would fall below that of the second decile if their food stamp allotment were removed.

Of course, it is impossible at this juncture to determine which households in the third and fourth deciles would suffer as a result of eliminating their food stamp eligibility. We do not know which of the households in the sample are presently enjoying the program benefits,

Table 5.4 -- Share (%) of Total Food Stamp Payments Received by Expenditure Quintiles, 1981/82: Sectors and All-Island

Quintiles	Urban	Rural	Estate	All
1 (Deciles 1 & 2)	2.7	31.6	0.4	35.0
2 (Deciles 3 & 4)	2.5	22.7	0.2	25.0
3 (Deciles 5 & 6)	2.3	15.5	0.07	18.0
4 (Deciles 7 & 8)	2.0	9.8	0.15	12.0
5 (Deciles 9 & 10)	2.9	4.9	0.10	10.0
TOTAL	13.0	85.0	1.00	100

Source: Neville Edirisinghe, "Preliminary Report on the Food Stamp Scheme in Sri Lanka: Distribution of Benefits and Impact on Nutrition" (Washington, D.C.: International Food Policy Research Institute, 1985), mimeographed.

Table 5.5 -- Th[illegible]t of Redistributing [illegible]ue of Food Stamps in the Rural Sector, 1

Per Capita Expenditure Decile		Present	After Redistribution from Top 60% to Bottom 20%	After Redistribution from Top 80% to Bottom 20%
1	Calories/capita	1239	1424	1577
	% Consuming <80% reqts.	81	67	52
	% Consuming <100% reqts.	98	92	82
2	Calories/capita	1617	1769	1900
	% Consuming <80% reqts.	48	28	16
	% Consuming <100% reqts.	89	75	60
3	Calories/capita	1815	1815	1720
	% Consuming <80% reqts.	26	26	37
	% Consuming <100% reqts.	73	73	78
4	Calories/capita	1977	1977	1804
	% Consuming <80% reqts.	15	15	28
	% Consuming <100% reqts.	49	49	72

Are those households receiving food stamps in the third and fourth deciles at present relatively better off, and would they continue to consume nutritionally adequate diets if they no longer were provided stamps? While data limitations preclude answering this question, they do argue for concentrating food stamp reforms primarily on eliminating the eligibility of those households in the upper 60 percent of the income distribution. Providing their share of the stamps to the lower two deciles, while maintaining levels for the third and fourth deciles of the distribution, is therefore strongly recommended.

The Effect of Price Changes on Farm Households

The above analysis is limited because it does not take into account that the incomes of many households in Sri Lanka are affected by a price change in the food crops which they produce. These effects can be evaluated both in the long-term when there is a supply response and in the short-term when there is not. Below, the short-term effect of changing prices on farm households in their dual role as producers and consumers of a given commodity is considered.

The demand for calories among farm households can be expressed as a function of incomes and prices:

(12) $$C = f(Y, P_k)$$

where:

C = calories

Y = total income

P_k = vector of prices

Taking the total derivative of (10):

$$\frac{dC}{dP_i} = \frac{\partial C}{\partial P_i} + \frac{\partial C}{\partial Y} \cdot \frac{dY}{dP_i} \tag{13}$$

Then substituting the quantity of commodity i produced, Q_i, for $\frac{dY}{dP_i}$, results in the following:

$$\frac{dC}{dP_i} = \frac{\partial C}{\partial P_i} + m_i \cdot Q_i \tag{14}$$

where:

m_i = the marginal propensity to consume commodity i

Q_i = the quantity of commodity i produced.

The right hand side of (14) is multiplied by ∂P to determine the effect of a price change on calorie consumption under the assumption of no short-term supply response, i.e., $E_s = 0$.

In Table 5.6, one can see the effect of increasing rice prices by 20 percent, taking into account the price effect as well as the positive income effect on producers in the rural sector.[1] The smallest producers have a net loss of 137 calories. The second and third groups of paddy producers have net losses of 110 and 65 calories, respectively. In addition, the percent of household not consuming 80 percent of the FAO/WHO calorie requirements increases in these three groups. In contrast, the large paddy producers have a net gain of 120 calories per capita as a result of the price rise, despite that most

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[1] This analysis assumes that the paddy producers are not tenants in a position where a share of the increased value for the paddy will have to be given to the landowner. To the extent this is true and there was a price increase, the income increment would be less, and concomitantly the increase in calorie consumption smaller than predicted in the models which follow.

Table 5.6 -- Calorie Consumption and Percent of Households Consuming Less than 80% of FAO/WHO Requirements Before and After an Increase in Farmgate and Market Prices of Rs. 0.4 Under Two Assumptions of No Rice Response and Net Supply Elasticity of 0.2 For Paddy Farmers in the Rural Sector

Household Paddy Production (Bushels)		Per Capita Expenditure Quartiles 1			2			3			4			Total		
		Before	After E_s[1]=0	After E_s=0.2	Before	After E_s=0	After E_s=0.2	Before	After E_s=0	After E_s=0.2	Before	After E_s=0	After E_s=0.2	Before	After E_s=0	After E_s=0.2
<16	Calories Per Capita	1507	1389	1392	2048	1915	1918	2532	2384	2386	3315	3148	3150	2190	2053	2056
	% <80% Requirement	59.5	71.3	71.3	11.1	26.7	26.7	4.9	9.9	9.9	0.0	0.0	0.0	22.6	32.0	32.0
			n=94			n=90			n=81			n=44			n=309	
16-37	Calories Per Capita	1562	1477	1484	2008	1902	1908	2596	2478	2484	3290	3147	3151	2274	2164	2170
	% <80% Requirement	50.6	62.1	62.1	14.3	25.0	25.0	2.5	5.1	5.1	3.4	3.4	3.4	19.5	26.3	26.3
			n=87			n=84			n=79			n=58			n=308	
38-90	Calories Per Capita	1560	1539	1553	2055	2000	2012	2566	2491	2502	3398	3303	3313	2485	2420	2432
	% <80% Requirement	56.7	61.7	58.3	9.7	12.5	9.7	3.3	6.6	6.6	0.0	1.1	0.0	14.2	17.2	15.5
			n=60			n=72			n=90			n=87			n=309	
>90	Calories Per Capita	1954	1794	1829	2326	2189	2224	2647	2786	2823	3430	3511	3543	2716	2836	2871
	% <80% Requirement	42.9	39.3	35.7	16.9	10.2	3.4	0.1	0.0	0.0	1.0	1.8	1.8	7.8	6.2	4.6
			n=28			n=59			n=111			n=108			n=306	
Total	Calories Per Capita	1550	1493	1503	2039	1984	1996	2590	2555	2570	3376	3325	3340			
	% <80% Requirement	54.3	62.8	61.7	12.8	19.7	17.7	2.8	5.0	5.0	1.0	1.7	1.3			
			n=269			n=305			n=361			n=297				

[1] E_s = Price Elasticity of Supply

of these households are from upper expenditure groups and therefore have low-income elasticities of demand for calories. With the exception of the largest producers, the increased income which accrues to paddy farmers as a result of an equal rise in farmgate and market rice prices will not compensate for their losses as consumers. They will be relatively worse off after the price hike; and there will be a net transfer of income from small farmers to larger producers. This is to say nothing of the almost three-quarters of the Sri Lankan population who are not producers of paddy at all.

The effect of an increase in rice prices, disaggregated by expenditure quartiles, indicates that on the average there is a decline of around 50 calories per capita. This reflects that in all the expenditure groups there are significant numbers of small producers. The point of importance, however, is that among the producer households in the low income quartile there is an increase from 54 to 63 percent of households which do not consume 80 percent of the calorie requirement, even taking into account the positive income effect of the price change.

The above short-term analysis assumes there is no supply response. Given the evidence from farm studies of the price responsiveness of paddy farmers, it is important to consider what happens if this assumption is relaxed.

A recent study of Sri Lankan agriculture by Thorbecke and Svejnar[1] found that the elasticity of paddy area sown with respect to the real

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[1] E. Thorbecke and J. Svejnar, "Effects of Macroeconomic Policies on Agricultural Performance in Sri Lanka," prepared for the OEDC Development Center (Paris, 1984), p. 89.

weighted producer price of paddy ranged from 0.20 to 0.48, depending on the crop and season. These can be used to approximate the price elasticity of output for paddy. Unfortunately, these paddy crop price response parameters do not indicate how the output of minor crops are affected. It is likely that a change in the price of a dominant crop like rice will have a systematic and opposite effect on the supply of other crops like coconut, pulses, oilseeds, and so forth. The extent of this substitution, which is mediated both by reallocating land and other factors of production, including labor, can only be guessed at given the limitations of available data. Therefore, for the sake of the simulations which follow it is assumed that the net effect on paddy output with respect to prices is captured by an elasticity of 0.2 (i.e., $E_s = 0.2$).

In order to integrate the supply response of farm households into the model, assuming that the outward shift in the supply curve will not dampen prices, equation (15) is expanded as follows:[1]

$$(16) \qquad \frac{dC}{dP_i} = \frac{\partial C}{\partial P_i} + m*Q\ (1 + 1/2\ E*D)$$

where:

E = the price elasticity of supply of commodity i

D = the change in price, or (dP/P)

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[1] This model assumes that the supply curve is linear over the small range where the producer moves up the supply schedule as the price increases. It also assumes that there is a real cost, either in the form of cash or the opportunity cost of family members time in raising production.

Once again, multiplying through by dP will indicate the expected change in calorie consumption among rice producers which results from a change in rice prices.

The effect on calorie intake of a 20 percent rise in farmgate and market rice prices, taking into account the output response, is also found in Table 5.6. There is still a net calorie loss for all but the largest group of producers. The effect of considering the output response over and above the income effect alone is negligible except for farmers producing more than 90 bushels per year, few of which have energy deficits.

There are obvious limitations in this short- and medium-term analysis. Most severe is that the impact of price changes on rural employment and wages are not accounted for. These are mediated through the factor utilization patterns (i.e., labor versus capital intensification) in the face of increasing production, coupled with the labor supply and wage functions. Estimating these parameters is beyond the scope of this analysis on consumer behavior. However, in analyzing the 1980/81 Survey it was possible to determine that Sri Lanka has a rural unemployment rate of around 15 percent. In addition, nearly 60 percent of all rural major income earners said that given the opportunity they would choose to work more hours. This figure was 77 percent among rural laborers and 60 percent among cultivators. These data suggest that the supply elasticity of hired labor is high, which indicates that the supply price of labor (i.e., wages) may remain relatively stable even in the face of a robust supply response which translates into increased labor, rather than capital,

utilization. A long-term analysis of the expected effect of commodity price changes is an important subject for future research. Nevertheless, there is considerable importance in addressing short-term dislocations which will result from further increases in staple prices.

VI. COMPARISONS WITH OTHER SURVEYS

In this Chapter, the results presented above from the 1980/81 Labour Force and SocioEconomic Survey are compared with those from other national surveys conducted recently in Sri Lanka. The comparison is limited to data on consumption and expenditures, focusing on matters concerning income distribution and calorie intake. The purpose is to gain some insights into whether and why nutritional levels have improved.

In presenting the data which follow, there are two important issues which must be addressed from the outset. The first concerns the comparability of the surveys themselves. Most of the comparisons are made between the 1980/81 survey and the 1969/70 SocioEconomic Survey, also performed by the Department of Census and Statistics. The 1969/70 survey used a similar sampling frame and nearly identical questionnaires and methods to gather data. The methods used by this author to clean and process the raw data from the two surveys were also identical.1

Consumption data from two other surveys are also presented in this Chapter. They are the 1978/79 and 1981/82 Consumer Finance Surveys (CFS) conducted by the Central Bank. The raw data from these

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1 The potential bias introduced into these comparisons is that the 1980/81 survey data were collected over a seven-month, rather than a one-year period. However, an analysis of the four survey rounds for 1969/70 displayed no seasonality in consumption and calorie intake.

were also analyzed at IFPRI.[1] The method of analysis of these surveys, such as the conversion of quantities of individual food items into calories, employed the same standard values to ensure comparability with the SocioEconomic Surveys. The CFS used a slightly different sampling frame, although it was constructed on the basic sampling blocks used by the Department of Census and Statistics surveys. The CFS questionnaires for the consumption and expenditure data were also extremely similar, although there were some slight differences in the definition of food items. So while the 1969/70 and 1980/81 SocioEconomic surveys (SES) conducted by the Department of Census and Statistics, and the Consumer Finance Surveys are designed to be nationally and regionally representative, some caution is suggested in comparing the two sets of surveys due to slight methodological differences.[2]

Besides the methodological issues involved in comparing survey data, the issue has been raised that there is considerable instability in levels of consumption in Sri Lanka. This instability arises out of a combination of climatic variability, electoral cycles and decisions by the government on the amount of food grains to import.[3] To the

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[1] The CFS data sets were prepared, analyzed, and reported by Neville Edirisinghe in "Preliminary Report on the Food Stamp Scheme in Sri Lanka: Distribution of Benefits and Impact on Nutrition," (Washington, D.C.: IFPRI, January 1985), mimeographed.

[2] Perhaps the most important difference in surveys is that despite that the SES and CFS defined the household in the same manner, the latter did not include any single member households.

[3] S. Bhalla and Paul Glewwe, "Living Standards in Sri Lanka in the Seventies -- Mirage and Reality," World Bank, May 1985, pp. 43-53, mimeographed.

extent that these cycles or stochastic events affect consumption, as mediated by changes in real income and prices, the comparison of data between years may reflect deviations from a trend, rather than the true picture of what transpired between one period and the next.

This problem, which is universal for all analyses between two or more points in time, can be addressed in a number of ways. One is to simply overlook such instability in consumption, as is usually done. A second solution is to try to compensate for such variability using statistical means. The traditional method for removing the instability from a data series is to fit a trend line and use predicted values to adjust data accordingly. The major problem with such an approach is that it assumes that there is a linear relationship between consumption and time. This may not be the case. For example, a trough in consumption occurred not only in Sri Lanka, but globally during the oil crises and world food shortage of the early 1970s. To ignore this period of three to four years of food stress would be an oversight. Similarly, using a trend line would result in obscuring the surge in consumption which, according to food balance sheets, occurred during 1977-1979.

As an alternative, one could derive a centered moving average for calorie intake. This technique will smooth out any major deviations such as an electoral cycle every four years, while not altering drastically the picture being told by the data. It is therefore commended over the use of the trend line approach (see Appendix H).

The use of any smoothing technique, whether it be trend lines or moving averages is plagued by a serious drawback: the need for a

series of reliable data points. The limited number of consumption and expenditure surveys precludes their use for that purpose. The only other alternative is to use aggregate data from food balance sheets, which are available for each year. In general, these are felt to be unreliable. Caution should be exhibited in their use. Nonetheless, in the comparisons which follow, some results are adjusted on the basis of a fitted values for calorie intake using moving averages.[1] The purpose is to both allay any criticisms that data were not collected in a "representative" year, and to indicate the possible magnitude of bias that such a problem portends.

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[1] There were two basic options for smoothing out the data to preclude the effects of instability confounding the analysis. One is to estimate the transitory income (by valuing the extent to the quantity of rice and other major commodities consumed in a given year is above or below a predicted amount according to food balance sheets), and apply income parameters to determine predicted consumption; and the other is to use calorie consumption data itself and remove major deviations from the trend. The latter is preferred. First, the focus of this analysis is on consumption changes over time. Definitions of poverty and welfare are presented in terms of calorie intake. Second, it would be a serious error to smooth out consumption data on the basis of transitory income. The well documented permanent income hypothesis indicates that transitory changes in income do not alter consumption in a manner similar to permanent income. Therefore, estimating a transitory income effect and thereafter applying income parameters to the transitory income component to derive predicted levels of consumption would be inappropriate. Third, the question remains as to whem (i.e., what year) to adjust consumption expenditures in the face of production-induced instability. Preliminary work by Peter Hazell and this author from India indicates that there are high correlations between the deviation of production and calorie consumption from the trend line, when consumption is lagged one year. That is, there is a lag of one year between the period of higher than predicted production and higher than predicted calorie intake. So, for example, if 1970 was an extraordinary year in terms of food production, work to date indicates that the consumption response would be observed in 1971. Thus, the analyst would confront the further peril of deciding during which time period to adjust consumption data on the basis of transitory production levels if the option of using food availability or production to smooth out data was selected.

RESULTS OF COMPARISONS

In Table 6.1, data on food share by expenditure deciles is presented. Among the households in the lowest expenditure deciles, the food share is slightly higher in all surveys subsequent to those found in 1969/70. This difference increases with the upper expenditure deciles. In accordance with Engel's law, these data represent an initial indicator of a deterioration in the standard of living. The fact that the food share among the poor has not increased as much as those in the upper income deciles may be regarded as an indicator that their non-food expenditures are compressed to their limit: further losses in real income eat directly into their food basket.

To test this idea, in Table 6.2 there is a comparison of per capita calorie and protein intake of the four surveys, by expenditure decile. (Sectoral figures are found in Appendixes D and J).

The average per capita daily calorie intake was considerably higher in 1969/70 than any other survey year. But of greater interest is that the 1,668 calories per capita consumed in the lowest expenditure decile in 1969/70 is more than 400 calories higher than in 1980/81; and that the calorie intake in 1978/79 was 1,335, as opposed to 1,181 in 1981/82 for the bottom expenditure decile, despite that the average intake for the entire country was only 18 calories higher.

Table 6.3 presents similar data, but this time it is adjusted on the basis of expected values derived by smoothing out consumption using food balance sheet data on the basis of a moving average (as discussed above). The results of the adjusted data paint the same picture: the lowest expenditure decile consumed 33 percent more calories in 1969/70 than in 1980/81, and there was a decrease in calorie consumption of 9.3 percent in the

Table 6.1 -- Comparison of the Food Share,[a] All Island

Per Capita Expenditure (Deciles)	1969/70[c]	1978/79[b]	1980/81	1981/82[b]
1	74.0	76.2	76.1	75.9
2	72.7	74.3	75.9	75.2
3	71.8	72.1	74.6	73.7
4	70.2	70.4	73.6	73.0
5	68.6	68.6	72.8	71.9
6	66.3	67.9	71.4	70.5
7	63.3	65.1	69.8	68.3
8	61.2	61.3	67.4	66.0
9	56.2	58.4	64.3	60.5
10	45.2	42.6	51.8	44.3
TOTAL	65.0	65.7	69.8	68.2

a Excludes liquor, tobacco and betel and includes the imputed value of the food subsidy.

b Source of 1978/79 and 1981/82 data: Neville Edirisinghe, op. cit., p. 24.

c It is noted that the data reported on the 1969/70 survey are slightly different than those reported in other studies. See Appendix I for a discussion of the origins of these differences.

Table 6.2 -- Per Capita Daily Calorie Consumption by Expenditure Decile, All Island

Per Capita Expenditure (Deciles)	1969/70	1978/79	1980/81	1981/82
1	1,661	1,305	1,221	1,181
2	1,938	1,663	1,590	1,558
3	2,159	1,848	1,788	1,794
4	2,340	1,994	1,964	2,008
5	2,496	2,157	2,113	2,168
6	2,618	2,377	2,303	2,373
7	2,727	2,528	2,519	2,553
8	2,989	2,738	2,666	2,838
9	3,120	3,054	2,971	3,120
10	3,601	3,296	3,261	3,216
TOTAL	2,565	2,299	2,240	2,281

Table 6.3 -- Per Capita Daily Calorie Consumption by Expenditure Decile, All Island, Adjusted Using a Moving Average on Food Balance Sheet Data[a]

Per Capita Expenditure (Deciles)	1969/70[b]	1978/79[c]	1980/81[d]	1981/82[e]
1	1,607	1,315	1,211	1,203
2	1,871	1,643	1,600	1,561
3	2,085	1,818	1,800	1,827
4	2,260	1,964	1,977	2,012
5	2,409	2,137	2,127	2,172
6	2,522	2,341	2,318	2,418
7	2,625	2,490	2,536	2,600
8	2,879	2,696	2,684	2,890
9	2,997	3,008	2,991	3,177
10	3,468	3,246	3,283	3,275
TOTAL	2,472	2,265	2,255	2,323

a Adjustments made on the basis of a three-year moving average.
b One-sixth of the survey undertaken in 1969 and five-sixths in 1970.
c One-quarter of the survey undertaken in 1978 and three-quarters in 1979.
d Two-fifth of the survey undertaken in 1980 and one-fifth in 1981.
e One-quarter of the survey undertaken in 1981 and three-quarters in 1982.

aggregate. Similarly, one finds a situation whereby in 1969/70, although the mean calorie intake per capita is only 150 (i.e., 6 percent) more than in 1981/82, the intake among the poor is 33 percent greater. The story here is that even if aggregate calorie consumption had remained stable over the decade, the decrease in the share consumed by the poor would have been responsible for a precipitous decline in their intake. This inequality of consumption can be summed up in terms of the increasing value of the Gini coefficient for calories, which was 0.173, 0.195, 0.201, and 0.202 for 1969/70, 1978/79, 1980/81, and 1981/82, respectively. Thus, the poor's food intake suffered the sharpest decline, and the overall national average was therefore brought down.

instructive to compare the distribution of calorie intake in Sri Lanka. Table 6.4 depicts the cumulative percentage of the population and households falling below different levels of calorie intake. One can see that after adjusting consumption levels on the basis of the moving average in 1980/81 and 1981/82, 13 percent of the households consumed less than 1,400 calories per capita. This contrasts with the 5 percent of the households which fell in that category in 1969/70 and the 11 percent in 1978/79. Similarly, less than one-half of the households consumed fewer than 1,600 calories per capita in 1969/70 than in 1980/81 and 1981/82, when the data are adjusted on the basis of food balance sheet values. Regardless of whether one examines adjusted or actual values, the percent of households in 1981/82 and 1980/81 with extremely low levels of calorie intake is slightly higher than in 1978/79, and markedly higher than in 1969/70.

Table 6.4 -- Distribution of Calorie Intake (Adjusted Value Based on the Moving Average in Parentheses)

		Percentage of Population and Households Consuming Below:					
		2,400 Calories	2,200 Calories	2,000 Calories	1,800 Calories	1,600 Calories	1,400 Calories
1981/82	Individuals	67 (66)	58 (56)	47 (45)	35 (33)	24 (23)	15 (15)
	Households	62 (61)	52 (51)	42 (40)	30 (29)	21 (20)	13 (13)
1980/81	Individuals	71 (71)	61 (60)	49 (49)	37 (36)	25 (25)	15 (15)
	Households	64 (64)	54 (54)	43 (43)	32 (32)	22 (21)	13 (13)
1978/79	Individuals	70 (71)	60 (62)	48 (50)	35 (37)	22 (23)	12 (13)
	Households	63 (65)	54 (55)	42 (44)	30 (31)	19 (20)	10 (11)
1969/70	Individuals	56 (63)	43 (52)	31 (31)	20 (24)	10 (14)	4 (6)
	Households	49 (55)	32 (43)	25 (31)	16 (20)	8 (11)	3 ([illegible]

In Table 6.5, the percent of households falling in the category of the ultra-poor (as discussed in Chapter II), and the number of households consuming less than 80 percent of their calorie requirements are presented for 1969/70 in comparison with 1980/81.[1]

The percentage of households falling in the category of the ultra poor has risen by threefold between 1969/70 and 1980/81; and the percentage of households consuming less than 80 percent of their required calories is more than two times greater. This increase in the ultra poor is especially marked among the bottom three expenditure deciles.

Before proceeding, it is worthwhile to point out that these dramatic declines in calorie consumption between 1969/70 and 1980/81 are well within plausible boundaries; they could result quite easily in the face of a worsening of income distribution or reduction in food subsidies coupled with allowing controlled prices to rise. For example, the observed decline in per capita calorie consumption from around 1,607 in 1969/70 to 1,203 in 1980/81 could be explained on the basis of a 15 percent drop in income and 30 percent rise in rice prices, or a 10 percent drop in income and 40 percent rise in rice prices. Similarly, if the overall increase in the consumer price index outpaced income gains by 33 percent, this too would have explained the marked change in consumption levels among the poor observed in the previous tables.[2]

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[1] Due to data limitations, it was not possible to estimate adult equivalency units for the 1978/79 and 1981/82 Consumer Finance Surveys.

[2] The scenarios are calculated using the parameters estimated in Chapter VI and the equation (11) in Chapter V.

Table 6.5 -- Percent of Households Who Are Ultra-Poor and Consuming Less Than 80 Percent of Calorie Requirements (Values Adjusted Using Moving Average in Parentheses)

Per Capita Expenditures	% Ultra Poor		% Consuming 80% Req'ts.	
	1969/70	1980/81	1969/70	1980/81
1	13.2 (15.3)	41.5 (41.7)	28.3 (30.6)	85.1 (85.3)
2	4.2 (5.2)	20.6 (20.6)	14.2 (15.0)	50.7 (50.7)
3	1.0 (1.7)	10.3 (10.3)	8.1 (10.7)	27.7 (27.7)
4	2.1 (2.4)	3.6 (3.6)	7.0 (7.5)	16.8 (16.8)
5	0.4 (0.7)	2.1 (2.1)	4.1 (5.1)	10.1 (10.1)
6	0.3 (0.6)	0.8 (0.8)	3.2 (3.8)	6.8 (6.8)
7	0 (0.2)	0.2 (0.2)	2.7 (3.0)	2.9 (2.9)
8	0 (0)	0.6 (0.6)	1.4 (1.6)	3.8 (3.8)
9	0 (0)	0 (0)	1.7 (2.5)	1.1 (1.1)
TOTAL	2.2 (2.7)	8.0 (8.0)	7.1 (8.2)	20.9 (20.9)

With this in mind, it is necessary to examine what actually happened to the income distribution and level of real purchasing power during the past decade.

Concerning the distribution of income, Tables 6.6 and 6.7 present data on the Gini coefficients computed from six household surveys in Sri Lanka. One can note the higher coefficient in 1980/81 than in 1969/70. In addition, the data from five Central Bank surveys paint a picture of a shift to greater income distribution equality during the period 1963 to 1973.[1] This is followed by a reversal of this trend between 1973 and 1978/79. During 1978/79 to 1981/82, this pattern of worsening income distribution inequality has continued.

In Tables 6.8 and 6.9, households are ranked according to their monthly per capita income and expenditures, respectively. In the former, the percent of the population in, and percent of total income controlled by each decile of the income distribution is presented. The same data, by expenditure deciles and expenditure levels, is

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[1] Some major non-sampling errors may have been introduced into the 1973 survey, which made comparisons with 1963 suspect (see Scott Grosse, "A Skeptical Perspective on Income Redistribution and Poverty Reductions in Sri Lanka" (Center for Research on Economic Development, University of Michigan, 1981). Some of these errors may also suggest caution when making comparisons with data from the late 1970s, although it seems unlikely that these non-sampling biases change the conclusion of the decline in income distribution equality during the 1970s.

Table 6.6 -- Gini Coefficients (Based on Total Household Incomes for Spending Units)

	1969/70[1]	1980/81
All-Island	0.36	0.43
Urban	0.42	0.44
Rural	0.32	0.38
Estate	0.26	0.27

[1] Figures include the imputed values of the rice ration.

Table 6.7 -- Gini Coefficients[1]

	1953	1963	1973	1978/79	1981/82
For Spending Units					
All-Island	0.46	0.45	0.35	0.44	0.45
For Income Receivers					
All-Island	0.50	0.49	0.41	0.49	0.52
Urban	-	-	0.40	0.51	0.54
Rural	-	-	0.37	0.49	0.49
Estate	-	-	0.37	0.32	0.32

Source: Central Bank of Ceylon, Statistics Department, "Report on Consumer Finances and SocioEconomic Survey, 1981/82," Colombo, Sri Lanka, October, 1984, p. 187.

[1] The data on income distribution are presented separately for the SocioEconomic surveys and the Consumer Finance Surveys. The major reason is that the CFS data are from secondary sources, and it is not possible to assure that the same analytic procedures were used in the SocioEconomic surveys for the measures of income distribution. In addition, there may have been slight differences in definitions of spending units (i.e., households) in the two sets of surveys.

Table 6.8 -- Comparison Between 1969/70 and 1980/81 of Income Shares Received by Deciles of Households Ranked According to Per Capita Income (and the Income Shares for Corresponding Deciles of Population)

Per Capita Income (Deciles)		Percent of Households	Percent of Population	Percentage Share of Total Income: For Decile of Population[a]	Percentage Share of Total Income: For Decile of Household[b]
1	1969/70[c]	10	12.17	3.61	4.59
	1980/81	10	12.23	2.72	3.67
2	1969/70	10	11.72	4.89	6.03
	1980/81	10	11.72	4.05	5.23
3	1969/70	10	10.97	5.73	6.68
	1980/81	10	11.62	4.89	6.27
4	1969/70	10	10.43	6.56	7.37
	1980/81	10	10.28	5.80	6.58
5	1969/70	10	9.95	7.47	7.98
	1980/81	10	10.29	6.80	7.73
6	1969/70	10	9.81	8.52	8.92
	1980/81	10	9.77	7.94	8.57
7	1969/70	10	9.43	9.83	9.87
	1980/81	10	9.21	9.37	9.52
8	1969/70	10	8.78	11.59	10.92
	1980/81	10	8.58	11.51	10.90
9	1969/70	10	8.68	14.40	13.63
	1980/81	10	8.51	15.17	14.26
10	1969/70	10	8.07	27.40	24.00
	1980/81	10	7.78	31.75	27.28

a Determined by $PCINC_j / (\sum_{j=1}^{10} PCINC_j)$

b Determined by $(PCINC_j \times HHSIZE_j) / \sum_{j=1}^{10} (PCINC_j \times HHSIZE_j)$

c Source of data from 1969/70: Visaria, op. cit., p.25.

Table 6.9 -- Comparison between 1969/70 and 1980/81 of Expenditure Shares for Deciles of Households Ranked According to Per Capita Expenditures (and the Expenditure Shares for Corresponding Deciles of the Population)

Per Capita Expenditure (Deciles)		Percent of Households	Percent of Population	Percentage Share of Total Expenditures: For Decile of Population	Percentage Share of Total Expenditures: For Decile of Households
1	1969/70[a]	10	12.45	4.18	5.94
	1980/81	10	12.68	3.68	5.00
2	1969/70	10	11.67	5.52	6.78
	1980/81	10	12.06	5.02	6.60
3	1969/70	10	11.01	6.35	7.43
	1980/81	10	11.21	5.98	7.35
4	1969/70	10	10.75	7.17	8.27
	1980/81	10	10.26	6.82	7.62
5	1969/70	10	10.14	8.03	8.70
	1980/81	10	10.10	8.00	8.55
6	1969/70	10	9.46	9.02	9.09
	1980/81	10	9.72	8.66	9.17
7	1969/70	10	9.71	10.21	10.57
	1980/81	10	9.21	9.96	9.99
8	1969/70	10	8.46	11.78	10.67
	1980/81	10	8.86	11.65	11.24
9	1969/70	10	8.53	14.20	13.26
	1980/81	10	8.12	14.34	12.69
10	1969/70	10	7.78	23.54	19.80
	1980/81	10	7.61	26.17	21.70

[a] Source of data from 1969/70: Visaria, op. cit., p.24.

included in Table 6.9. Data from 1969/70 are also presented to serve as a source of comparison.

As expected, the inequality in per capita income or expenditures is greater when the percentage share of total income or expenditures for deciles of the population, rather than the household, is employed. This is because households at the lower end of the distribution have more members. In general, given that the households are ranked on a per capita basis, the use of percentage shares in terms of the population is commended. The other is also presented to facilitate comparisons with the 1969/70 data and surveys in other countries.

It can be readily seen that, regardless of whether one ranks by per capita incomes or expenditures, the bottom deciles of the population control a smaller share of the resources in 1980 than they did a decade previously. This supports the inference drawn from the Gini Coefficients that the equality of the income distribution has deteriorated. For example, in 1969/70 the bottom 20 percent of the distribution controlled 8.5 percent of the total income; in 1980/81 this figure was 6.8 percent. Another interesting point is that the overall inequitableness of the distribution is greater for income than expenditures. This can be explained by the savings of the wealthier households and the disavings of those at the bottom end of the income distribution.

Further support to these findings of a reversal towards less equitable income distribution can be seen from data in Table 6.10. These data are compiled from comparable surveys performed by the

Table 6.10 -- Comparison Between 1963, 1973, 1978/79 and 1981/82 of the Percentage Income Shares Received by Deciles of the Income Receivers and Households Ranked According to Per Capita Income

Per Capita Income (Deciles)	Year	Percent of Households	Percentage Share of Total Income for Decile of Households	Percent of Receivers	Percentage Share of Total Income for Decile of Income Receivers
1	1963	10	1.50	10	1.17
	1973	10	2.79	10	1.80
	1978/79	10	2.12	10	1.20
	1981/82	10	2.18	10	1.21
2	1963	10	3.45	10	2.70
	1973	10	4.38	10	3.17
	1978/79	10	3.61	10	2.56
	1981/82	10	3.55	10	2.49
3	1963	10	4.00	10	3.56
	1973	10	5.60	10	4.38
	1978/79	10	4.65	10	3.60
	1981/82	10	4.35	10	3.47
4	1963	10	5.21	10	4.51
	1973	10	6.52	10	5.70
	1978/79	10	5.68	10	4.77
	1981/82	10	5.24	10	4.61
5	1963	10	6.27	10	5.55
	1973	10	7.45	10	7.10
	1978/79	10	6.59	10	5.93
	1981/82	10	6.35	10	5.57
6	1963	10	7.54	10	6.82
	1973	10	8.75	10	8.75
	1978/79	10	7.69	10	7.29
	1981/82	10	7.02	10	6.90
7	1963	10	9.00	10	8.98
	1973	10	9.91	10	10.56
	1978/79	10	8.57	10	9.12
	1981/82	10	8.69	10	8.56
8	1963	10	11.22	10	11.46
	1973	10	11.65	10	12.65
	1978/79	10	11.22	10	11.23
	1981/82	10	10.71	10	10.64
9	1963	10	15.54	10	16.01
	1973	10	14.92	10	15.91
	1978/79	10	14.03	10	15.27
	1981/82	10	14.52	10	14.82
10	1963	10	36.77	10	39.24
	1973	10	28.02	10	29.98
	1978/79	10	35.84	10	39.05
	1981/82	10	37.29	10	41.70

Central Bank. They corroborate the earlier conclusion of a decline in the share of income controlled by the lowest quartiles of the population.

The worsening of the income distribution is not necessarily detrimental to the poor if there is a major upward shift in income among the entire population. Therefore, further reasons for the deteriorating nutrition situation must be sought. To do so, first, in Table 6.11 the percent nominal change in per capita expenditures between the two survey periods covered by the SocioEconomic Surveys is presented. On the average, nominal expenditures increased 326 percent during the 1970s. Note, however, the change within the highest decile is considerably greater (339 percent) than the change in the lowest expenditure decile (300 percent). Thus the increase in purchasing power among the rich is relatively greater than the poor. But even more poignant is the absolute size of the changes in expenditures. The poorest decile increased their levels of expenditures by approximately Rs. 75; the corresponding increase for the upper expenditure decile is nearly Rs. 550. These figures are just another manifestation of the increasing skewing of income. However, tney do not answer fully why the apparent loss in welfare of all groups, as less equitable income distribution does not necessarily portend a decreasing absolute level of well-being among the poor if aggregate income growth is great enough.

Ordinarily, one would employ a consumer price index (CPI) to determine whether there was a gain or loss in overall consumer welfare. There is, however, considerable evidence that the CPI

Table 6.11 - Nominal Changes in Per Capita Expenditures, By Deciles

Expenditure Class (Deciles)	Nominal Monthly Per Capita Expenditures (Rs.)		
	1969/70[a]	1980/81	% Change
1	24.25	97.11	300
2	32.75	132.21	304
3	37.91	157.64	316
4	43.33	179.49	314
5	48.02	202.59	321
6	54.25	228.01	320
7	61.42	262.10	327
8	70.5	306.61	335
9	89.25	377.60	323
10	156.91	688.90	339
TOTAL	61.8	263.21	326

[a] Includes the value of the rice ration.

published by the Central Bank of Ceylon is seriously biased because of its reliance on administered prices.[1] Thus, it becomes necessary to employ an alternative means of consumer prices in order to assess the changes in overall purchasing power.

Two options are available. The first is to employ the alternative price index which was estimated by Bhalla and Glewwe, in cooperation with the Sri Lanka Department of Census and Statistics (DCS).[2] The second is simply to examine the cost of purchasing the same food basket over two periods of time, based on reported nominal prices, and thereafter compare this with the nominal change in expenditures during the same period.

Concerning the former -- employing the DCS modified index -- there is a 384 percent increase in the cost of living between the period covered by the 1969/70 and 1980/81 surveys.[3] This compares rather dramatically with the 300 and 304 percent change in nominal expenditures during the same period for households in the lowest and second expenditure deciles. This divergence between changes in nominal expenditures and the CPI could explain the 33 percent decline in calorie consumption discussed above. In contrast, the expenditures in the highest decile of the income distribution exceeded the increase in the cost of living, although only slightly.

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1 The official CPI is found in Appendix K, Table 2. See Bhalla and Glewwe, op. cit., pp. 98-104, for further discussion of the problems with this official index.

2 Ibid, p. 104. This index is reported in Appendix K, Table 1.

3 The index value for the 1969/70 and 1980/81 surveys are constructed by weighing the values found in Appendix K, Table 2, as follows:

1969/70 : 1/6 * 96.7 + 5/6 * 100 = 99.45

1980/81 : 2/5 * 422.4 + 3/5 * 524.4 = 483.6.

To further corroborate these results, the data in Table 6.12 present the cost of the diet consumed by the three expenditure groups in 1970 and 1980/81.[1] The quantities consumed are taken directly from Table 2.7 of Chapter II for the lowest expenditure group, the highest expenditure group, and the average of the entire population. Prices are those published by the Department of Census and Statistics of the Government of Sri Lanka.[2]

In turn, the quantities in the same consumption bundle are multiplied by the prices reported for 1970 to determine the cost of the identical food basket 11 years earlier.[3] The percentage change in expenditures on each item and the overall percent change in food expenditures between 1970 and 1981 are presented. One can note that for the lowest expenditure decile, the basket of food commodities that they consumed in 1980/81 would have cost 403 percent more in 1981 than in 1970; the comparable figures for households in the highest expenditure decile and the average household are 407 and 412, respectively.[4]

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[1] Miscellaneous food items which account for less than five percent of the total for expenditures are not included because of no published prices.

[2] Department of Census and Statistics, Ministry of Plan Implementation, Bulletin of Selected Retail Prices, 1979-1981, Colombo, Sri Lanka, 1982.

[3] There has been only a slight change in the food basket during the past decade. Therefore, calculating the increase in the cost of the food basket on the basis of the commodities consumed in 1969/70 will yield nearly identical results.

[4] It should be noted that the rise in the cost of living implied by these government-published price data is slightly higher than that implied by the published DCS Index. This is explained by the fact that the Food Index increased at a more rapid pace than the Non-Food Index (see Appendix K).

Table 6.12 -- Changes in the Nominal Cost of the Food Basket, 1970 to 1980/81[1]

Food Category & Expenditure Groups	1970 Quantity	x	Price	=	Value	1980/81[2] Quantity	x	Price	=	Value	% Change
Rice											
Low[a]	155.4	x	0.605	=	94.0	155.4	x	2.59	=	418.0	345
Medium[b]	258.8	x	0.605	=	157.6	258.8	x	2.69	=	696.2	342
High[c]	354.1	x	0.605	=	214.2	354.1	x	2.69	=	952.5	345
Wheat											
Low	7.6	x	0.33	=	2.5	7.6	x	2.46	=	18.7	648
Medium	14.0	x	0.33	=	4.62	14.0	x	2.46	=	34.4	645
High	13.9	x	0.33	=	4.59	13.9	x	2.46	=	34.2	645
Bread											
Low	17.7	x	0.35	=	6.2	17.7	x	2.19	=	38.8	525
Medium	35.3	x	0.35	=	12.4	35.3	x	2.19	=	77.3	523
High	63.3	x	0.35	=	22.2	63.3	x	2.19	=	143.0	544
Coconut											
Low	56.2	x	0.29	=	14.15	56.2	x	2.04	=	114.7	710
Medium	102.3	x	0.25	=	25.6	102.3	x	2.04	=	208.7	715
High	168.4	x	0.25	=	42.1	168.4	x	2.04	=	343.5	716
Sugar											
Low	9.43	x	0.72	=	6.8	9.43	x	6.59	=	62.1	814
Medium	22.5	x	0.72	=	16.2	22.5	x	6.59	=	148.3	815
High	42.6	x	0.72	=	30.7	42.6	x	6.59	=	280.7	814
Pulses[d]											
Low	2.2	x	0.52	=	1.1	2.2	x	6.51	=	14.3	1202
Medium	8.2	x	0.52	=	4.3	8.2	x	6.51	=	53.9	1141
High	19.0	x	0.52	=	9.9	19.0	x	6.51	=	123.7	1149
Fish[e]											
Low	9.4	x	3.19	=	29.9	9.4	x	13.83	=	130.0	335
Medium	26.6	x	3.19	=	84.9	26.6	x	13.83	=	367.9	333
High	55.0	x	3.19	=	175.5	55.0	x	13.83	=	760.6	333
Meat											
Low	0.71	x	1.67	=	1.2	0.71	x	7.54	=	5.35	346
Medium	3.5	x	1.67	=	5.8	3.5	x	7.54	=	26.4	355
High	12.4	x	1.67	=	20.7	12.4	x	7.54	=	93.5	352
Yams											
Low	10.9	x	.23	=	2.5	10.9	x	1.35	=	14.7	489
Medium	11.4	x	.23	=	2.6	11.4	x	1.35	=	15.4	492
High	14.8	x	.23	=	3.4	14.8	x	1.35	=	20.0	488
Potato[e]											
Low	4.69	x	0.83	=	3.9	4.69	x	3.91	=	18.3	370
Medium	5.6	x	0.83	=	4.6	5.6	x	3.91	=	21.9	376
High	7.41	x	0.83	=	6.2	7.41	x	3.91	=	29.0	367
Vegetable Oil[f]											
Low	1.6	x	1.26	=	2.0	1.6	x	8.62	=	13.7	590
Medium	4.4	x	1.26	=	5.5	4.4	x	8.62	=	37.9	589
High	9.2	x	1.26	=	11.6	9.2	x	8.62	=	79.3	583
Vegetables[g]											
Low	46.2	x	0.49	=	22.8	46.2	x	2.53	=	116.9	413
Medium	84.3	x	0.49	=	41.3	84.3	x	2.53	=	213.3	416
High	148.4	x	0.49	=	72.7	148.4	x	2.53	=	375.5	416
Condiments[h]											
Low	16.0	x	1.49	=	23.8	16.0	x	6.01	=	96.0	303
Medium	31.9	x	1.49	=	47.5	31.9	x	6.01	=	191.4	303
High	57.1	x	1.49	=	85.1	57.1	x	6.01	=	342.6	302
Total											
Low					210.85					1061.55	403
Medium					412.92					2092.5	407
High					698.89					3578.10	412

1 Prices are taken from Bulletin of Selected Retail Prices, 1979-81. Department of Census and Statistics, Ministry of Plan Implementation, Colombo, Sri Lanka, 1982, pp. 1-20.

a Corresponds to the lowest expenditure decile
b Corresponds to the average for the entire population
c Corresponds to the highest expenditure decile
d Based on cooperative price of mysore dahl
e Based on 50 percent consumption of dried fish and 50 percent consumption of fresh fish (seer, paraw and galmaru).
f Based on coconut oil
g Assumes equal shares of plantains, pumpkins, bandakka, bean, bringals, cucumber, cabbage, snake-gourd, tomatoes, and vetakola
h Based on a weighted average price of chiles, garlic, red onions and salt.

2 1980/81 are a weighted average of prices during the two years corresponding to the percent of households surveyed in 1980 and 1981, respectively.

Given that food expenditures account for well over 70 percent of total expenditures among the lowest decile of the population, the 403 percent increase in the cost of food commodities is around 33 percent higher than the 301 percent change in nominal expenditures reported in the previous table. The fact that there was also precipitous increases in the prices of non-food commodities supports that there has been a marked decline in purchasing power among the poor between the two survey periods.

In sum, the evidence presented above is persuasive that the purchasing power of the poor deteriorated between 1969/70 and 1980/81, and that their economic position relative to the rich also declined. In combination, this supports and explains the findings of a decrease in food and nutrient consumption levels during the 1970s in Sri Lanka.

VI. SUMMARY AND CONCLUSIONS

This research was designed to examine food acquisition behavior in Sri Lanka. The intent was to elucidate the effect of previous and future food policies on consumers. In doing so, numerous findings and results are presented throughout. In addition, specific policy issues are discussed in the text which will not be recounted at this juncture. Nevertheless, there are a number of more general considerations which demand further reflection.

To amplify, a number of themes link the analysis in each of the chapters. The first is the common concern with disaggregation. Food policy analysis performed at the level of national food availability or national food consumption statistics will obscure the differential effects on various segments of the population and preclude formulating enlightened policies to assist the poor. Therefore, whether it be examining food expenditure and consumption patterns, estimating parameters, or analyzing the dual role of food prices in determining incomes, disaggregation proved to be vital. For example, a distinction was made throughout between the nature and extent of the malnutrition, consumption and poverty problems in the rural, urban, and estate sectors. Findings such as that urban households spend less of their income on food and purchase more expensive sources of calories (e.g., milk and meat) suggest that the poor in the cities are at greater risk. Policy makers must consider measures to counter the potential of burgeoning nutrition problems which will evolve commensurate with urbanization. Similarly, the fact that the rates of stunting were

higher in the estate sector than would have been predicted on the basis of consumption data reinforces the need to consider malnutrition in the broader perspective of maintaining an energy balance in terms of intake relative to individual needs dictated by factors such as physical activity and health status. Thus, the role of the health delivery system concurrent with economic measures to reduce malnutrition is emphasized.

Another way of disaggregating the population was to identify those households consuming less than 80 percent of their dietary requirements. Not only were their occupational characteristics examined but they were dichotomized into households spending greater than or less than 80 percent of their outlays on food. Despite having the same calorie intake per AEU, the former group, referred to as the "ultra-poor," were significantly different in many other social and economic characteristics. The distinction proves useful in that those households which have inadequate diets and spend a low share of their budgets on food may be good subjects for nutrition education and other efforts to change their behavior. The households which spend more than 80 percent of their incomes on food and still do not achieve dietary adequacy, on the other hand, have fewer degrees of freedom in increasing calorie consumption. Economic measures are required to raise their intakes.

It was also possible to explore the extent to which various occupation groups are not consuming adequate diets. This too can facilitate investments and policies to reach out on the basis of such information. As expected, non-classified laborers and agricultural

workers are at greatest risk. They make up the largest groups in the labor force and are where the ultra-poor are disproportionately represented. Agricultural policy must be formulated with the intent of not only raising the labor demand for these workers but also ensuring a reasonable wage which will extricate them from their impoverished status.

In this regard, the role of rice prices and the fact that they cut with a double-edged sword was explored. Relating the structure of production and farm holdings to consumption patterns emphasized that, at least in the short and medium terms, the small farmer who is also likely to be poor and hungry will not be a primary beneficiary of higher rice prices. Those households with small holdings consume at home most of their production; they are net consumers in the market. There remains a need to explore whether higher prices will indirectly improve the plight of the agricultural workers and laborers through increasing output and fueling agricultural development, which will in turn increase the demand for labor and drive up wages. This is an area for further research in which this author is engaged presently.

Although this report was not focused on the issue of food subsidies, it addressed implicitly some important issues in this regard. The evidence of the serious and deteriorating nutritional situation in Sri Lanka, and the high level of responsiveness of the poor to price and income shifts, emphasizes the importance of indexing the value of the existing food stamp program to either the price of rice or the cost of living index. It was also shown how improved targetting of the present food-related income transfer would go a long way to

reducing undernutrition. In addition, consideration must be given to enrolling new households which are at high risk but cannot participate due to bureaucratic impediments.

It is possible to continue to recapitulate the individual lessons learned, be they methodological or substantive. However, there remains an underlying story which has been alluded to in Chapters I and VI, and deserves to be the subject of explicit attention in these concluding remarks.

Sri Lanka has received convincing and considerable praise for assuring that basic human needs were realized.[1] However, the detailed description of nutritional status and food consumption and expenditure patterns contained in this report represents a disconcerting assessment of the magnitude of dietary inadequacy in Sri Lanka. Of greater concern, however, was the fact that comparisons between 1969/70, 1978/79, 1980/81, and 1981/82 indicated a steady decline in consumption level and calorie intake among the poor during the past decade; and that the level of wasting increased between 1975/76 and 1980/82. Further analysis found that the decline in calorie consumption was a reflection of expenditures not keeping pace with prices, coupled with a continued trend toward more inequitable income distri-

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[1] See Alan Berg, Malnourished People: A Policy View, Poverty and Basic Needs Series (Washington, D.C.: The World Bank, 1981); James D. Gavan and Indrani S. Chandrasekera, The Impact of Public Foodgrain Distribution on Food Consumption and Welfare in Sri Lanka, Research Report 13 (Washington, D.C.: IFPRI, 1979); D. R. Gwatkin, "Food Policy, Nutrition Planning, and Survival -- The Cases, Kerala and Sri Lanka," Food Policy 4, 1979; and Paul Isenman, "Basic Needs: The Case of Sri Lanka," World Development 8, 1980.

bution. One must ask why this has taken place and what can be done to forestall such trends.

Insights into the immediate causal factors are found in the price and income parameters, as well as findings such as the fact that the most nutritionally vulnerable, the urban poor, estate workers, small landholders, and landless laborers were shown to be adversely affected by increasing rice prices. This represents both an explanation for any drop in consumption and a serious policy dilemma in need of further consideration.

However, of greater importance is understanding how the broader policy framework has influenced these disconcerting findings. In that regard, all those even slightly familiar with Sri Lanka will note that major economic changes accompanied the ascendancy of a new government in 1977. The shift from a welfare-oriented economy where basic human needs were primal to a liberalized economy embracing the central tenets of economic liberalization, which included eliminating price controls and decreasing food-related income transfers, is well documented.[1] Such an economic transformation runs the risk of having short-term deleterious consequences. However, it would be a simplification, and premature to conclude from the data in this report that the process of liberalization was inappropriate or that the elimination of the quantity rationing scheme in lieu of the much smaller and less fiscally burdensome food stamp

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[1] R. Herring, "The Janus-Faced State in a Dependent Society: Sri Lanka's Shifts in Development Strategy" (Evanston, IL: Northwestern University, 1981) mimeographed; and David E. Sahn and Neville Edirisinghe, "The Politics of Food Policy in Sri Lanka: From Basic Human Needs to Trickle Down" (Washington, D.C.: IFPRI, 1985) mimeographed.

program is the sole explanation for the high levels of dietary inadequacy observed in the late 1970s and 1980s. This is especially so given the evidence of increased investment, reduced unemployment, and an increase in the rate of growth of GDP in the post-liberalization period.[1]

The available data from the consumption surveys has a large gap between 1970 and 1978. It is not possible to determine the pattern of consumption and real income during this period. So, the question remains as to what extent the decline in nutritional status and calorie intake was the result of liberalization or the relatively slow economic growth which occurred between 1971 and 1977. Glimpses into that question can be garnered. For example, the level of wasting, a measure of current nutritional status, was considerably higher in 1980/82 than in 1975/76. This indicates that the nutrition situation was not as serious directly before the change in government as three years after economic reforms. Conversely, the high level of stunting in 1975/76 is a strong indication that during the years of the oil crises and world food shortage (i.e. 1972-1974) there were high levels of malnutrition. Similarly, indications are that the worsening of income distribution which was noted in 1977 compared to 1970 continued through 1981; and there is strong evidence that the marked decline in levels of calorie consumption recorded between 1970 and 1978 continued in the ensuing years.

In sum, it is not feasible to determine when during the 1970s the drop in the level of calorie consumption was most precipitous. However, it is indeed clear that a portion of the decline occurred in the post-liberalization period. Furthermore, the data do not unambiguously determine what factors

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[1] Op. cit., David E. Sahn and Neville Edirisinghe, pp. 20-27.

were mainly responsible for the observed decline in nutritional well-being during the decade. It would be fair to infer, however, that the major reduction in subsidies concurrent with the process of economic liberalization involving removal of price controls represented potentially a double blow to the welfare in general, and nutritional status in specific, of the poor in the short-term. What is also clear is that the exact time the subsidies were reduced, during the late 1970s and early 1980s, was when their need was acute. This is precisely what could have been predicted if the data and parameter estimates from previous chapters were available to and used by policymakers.

Thus, the findings of poor nutritional well-being should not be construed to militate against liberalization. This is especially so since this paper has not shown a direct causal relationship between the change in economic policies in the late 1970s and a decline in consumption. Not enough is known about what occurred between 1970 and 1977 to make a strong argument one way of the other. This important question is the subject for further research, in which the author is presently engaged.

Nevertheless, an interesting argument must be considered in order to assure the necessary measures are taken to protect the poor. Simply, the promotion of the free market is designed to spur investment and generate long-term economic growth. If the theoretical basis for fueling development through the process of liberalization is sound, borrowing in the short-term to protect the quality of human capital and basic human needs should be all the more acceptable given the expectation of rapid economic growth in the future. There is a manifest need to de-couple the process

of getting prices right from the process of ending efforts to protect people from severe hardships through targeted subsidies. Donor and developing countries who promote liberalization should stand by their conviction that the process will promote long-term growth. This can be accomplished by rewarding countries which promote structural change with further support for targeted efforts to insulate the nutritionally vulnerable households from short-term dislocation.

No matter what schemes are adapted or expanded and no matter how well they are targeted, there are no easy answers to the hunger problem in Sri Lanka, like anywhere else. This was exemplified in the simulations which illustrated that even if the economy as a whole grows rapidly during the next few years, unless a relatively larger share of the increased wealth accrues to the poor they will remain hungry. Thus, it is apparent that the platitudes given Sri Lanka by researchers in the past have led many to assume wrongly that they found a simple solution to poverty and malnutrition. This is not the case, witnessed by the data presented in previous chapters. Promoting economic growth while not further disenfranchising the poor is clearly the challenge for policy makers in the years to come.

Appendix A

Distribution of Population Shares in the Urban, Rural, and Estate Sectors by Expenditure Deciles

Per Capita Expenditure Decile	Urban	Rural	Estate	All-Island
1	8.2	10.7	7.5	10
2	6.7	10.9	10.5	10
3	7.3	10.7	10.9	10
4	6.7	10.5	14.6	10
5	8.6	10.1	13.6	10
6	8.8	10.3	10.5	10
7	9.0	10.3	10.1	10
8	10.8	9.8	10.2	10
9	13.4	9.3	6.9	10
10	20.5	7.4	5.1	10

Appendix B

Table 1 — Consumption Functions Estimated Using Ordinary Least Squares

Independent Variable	Dependent Variables: LRICEQ		LCOCOQ		LSUGARQ		LFISHQ		LCONDMTQ		LVEGQ	
LPCEXP	3.56	(15.2)	2.92	(9.1)	5.09	(13.5)	10.8	(11.3)	3.81	(15.9)	4.59	(11.1)
LPCEXP2	-.16	(11.5)	-.12	(12.1)	-.21	(11.8)	-.62	(1.1)	-.17	(12.4)	-.22	(9.3)
LRICEP	-.67	(23.3)	-.05	(1.7)	-.11	(2.9)	-.25	(2.3)	-1.37	(3.2)	.02	(0.6)
LCOCOP	-.06	(3.6)	-1.94	(6.3)	.04	(1.5)	-.37	(4.5)	-1.02	(3.1)	-.003	(0.1)
LBREADP	.19	(1.9)	-3.4	(2.0)			-1.26	(2.6)	.10	(0.8)	.41	(2.2)
LWHEATP			.08	(1.0)	2.77	(1.7)	.77	(2.1)	-.11	(1.3)		
LFISHP	-.02	(2.6)	-.05	(5.0)	.06	(3.9)	-7.61	(10.7)	.12	(10.1)		
LMILKP	.02	(1.6)	1.13	(5.2)			.20	(3.0)			.04	(2.5)
LMEATP	1.32	(4.1)	1.85	(5.1)	1.00	(2.0)	5.81	(3.9)			.99	(2.8)
LGRAINP	-.20	(11.2)	-.05	(2.5)	.11	(4.0)			1.50	(3.8)	-.21	(4.6)
LFRUITP			.01	(1.0)	.046	(3.8)			-.16	(7.3	-.17	(5.4)
LPULSEP			-.08	(4.0)	.061	(2.1)						
LSUGARP					-2.01	(3.4)	.26	(3.0)				
LYAMP	.53	(4.0)	.04	(4.0)	.04	(3.0)	3.20	(1.9)	-.028	(1.2)		
LCONDMTP	-.02	(1.4)	.01	(0.6)	-.59	(1.7)	-1.93	(3.2)	-.109	(3.3)	.04	(0.9)
LOILP	-.06	(3.5)	-.09	(4.5)	-.02	(0.7)	.22	(2.9)	-.05	(5.1)	.02	(1.7)
LVEGP	.45	(2.5)			-.05	(2.6)	-.16	(-2.0)	-.50	(22.9)	.07	(2.5)
URB	.26	(1.5)	.24	(1.2)	.55	(1.9)	.25	(4.3)	-.02	(-1.3)	-.04	(1.5)
EST			-.52	(1.2)	-1.22	(2.2)	2.63	(3.3)	.38	(1.6)	-1.71	(5.6)
URBX	-.07	(3.1)	-.06	(2.5)	-.06	(1.9)			-.21	(0.5)	-.36	(1.2)
ESTX	.007	(2.8)	.05	(1.0)	.17	(2.4)	-.38	(0.4)	-.06	(-2.2)	1.12	(1.8)
AEURAT	.74	(13.4)	.42	(6.0)	-.48	(5.3)	.03	(0.4)	.023	(0.4)	.04	(1.0)
HHSIZE	.24	(6.9)	.10	(2.4)	.09	(1.8)	-.71	(2.7)	.14	(2.0)	-.14	(1.7)
HHSX	-.03	(6.7)	-.02	(3.7)	-.01	(1.7)	.33	(2.2)	.174	(4.2)	.64	(6.3)
LRICEPX							-.033	(1.7)	-.03	(5.1)	.15	(2.5)
EARNERS									.156	(2.9)	-.02	(2.7)
D1	.05	(4.5)	-.14	(7.0)	-.05	(5.5)						
D2					-.07	(2.7)						
RICEDUM	-.03	(1.6)					-.10	(1.9)	-.05	(-2.4)	-.03	(2.4)
RICEPURB	.09	(1.4)	.05	(1.7)			.79	(4.2)			-.06	(2.2)
COCOURB												
CONDMURB			.11	(2.0)							.012	(0.3)
COCODUM											-.06	(0.6)
SUGPES												
SUGPURB									-.06	(1.2)		
FISHPURB					.22	(1.4)						
VEGEST					.06	(0.6)					-.06	(1.0)
WHTEST												
LCOCOPX							.18	(1.4)				
LFISHPX			.17	(4.3)			-.79	(1.1)			.16	(2.2)
LVEGPX												
LMEATPX	-.06	(2.6)					.80	(8.8)	.14	(3.5)		
LYAMPX	-.15	(3.9)	-.21	(4.7)	-.11	(1.9)						
LMILKPX	-.07	(4.1)					-.64	(3.5)	-.18	(3.8)	.13	(3.2)
LBREADPX			-.13	(4.2)			.25	(3.2)				
LWHEATPX			.39	(1.8)								
LCONDMTPX											-.12	(-2.6)
LSUGARPX					-.38	(1.8)						
YAMDUM					.06	(1.4)						
FRUITDUM				(1.0)	.16	(2.1)						
			-.02				-.44	(2.0)				
			-.03	(1.5)								
R^2	.48		.52		.46		.31		.52		.42	

Appendix B

Table 2 -- Market Entry and Conditional Response Models

ppendent riable	Dependent Variables											
	BREAD [a]		LBREADQ* [b]		OIL [a]		LOILQ* [b]		PULSE [a]		LPULSEQ* [b]	
ERCEPT	-2.56		12.3		-1.69		-12.4		-4.8		-2.80	
EXP	0.26	(2.09)	3.36	(6.1)	0.52	(3.54)	3.16	(4.22)	-2.19	(1.3)	1.38	(1.80)
EXP2	-	-	-0.17	(5.7)	-	-	-0.17	(4.1)	-0.15	(1.6)	-0.08	(1.80)
EP	0.08	(0.62)	0.13	(14.8)	0.20	(1.31)	-1.99	(1.7)	-0.75	(3.8)	0.15	(1.52)
OP	0.16	(1.8)	1.13	(1.5)	0.37	(2.91)	0.30	(4.2)	0.21	(1.9)	0.09	(1.59)
ADP	-0.53	(-.88)	-1.26	(4.8)	0.63	(0.95)	1.11	(3.6)	-1.14	(1.7)	1.15	(3.46)
ATP	0.35	(0.94)	0.46	(2.4)	-0.23	(-0.46)	-0.90	(3.9)	-	-	-	-
HP	-	-	-0.08	(2.7)	-0.09	(-1.23)	0.03	(0.9)	0.34	(5.1)	0.008	(0.23)
KP	-	-	-	-	-0.37	(-3.73)	-0.11	(2.2)	-	-	-	-
TP	-0.33	(-2.31)	-0.25	(3.6)	-0.23	(-1.43)	0.15	(1.9)	0.38	(3.0)	-2.1	(-2.06)
INP	1.20	(11.5)	0.52	-	0.20	(1.78)	0.01	(0.23)	-	-	-	-
ITP	0.07	(1.70)	0.08	(4.4)	-	-	0.04	(1.7)	0.13	(2.4)	-0.003	(-0.15)
SEP	0.21	(2.18)	0.18	(3.6)	-	-	0.05	(0.8)	-5.2	(2.6)	-1.00	(-19.2)
ARP	-0.23	(-1.51)	0.14	(1.8)	-0.02	(-0.15)	0.06	(0.6)	-	-	-	-
P	-	-	0.13	(6.5)	-0.10	(-2.13)	0.03	(1.3)	-	-	-	-
DMTP	0.13	(1.49)	0.07	(2.0)	-0.28	(-2.94)	-0.04	(0.6)	0.11	(1.0)	0.158	(2.75)
P	0.17	(1.76)	0.12	(3.0)	-0.50	(-5.43)	-0.31	(4.1)	-0.18	(1.6)	0.10	(1.92)
P	-	-	-	-	-	-	-	-	-	-	-	-
	2.46	(2.29)	0.27	(0.5)	2.40	(2.20)	-0.06	(0.1)	4.0	(3.2)	0.59	(0.99)
	-8.51	(-4.25)	0.82	(1.6)	1.99	(0.85)	-2.36	(2.2)	0.45	(0.2)	1.80	(1.65)
	-0.25	(-1.8)	-0.08	(1.6)	-0.27	(-2.02)	0.01	(0.2)	-0.59	(3.0)	-0.04	(-0.63)
	0.99	(3.9)	-0.09	(0.6)	-0.20	(-0.67)	0.00	(0.2)	-0.12	(0.1)	-0.15	(-1.14)
AT	-1.01	(-3.16)	0.81	(5.1)	-0.75	(-2.16)	0.33	(1.7)	-	-	0.37	(1.93)
ZE	0.06	(0.37)	0.07	(0.7)	-0.53	(-2.55)	-0.08	(0.8)	0.27	(0.0)	0.04	(0.40)
	-0.001	(-.05)	-0.01	(1.1)	0.08	(3.23)	0.00	(0.2)	0.01	(0.4)	-0.01	(-.83)
EPX	-	-	-	-	-	-	0.24	(1.7)	-	-	-	-
ERS	0.03	(1.08)	-0.04	(2.5)	0.88	(0.22)	-0.03	(1.5)	-0.34	(0.8)	-0.04	(-2.4)
	0.007	(0.07)	-	-	0.11	(1.09)	-0.09	(1.5)	0.69	(0.6)	-0.09	(-1.47)
PURB	-	-	-	-	-	-	-	-	0.70	(1.8)	-0.27	(-1.39)
DUM	-	-	-	-	-0.15	(-0.74)	0.14	(1.2)	-	-	-	-
DURB	-	-	0.74	(1.6)	-	-	-	-	-	-	-	-
ST	-	-	-	-	-	-	-	-	-	-	-	-
ST	-	-	-	-	-	-	1.14	(2.9)	-	-	-	-
PX	-	-	-	-	-	-	-	-	-	-	0.25	(2.00)
DUM	-	-	-	-	0.07	(0.59)	-0.14	(2.3)	-	-	-	-
M	-	-	-0.12	(2.0)	-	-	0.12	(0.7)	-	-	-	-
M	-	-	-	-	-0.13	(-0.42)	0.28	(1.4)	-	-	-	-
M	-	-	-	-	-	-	-	-	-0.88	(1.8)	-0.01	(-0.39)
EST	-	-	-	-	-	-	-	-	0.65	(0.7)	-0.46	(-1.39)
DUM	-	-	-	-	-	-	-	-	-	-	-	-
S	-	-	0.40	(1.5)	-	-	0.15	(0.5)	-	-	-	-
DUM	-	-	-	-	-	-	-	-	-	-	-	-
ILD	-	-	-	-	-	-	-	-	-	-	-	-
RB	-	-	-	-	-	-	-	-	-	-	-	-
EPX	-	-	-	-	-	-	-	-	0.56	(2.2)	-	-
			.277				.332				.358	

'ket Entry Equation

ditional Response Equation Using Truncated Sample

Appendix B
Table 2
(continued)

Independent Variable	Dependent Variables: WHEAT [a]		LWHEATQ* [b]		MILK [a]		LMILKQ* [b]	
INTERCEPT	6.71	(1.79)	-35.3	(5.2)	-7.41	(-5.74)	-11.09	
LPCEXP	-0.62	(-1.34)	7.42	(5.1)	1.23	(8.27)	3.12	(4.39)
LPCEXP2	-	-	-0.3[illegible]	(4.1)	-	-	-0.14	(-0.35)
LRICEP	-0.09	(-0.63)	0.0[illegible]0	(0.0)	0.04	(0.27)	-0.03	(-0.42)
LCOCOP	0.28	(2.83)	-0.40	(2.4)	0.17	(1.63)	-0.012	(-0.18)
LBREADP	-0.12	(-0.21)	1.77	(3.1)	-1.07	(-1.76)	0.322	(1.03)
LWHEATP	-0.73	(-2.09)	-0.36	(1.6)	-	-	-	-
LFISHP	-	-	-	-	0.41	(5.74)	0.08	(2.09)
LMILKP	-0.59	(-7.45)	0.29	(1.4)	-0.89	(-9.29)	-0.59	(-9.83)
LMEATP	-2.41	(-1.38)	4.80	(2.6)	0.18	(1.07)	0.005	(0.06)
LGRAINP	-	-	0.07	(0.7)	0.65	(5.99)	0.27	(4.32)
LFRUITP	-	-	-	-	-	-	-	-
LPULSEP	-0.41	(-3.94)	0.33	(1.9)	0.18	(1.60)	-0.05	(-0.83)
LSUGARP	-	-	-	-	-	-	-	-
LYAMP	-0.18	(-3.97)	0.21	(2.7)	0.06	(1.33)	0.06	(2.06)
LCONDMTP	-	-	0.20	(2.2)	-	-	-	-
LOILP	0.03	(0.387)	0.16	(1.7)	0.17	(1.65)	0.03	(0.61)
LVEGP	-0.30	(-4.36)	0.26	(2.0)	0.08	(-1.10)	-0.100	(-2.5)
URB	-0.91	(-0.127)	0.08	(0.9)	0.30	(3.95)	0.31	(0.61)
EST	1.01	(9.48)	1.16	(0.8)	0.09	(-0.756)	0.11	(0.116)
URBX	-	-	-0.01	(0.9)	-	-	0.02	(0.317)
ESTX	-	-	-0.20	(1.1)	-	-	-0.008	(-0.06)
AEURAT	-1.19	(-3.59)	2.21	(4.1)	-4.15	(-8.54)	-1.42	(-4.30)
HHSIZE	0.056	(4.07)	0.42	(1.9)	0.04	(-0.19)	-0.03	(-0.27)
HHSX	-	-	-0.06	(2.3)	0.02	(0.74)	-0.002	(0.14)
LRICEPX	-	-	-	-	-	-	-	-
EARNERS	0.074	(2.18)	-0.08	(1.9)	-	-	-	-
D1	0.58	(0.54)	-0.14	(0.2)	0.182	(1.67)	-0.07	(-1.06)
RICEPURB	-	-	-	-	-	-	-	-
COCODUM	-	-	-	-	-	-	-0.29	-
SUGPES	-	-	-	-	-	-	-	(-1.99)
WHTEST	-	-	-	-	-	-	-	-
MEATPX	0.36	(1.68)	0.63	(2.6)	-	-	-	-
FISHDUM	-	-	-	-	0.163	(1.25)	-	-
SUGDUM	-	-	-	-	-	-	-	-
WHTDUM	-0.15	(-1.66)	-	-	-	-	-	-
RICEEST	-	-	0.42	(0.9)	-	-	-	-
MILKDUM	-	-	-	-	-0.91	(-4.5)	0.153	(3.13)
MILLS	-	-	-	-	-	-	0.138	(1.47)
MEATDUM	-	-	-	-	0.82	(3.71)	-	-
NO CHILD	-	-	-	-	0.33	(6.34)	0.02	(0.92)
MILKURB	-	-	-	-	-	-	-0.19	(-2.60)
LPULSPX	-	-	-	-	-	-	-	-
R^2			0.269				.427	

a Market Entry Equation

b Conditional Response Equation Using Truncated Sample

Appendix B
Table 2
(continued)

Independent Variable	Dependent Variables							
	MEAT [a]		LMEATQ* [b]		YAM [a]		LYAMQ* [b]	
INTERCEPT	4.63		-16.3		-4.3		9.3	
LPCEXP	0.76	(7.8)	4.0	(3.1)	0.89	(12.5)	1.60	(2.3)
LPCEXP2	-	-	-0.20	(2.7)	0.05	(0.3)	0.10	(2.5)
LRICEP	-0.11	(0.7)	0.20	(1.6)	0.74	(0.8)	-0.11	(1.2)
LCOCOP	-0.38	(3.8)	0.03	(0.1)	-1.4	(2.6)	-0.11	(1.8)
LBREADP	-	-	-	-	-0.4	(1.1)	1.5	(3.7)
LWHEATP	-	-	-	-	-	-	0.14	(1.2)
LFISHP	-0.13	(1.9)	-0.0	(0.0)	-	-	-	-
LMILKP	-0.02	(0.3)	0.04	(0.6)	-	-	-	-
LMEATP	-1.28	(9.6)	-2.18	(1.3)	-	-	-	-
LGRAINP	-	-	-	-	0.01	(0.1)	-0.09	(1.8)
LFRUITP	-0.02	(0.4)	0.05	(1.3)	-	-	-	-
LPULSEP	0.03	(0.5)	0.12	(1.1)	-0.12	(1.1)	0.13	(2.2)
LSUGARP	0.06	(0.3)	-0.09	(0.6)	-	-	-	-
LYAMP	0.21	(3.5)	0.06	(0.6)	-0.76	(14.7)	-0.43	(4.3)
LCONDMTP	-	-	-	-	-	-	-	-
LOILP	0.22	(2.2)	0.03	(0.3)	-0.45	(1.13)	0.20	(3.3)
LVEGP	-	-	-	-	0.54	(7.7)	-0.20	(2.2)
URB	0.62	(0.7)	0.04	(0.0)	-0.50	(0.5)	0.61	(1.1)
EST	-3.5	(1.3)	2.8	(0.9)	2.7	(1.5)	2.2	(1.7)
URBX	0.03	(0.2)	0.01	(0.1)	0.05	(0.5)	-0.09	(1.3)
ESTX	0.5	(1.4)	-0.31	(0.8)	-0.36	(1.6)	0.28	(1.6)
AEURAT	-0.04	(1.1)	0.42	(0.98)	-	-	-	-
HHSIZE	0.1	(6.3)	0.41	(2.0)	0.08	(5.8)	-0.14	(1.2)
HHSX	-	-	-0.05	(2.1)	-	-	0.00	(0.4)
LRICEPX	-	-	-	-	-	-	-	-
EARNERS	-0.04	(1.1)	-0.07	(1.8)	0.04	(0.1)	-	-
D1	0.004	(0.0)	0.09	(0.9)	-	-	-0.04	(0.6)
RICEPURB	-	-	-	-	-	-	-	-
COCODUM	-	-	-	-	-	-	-	-
SUGPES	-	-	-	-	-	-	-	-
WHTEST	-	-	-	-	-	-	-	-
MEATPX	-	-	0.17	(1.0)	-	-	-	-
FISHDUM	-0.11	(2.0)	-0.27	(1.7)	-	-	-	-
SUGDUM	-	-	-	-	-	-	-	-
WHTDUM	-	-	-	-	-	-	-	-
RICEEST	-	-	-	-	-	-	-	-
MILKDUM	-	-	0.21	(1.8)	-	-	-	-
MILLS	-	-	0.24	(0.4)	-	-	1.13	(4.0)
MEATDUM	-	-	-	-	-	-	-	-
NO CHILD	-	-	-	-	-	-	-	-
MILKURB	-	-	-	-	-	-	-	-
LPULSPX	-	-	-	-	-	-	-	-
YAMDUM	-	-	-	-	-	-	0.14	(2.8)
R^2	-		0.357		-		0.510	

[a] Market Entry Equation

[b] Conditional Response Equation Using Truncated Sample

Appendix B

Table 3 -- Weighted Entry and Response Elasticities for Computing Expenditure and Own-Price Elasticities

	EXPENDITURE ELASTICITY						OWN-PRICE ELASTICITY					
	Low		Average		High		Low		Average		High	
	Entry	Response	Entry	Response	Entry	Response	Entry	Response	Entry	Response	Entry	Response
Bread												
Urban	0.024	0.441	0.024	0.337	0.024	-0.183[a]	-	-0.326	-	-0.326	-	-0.326
Rural	0.404	0.492	0.404	0.388	0.409	0.234	-	-0.806	-	-0.806	-	-0.806
Estate	1.906	0.492	1.906	0.388	1.906	0.234	-	-0.806	-	-0.806	-	-0.806
Oil												
Urban	0.108	0.707	0.108	0.574	0.108	0.256	-0.261	-0.253	-0.261	-0.253	-0.261	-0.253
Rural	0.229	0.707	0.229	0.574	0.229	0.256	-0.261	-0.253	-0.261	-0.253	-0.261	-0.253
Estate	0.229	0.868	0.229	0.735	0.229	0.417	-0.261	-0.253	-0.261	-0.253	-0.261	-0.253
Pulses												
Urban	0.335	0.554	0.302	0.410	-0.049	0.298[a]	-1.036	-0.615	-0.773	-0.615	-0.144	-0.615
Rural	0.911	0.554	0.878	0.410	0.583	0.298	-1.036	-0.615	-0.773	-0.615	-0.144	-0.615
Estate	0.911	0.554	0.878	0.410	0.583	0.298	-1.036	-0.615	-0.773	-0.615	-0.144	-0.615
Wheat												
Urban	-	0.148	-	0.066	-	-0.152	-1.230	-0.104	-1.009	-0.104	-1.009	-0.104
Rural	-	0.148	-	0.066	-	-0.152	-1.230	-0.104	-1.009	-0.104	-1.009	-0.104
Estate	-	0.148	-	0.066	-	-0.152	-1.230	-0.104	-1.009	-0.104	-1.009	-0.104
Milk												
Urban	1.318	0.405	1.318	0.325	1.318	0.194	-1.69	-0.260	-0.839	-0.322	-0.839	-0.322
Rural	1.318	0.405	1.318	0.325	1.318	0.194	-1.69	-0.183	-0.839	-0.244	-0.839	-0.244
Estate	1.318	0.405	1.318	0.325	1.318	0.194	-1.69	-0.183	-0.839	-0.244	-0.839	-0.244
Meat												
Urban	0.558	0.203	0.558	0.176	0.558	0.102	-0.953	-0.174	-0.953	-0.159	-0.953	-0.122
Rural	0.558	0.203	0.558	0.176	0.558	0.102	-0.953	-0.174	-0.953	-0.159	-0.953	-0.122
Estate	0.558	0.203	0.558	0.176	0.558	0.102	-0.953	-0.174	-0.953	-0.159	-0.953	-0.122
Yams												
Urban	1.151	-0.084	1.151	-0.025[a]	1.151	0.116	-0.980	-0.348	-0.980	-0.262	-0.980	-0.262
Rural	1.151	-0.084	1.151	-0.025[a]	1.151	0.116	-0.980	-0.348	-0.980	-0.262	-0.980	-0.262
Estate	0.681	0.084	0.681	0.143	0.681	0.284	-0.980	-0.348	-0.980	-0.262	-0.980	-0.262

[a] Note that there are a few cases, both in this Table and the one which follows, where the sign of the entry and response weighted elasticities are opposite. This is indeed difficult to explain, and defies the concept of a continuous utility function. It may be that some unusual phenomenon are operating concerning price expectations or threshold behavior, which are not being captured by a shifter variable. The dilemma is whether to reject observations that do not conform with theory, or consider that there may be weakness in the theory itself. Since economics is an empirical science, the decision was made to retain these few empirical results which are indeed difficult to explain.

Appendix B

Table 4 -- Weighted Entry and Response Elasticities for Computing Cross-Price Elasticities

	Bread		Oil		Pulses		Meat		Milk		Meat		Yam	
	Entry	Response	Entry	Response	Entry	Response	Entry	Response	Entry	Response	Entry	Response	Entry	Response
Rice														
Low	-	.006	-	-.176	-.543	.050	-	-	-	-	-	.038	-	-
Medium	-	.005	-	-.071	-.543	.050	-	-	-	-	-	.038	-	-
High	-	.065	-	.156	-.543	.050	-	-	-	-	-	.038	-	-
Coconut														
Low	.254	.016	.165	.242	.206	.050	.393	.116	.186	-.122	.252	-	-	.068
Medium	.254	-.032	.165	.242	.206	.050	.393	.116	.186	-	.252	-	-	.068
High	.254	-.143	.165	.242	.206	.050	.393	.116	.186	-	.252	-	-	.068
Sugar														
Low	-.349	-.476	-	-	-	-	-	-	-	-	-	-	-	-
Medium	-.349	-.514	-	-	-	-	-	-	-	-	-	-	-	-
High	-.349	-.942	-	-	-	-	-	-	-	-	-	-	-	-
Condiments														
Low	.196	.051	-.123	-	-	.008	-	-	-	-	-	-	-	-
Medium	.196	.051	-.123	-	-	.008	-	-	-	-	-	-	-	-
High	.196	.051	-.123	-	-	.008	-	-	-	-	-	-	-	-
Perishable														
Low	-	-	-	-	-	-	-.415	.072	-	.041	-	-	.001	-.121
Medium	-	-	-	-	-	-	-.415	.072	-	.041	-	-	.001	-.121
High	-	-	-	-	-	-	-.415	.072	-	.041	-	-	.001	-.121
Fish														
Low	-	-.054	-	-.116	-	-	-	-	.045	.036	-.178	-.051	-	-
Medium	-	-.054	-	-	-	-	-	-	.045	.036	-.120	-	-	-
High	-	-.054	-	-	-	-	-	-	.045	.036	-.120	-	-	-
Bread														
Low	-	-.006	-	.005	1.101	-	-	.019	-1.145	-	-	-	-1.06	.001
Medium	-	-.006	-	.005	1.101	-	-	.019	-1.145	-	-	-	-1.06	.001
High	-	-.006	-	.005	1.101	-	-	.019	-1.145	-	-	-	-1.06	.001
Pulses														
Low	.329	.115	-	-	-1.036	-.015	-.067	.004	.197	-	-	-	-	.002
Medium	.329	.115	-	-	-0.773	-.015	-.067	.004	.197	-	-	-	-	.002
High	.329	.115	-	-	-0.144	-.015	-.067	.004	.197	-	-	-	-	.002
Oil														
Low	.263	.078	-	-.253	-.249	-.061	-	.102	.182	-	.165	-	-.268	.120
Medium	.263	.078	-	-.253	-.177	-.067	-	.182	.182	-	.165	-	-.268	.120
High	.263	.078	-	-.253	-.177	-.067	-	.182	.182	-	.165	-	-.268	.120
Meat														
Low	-	.290	-	-.724	-	-	-1.230	-.104	-	-	-	-	-	-
Medium	-	.290	-	-.724	-	-	-1.009	-.104	-	-	-	-	-	-
High	-	.290	-	-.724	-	-	-1.009	-.104	-	-	-	-	-	-
Oil														
Low	.263	.078	-	-.253	-.249	-.061	-	.102	.182	-	.165	-	-.268	.120
Medium	.263	.078	-	-.253	-.177	-.067	-	.182	.182	-	.165	-	-.268	.120
High	.263	.078	-	-.253	-.177	-.067	-	.182	.182	-	.165	-	-.268	.120
Meat														
Low	-	.290	-	-.724	-	-	-1.230	-.104	-	-	-	-	-	-
Medium	-	.290	-	-.724	-	-	-1.009	-.104	-	-	-	-	-	-
High	-	.290	-	-.724	-	-	-1.009	-.104	-	-	-	-	-	-
Milk														
Low	-	-	-.162	-.087	-	-	-1.049	-	-1.93	-.183	-	-	-	-
Medium	-	-	-.162	-.087	-	-	-	-	-.967	-.244	-	-	-	-
High	-	-	-.162	-.087	-	-	-	-	-.967	-.244	-	-	-	-
Yam														
Low	-	.001	-.046	-	-	-	-.249	-	-	-	.183	-	-	-
Medium	-	.001	-.046	-	-	-	-.249	-	-	-	.183	-	-	-
High	-	.001	-.046	-	-	-	-.249	-	-	-	.183	-	-	-
Roots														
Low	-.501	-.173	-.103	.117	-.369	-.150	.052	.015	.004	-	-.963	-	-	-
Medium	-.501	-.173	-.103	.117	-.369	-.072	.701	.031	-	-	-.963	-	-	-
High	-.501	-.173	-.103	.117	-.369	.114	1.28	-.236	-	-	-.963	-	-	-
Fruit														
Low	.110	.064	.031	-	-.122	-	-	-	-	-	-	-	-	-
Medium	.110	.064	.031	-	-.122	-	-	-	-	-	-	-	-	-
High	.110	.064	.031	-	-.122	-	-	-	-	-	-	-	-	-
Other Grains														
Low	1.829	.333	.007	-	-	-	-	-	.004	.114	-	-	-	-.065
Medium	1.829	.333	.007	-	-	-	-	-	.004	.114	-	-	-	-.065
High	1.829	.333	.007	-	-	-	-	-	.004	.114	-	-	-	-.065

Appendix B

Table 5--Demand Equation for Calories

Independent Variable		t-Statistic
LPCEXP	3.53	15.50
LPCEXP2	-0.18	-13.02
LRICEP	-1.66	- 1.30
LCOCOP	0.50	1.87
LBREADP	0.08	0.89
LWHEATP	-0.14	- 2.46
LFISHP	-0.42	- 2.47
LMILKP	-0.03	- 2.81
LMEATP	1.12	3.50
LGRAINP	-0.05	- 3.81
LPULSEP	-0.07	- 4.82
LSUGARP	-0.003	- 0.15
LYAMP	-0.04	- 5.42
LCONDMTP	-0.03	- 2.20
LOILP	-0.43	- 4.93
URB	0.50	2.32
EST	-0.49	- 1.33
URBX	-0.06	- 2.95
ESTX	0.07	1.63
AEURAT	0.22	4.81
HHSIZE	0.13	3.80
HHSX	-0.02	- 4.14
LRICEPX	0.17	3.79
EARNERS	0.01	1.40
AGE1	0.001	5.38
LCOCOPX	-0.08	- 2.30
LFISHPX	0.05	2.30
LVEGPX	-0.006	- 5.00
LMEATPX	-0.13	- 3.45
LOILPX	0.05	1.91
LBREADURB	-0.14	- .083
R^2	0.50	

Appendix C

Variable Definitions

LPCEXP	=	natural log of per capita expenditures
LPCEXP2	=	$(LPCEXP)^2$
LPCCAL	=	natural log of calories/AEU
LPCCALII	=	natural log of calories/number of persons in the household
LRICEQ	=	natural log of per capita rice consumption
LCOCOQ	=	natural log of per capita coconut consumption
LSUGARQ	=	natural log of per capita sugar consumption
LFISHQ	=	natural log of per capita fish consumption
LVEGQ	=	natural log of per capita vegetable consumption
LCONDMTQ	=	natural log of per capita condiment consumption
LOILQ	=	natural log of per capita oil consumption
LWHEATQ	=	natural log of per capita wheat consumption
LMILKQ	=	natural log of per capita milk consumption
LYAMO	=	natural log of per capita roots and tubers consumption
LMEATQ	=	natural log of per capita meat consumption
LGRAINQ	=	natural log of per capita consumption of other grains (including maize, millet, and sorghum)
LPULSEQ	=	natural log of per capita pulses consumption
LBREADQ	=	natural log of per capita bread consumption
LRICEP	=	natural log of the price of rice
LCOCOP	=	natural log of the price of coconut
LSUGARP	=	natural log of the price of sugar

Appendix C -- Definition of Variables

LFISHP	=	natural log of the price of fish
LBREADP	=	natural log of the price of bread
LWHEATP	=	natural log of the price of wheat
LCONDMTP	=	natural log of the price of condiments
LOILP	=	natural log of the price of cooking oil
LVEGP	=	natural log of the price of vegetables
LMILKP	=	natural log of the price of milk
LYAMP	=	natural log of the price of roots and tubers
LMEATP	=	natural log of the price of meat
LGRAINP	=	natural log of the price of other grains
LPULSEP	=	natural log of the price of pulses
MOMED	=	mother's education
DADED	=	father's education
HHSIZE	=	number of persons in the household
HHSX	=	HHSIZE * LPCEXP
AGE1	=	age of major income earner
AEURAT	=	adult equivalency units/HHSIZE
EARNERS	=	number of household members who are income receivers
D1	=	dummy variable which equals 1 when a household member is a farmer or cultivator, and 0 otherwise
D2	=	dummy variable which equals 1 when a household member is a fisherman, and 0 otherwise
URB	=	dummy variable which equals 1 when a household resides in the urban sector, and 0 otherwise
EST	=	dummy variable which equals 1 when a household resides in the estate sector, and 0 otherwise
URBX	=	URB * LPCEXP

Appendix C -- Definition of Variables

ESTX	=	EST * LPCEXP
DUM	=	dummy variable when PCEXP is less than Rs. 2000/year
RICEDUM	=	LRICEP * DUM
RICEPURB	=	LRICEP * URB
RICEEST	=	LRICEP * EST
BREADUM	=	LBREADP * DUM
BREADURB	=	LBREADP * URB
FISHDUM	=	LFISHP * DUM
COCOURB	=	LCOCOP * URB
CONDMURB	=	LCONDMTP * URB
COCODUM	=	LCOCOP * DUM
OILDUM	=	LOILP * DUM
SUGPES	=	LSUGARP * EST
SUGPURB	=	LSUGARP * URB
MILKDUM	=	LMILKP * DUM
FISHPURB	=	LFISHP * URB
YAMDUM	=	LYAMP * DUM
WHTDUM	=	LWHEATQ * DUM
WHTEST	=	LWHEATP * EST
VEGEST	=	LVEGP * EST
LCOCOPX	=	LCOCOP * LPCEXP
LFISHPX	=	LFISHP * LPCEXP
LVEGPX	=	LVEGP * LPCEXP
LMEATPX	=	LMEATP * LPCEXP
LYAMPX	=	LYAMP * LPCEXP

Appendix C -- Definition of Variables

LMILKPX = LMILKP * LPCEXP

LBREADPX = LBREADP * LPCEXP

LWHEATPX = LWHEATP * LPCEXP

LCNDMTPX = LCNDMTP * LPCEXP

PRINDEX = Price Index

FEMINCR = ratio of income earned by females to total income

FEMINCR2 = FEMINCR * FEMINCR

FEMINCRX = FEMINCR * LPCEXP

FARMLAND = acres of farm land

PADDYLAND = acres of paddy land

HIGHLAND = acres of high land

Yw = income from wages and salaries and interest payments

Ys_1 = income from non-money sources

Ys_2 = income from agricultural sales plus home consumption

Ys_3 = income from pensions, remittances, and food stamps

RYs_1 = ratio of income from non-money sources to total income

RYs_2 = ratio of income from agricultural sources to total income

RYs_3 = ratio of income from pensions, remittances, and food stamps to total income

RYs_4 = ratio of income from periodic cash payments to total income

RYs_5 = ratio of income from business profits to total income

$RYXs_1$ = RYs_1 * LPCEXP

$RYXs_2$ = RYs_2 * LPCEXP

Appendix C -- Definition of Variables

RYXs3	=	RYs3 * LPCEXP
MILLS	=	Inverse of the Mill's Ratio

Appendix D

Table 1 -- Per Capita Calorie Intake by Expenditure Deciles and Sector

Per Capita Expenditures (Deciles)	Calories/Capita			
	Urban	Rural	Estate	Total
1	1138	1239	1222	1221
2	1433	1617	1595	1590
3	1625	1815	1811	1788
4	1785	1977	2047	1964
5	1875	2144	2269	2113
6	2002	2331	2580	2303
7	2139	2586	2691	2519
8	2248	2716	3223	2666
9	2434	3119	3510	2971
10	2765	3595	3754	3261
Total	2095	2257	2400	2240

Appendix D

Table 2 -- Imputed Prices of Major Calorie Sources By Sector

Commodity	Urban	Rural	Estate
Rice (Rs/lb)	2.57	2.50	2.55
Wheat (Rs/lb)	2.42	2.38	2.39
Bread (Rs/lb)	2.17	2.19	2.20
Coconuts (Rs/Item)	2.00	1.78	2.00
Sugar (Rs/oz)	0.47	0.47	0.49

Appendix E

Each household consumption record included over 200 potential food commodities. As a first step, the calorie and protein equivalents of each of these commodities per unit was determined. These were then multiplied by the quantity consumed and summed over all the commodities to determine household calorie and protein intake.

Specifically, the following formulas were used:

$$D_{cj} = \sum_{i=1}^{220} Q_{ij} \times V_i \times E_i \times C_i$$

and

$$D_{pj} = \sum_{i=1}^{220} Q_{ij} \times V_i \times E_i \times P_i$$

where D_{cj} = Calorie consumption for household j,

Q_{ij} = Quantity of commodity i reported to be consumed by household j in a given week in the units used in the questionnaire (e.g., pounds of rice, number of coconuts, bottles of vegetable oil).

V_i = Factor to convert the quantity reported into units for which there are available nutrient equivalents in food consumption tables (e.g., no. of coconuts multiplied by 3.408 equals the number of ounces or pounds of coconut consumed).

E_i = The percent edible portion of commodity i (e.g., 80 percent of the carrot, 100 percent of wheat).

C_i = Calorie value per unit given in Sri Lankan food consumption tables.

D_{pj} = Protein consumption for household j.

P_i = Protein value per unit given in Sri Lankan food consumption tables.

Appendix F

Demand Functions for Calories and Protein

Independent[a] Variable	Dependent Variable: Ln(Calories/AEU)	Dependent Variable: Ln(Protein/AEU)
Intercept	-6.98	-12.24
LPCEXP	3.41 (28.9)[b]	3.73 (30.60)
LPCEXP2	-0.17 (24.2)	-0.18 (25.31)
AEURAT	-0.98 (26.74)	-1.21 (32.06)
HHSIZE	0.4 (6.69)	0.17 (7.68)
URB	0.48 (4.58)	0.57 (5.31)
EST	-0.70 (3.14)	-0.46 (2.0)
URBX	-0.08 (5.87)	-0.08 (7.68)
ESTX	0.10 (3.59)	0.07 (2.55)
HHSX	0.14 (6.69)	-0.02 (7.68)
EARNERS	0.00 (0.08)	0.00 (0.83)
D1	-0.01 (1.51)	0.00 (0.93)
PRINDEX	-0.64 (29.0)	-0.67 (29.40)
	$R^2 = 0.68$	$R^2 = 0.71$

a Variable definitions are found in Appendix B

b t-ratios are in parentheses

Appendix G

Activity and Unemployment Rates, All Island

Age Group	Activity Rates[a/]		Unemployment Rates[b/]	
	Males	Females	Males	Females
10 - 14	6.4	3.1	14.4	22.1
15 - 19	41.9	20.6	38.0	43.6
20 - 29	90.5	37.2	21.7	34.5
30 - 39	96.2	36.7	4.5	10.9
40 - 49	95.4	34.4	2.4	1.2
50 - 59	84.8	26.3	0.7	0.0
Over 60	48.2	8.1	0.9	1.2
All	66.8	25.8	12.4	23.0

a/ Activity Rate = $\frac{\text{Economically Active Population}}{\text{Working Age Population}} \times 100$

b/ Unemployment Rate = $\frac{\text{Unemployed Population}}{\text{Economically Active Population}}$

Appendix H

Predicted Values for Calorie Consumption Based on Food Balance Sheets

Actual and Fitted Values for Calorie Intake Based on Food Balance Sheet Data:

Year	Actual	Predicted by 3-Year Moving Average
1960	2183	2141
1961	2168	2099
1962	2012	2072
1963	2118	2119
1964	2086	2156
1965	2154	2189
1966	2229	2194
1967	2184	2177
1968	2169	2240
1969	2179	2260
1970	2371	2253
1971	2231	2186
1972	2158	2154
1973	2169	2144
1974	2136	2145
1975	2127	2214
1976	2172	2214
1977	2343	2280
1978	2325	2328
1979	2317	2270
1980	2169	2229
1981	2200	2186
1982	2189	2250
1983	2361	

Appendix I

Comments on Cleaning and Data Set Preparations for 1969/70 SocioEconomic Survey

It is to be noted that the findings reported herein are slightly different, especially for calorie intake, from (a) Pravin Visaria, "Some Aspects of Relative Poverty in Sri Lanka, 1969-70," Staff Working Paper No. 461 (Washington, D.C.: World Bank, 1981); and (b) Socio-Economic Survey of Sri Lanka, 1969/70," Special Report on Food and Nutritional Levels in Sri Lanka, Department of Census and Statistics, Colombo, Sri Lanka, October 1972. The reasons apparently emanate from three reasons: (1) the methods of data cleaning, (2) the calorie conversion standards employed, and (3) adjustments in the sample to make it nationally representative.

To amplify, in the 1969/70 data, there were a couple hundred households where the value of expenditures relative to the quantity of the commodity consumed were implausible. Either the value or the quantity was therefore adjusted, depending on which fell outside the range of $\pm$ 3 standard deviation from the mean for a given household size. Without following this procedure, the alternatives were simply to delete households with calorie intakes above some arbitrary figure, such as 3,500 calories per capita. This would have resulted in the elimination of a couple hundred households. Following such a procedure yielded results similar to those reported by the Department of Census and Statistics in reference (b) above.

The alternative of not cleaning the data at all was found equally unacceptable. There were many households consuming less than 500 or greater than 5,000 calories per capita. Therefore, as with the 1980/81 data, outliers were determined for both quantity and value of food items, and adjusted accordingly, which most of the time involved simply moving a decimal point. In some instances, both the relationship between quantity and value (i.e., prices) were not plausible, and it was impossible to tell which one was incorrect. In those instances, the household record was deleted if the discrepancy was for a major food item (e.g., rice, wheat, bread, sugar, coconut, oil).

Concerning the calorie conversion factors, these were based on the reported calorie equivalents in W. Perera, P. Jayasekera, and S. Thana, Tables of Food Composition for Use in Sri Lanka, compiled for The Nutrition Department of the Medical Research Institute, World Health Foundation of Sri Lanka (Banco Printers and Publishers Ltd., Colombo, 1979). Despite the comprehensiveness of these tables, there is considerable discretion left to the analyst, especially in converting numbers of food items into gram equivalents. In the 1969/70 survey, this problem was more difficult than the 1980/81 survey because more commodities were reported in terms of the numbers consumed rather than weight measurements. This was particularly problematic for five food items: buns, rusks, cake, other cereal products, and cereal preparations bought outside and consumed in the home. To deal with this, and the fact that there were hundreds of households where quantities and values seemed unreasonable, the calorie contribution for these commodites was assumed to be equal to that reported in 1980/81. Since

they contributed less than one percent of total calorie intake, even if the share of calories from these sources changed 50 percent, the results would not change appreciably.

The third reason why the results of this analysis of the 1969/70 data may differ from others revolves around the adjustment made herein for the structure of the sample. In Sri Lanka, based on the 1963 census, approximately 16 percent of the households lived in the urban sector in 1969/70, with 72 percent and 12 percent residing in the rural and estate sectors, respectively.[1] In the sample, however, data were collected on 4,022 urban households, 3,652 rural households, and 1,990 estate households. In order to compensate for the fact that unlike the other surveys, the sample from 1969/70 was not self-weighting at the national level (although it was at the sectoral level), correction factors were employed. So, for example, in creating per capita expenditure deciles, the approximately 10,000 households were not sorted and then divided into ten groups which formed the cut-off point for the deciles. Rather, each urban household was duplicated 85.51 times, each rural household 412.29 times, and each estate household 124.19 times; thereafter, the households were ranked from which deciles, and decile cut-off points were determined.

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[1] Visaria, op. cit., p. 151.

Appendix J

Per Capita Daily Calorie Consumption by Expenditure Decile, By Sector, 1969/70, 1978/79, and 1981/82

Per Capita Expenditure Decile	1969/70			1978/79[1]			1981/82[1]		
	Urban	Rural	Estate	Urban	Rural	Estate	Urban	Rural	Estate
1	1433	1691	1722	1288	1346	1324	1137	1186	1214
2	1699	1935	2117	1620	1663	1821	1351	1586	1607
3	1857	2168	2340	1718	1855	2027	1589	1813	1924
4	1966	2357	2546	1824	1999	2222	1784	2031	2122
5	2065	2497	2793	1917	2155	2490	1927	2184	2371
6	2200	2608	2947	2079	2385	2716	2088	2392	2687
7	2292	2681	3184	2260	2505	3032	2216	2581	3024
8	2419	3003	3338	2495	2757	3160	2484	2869	3344
9	2621	3066	3648	2674	3071	3884	2705	3203	3783
10	3016	3504	4333	3181	3336	3845	2882	3475	3549

1 Source of 1978/79 and 1981/82 data: Neville Edirisinghe, op. cit., p. 31.

Appendix K

Table 1 -- DCS Price Indexes for Sri Lanka, 1960-1982

(1970 = 100)

Year	Food	Non Food	Overall
1960	75.7	74.5	75.2
1961	75.1	78.5	76.4
1962	75.8	80.2	77.5
1963	77.1	82.8	79.4
1964	80.2	85.5	82.2
1965	80.7	85.0	82.4
1966	81.3	82.2	81.6
1967	82.8	82.7	82.7
1968	88.9	85.1	87.5
1969	96.3	97.4	96.7
1970	100.0	100.0	100.0
1971	105.3	104.5	105.0
1972	114.7	112.4	113.8
1973	165.7	129.2	151.5
1974	304.1	247.6*	282.1*
1975	299.1	240.2*	276.2*
1976	290.8	207.8*	258.5*
1977	297.7	265.8*	284.2*
1978	292.9	234.1	270.0
1979	346.4	287.9	323.6
1980	453.9	373.0	422.4
1981	548.9	486.1	524.4
1982	592.6	536.9	570.9

* As explained in the text, these estimates should be treated with caution.

Note: The overall index gives a weight of 0.6104 to the food index and 0.3896 to the nonfood index.

Source: Bhalla and Gilewwe, op. cit., p. 104.

Appendix K

Table 2 -- Cost of Living Indexes for Colombo Town
(Base Year 1969 = 100)[a]

Year	Food Index	Non-Food Index	Food and Non-Food Index
1969	1.00	1.00	1.00
1970	1.06	1.05	1.00
1971	1.09	1.09	1.00
1972	1.16	1.16	1.00
1973	1.29	1.24	1.04
1974	1.48	1.33	1.11
1975	1.60	1.40	1.14
1976	1.58	1.47	1.07
1977	1.59	1.51	1.05
1978	1.86	1.57	1.18
1979	2.06	1.74	1.18
1980	2.66	2.10	1.27
1981	3.13	2.50	1.25
1982	3.52	2.68	1.31

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[a] Data adopted from Central Bank of Sri Lanka, 1982 Annual Report, Statistical Appendix.

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