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Staple Food Consumption in the Philippines

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by

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FOREWORD

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

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

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

Mark W. Rosegrant
Coordinator, Rice Policies
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1. INTRODUCTION

Staple foods account for nearly three fourths of the Filipino diet as measured in calorie intake.1/ Rice is the main and preferred staple in the country. It supplies the Filipino with about 1,035 kilocalories of energy accounting for 57 percent of his daily calorie absorption and with 43 percent (23 grams) of his protein intake. On a national average basis, per capita consumption of rice is estimated at 109 kilograms per year.2/

Although rice is the preferred staple throughout the country, consumption of maize, sweet potatoes (called camote locally), cassava, and other root crops is also important to some segments of the population in some regions of the country. These crops are important because they are rice substitutes.

This paper analyzes the structure of demand for staple foods, particularly rice, in the Philippines. The analysis is based primarily on data from selected Philippine food demand studies. Chapter 2 identifies and discusses the different data sources on which Philippine food consumption studies are based. Chapter 3 examines the patterns and trends in staple consumption, identifying the different categories of the population for which data are available. Substitution between staples is investigated. Consumption of major food groups such as meat, dairy products, and fruits and vegetables is also examined. Chapter 4 examines and compares the existing estimates of price and income elasticities for rice and the other staples reported in selected consumption studies. An attempt is made to explain or reconcile any discrepancies between the estimates. Chapter 5 presents some projections of rates of growth of demand for staples. The last chapter suggests some directions for research in staple consumption.

1/In this paper, staples include rice, maize, root crops, and wheat.

2/Based on household survey data (Food and Nutrition Research Institute, First Nationwide Nutrition Survey, 1978: A Summary Report, FNRI Publication No. GP-11 [Manila: FNRI, 1979]). Per capita estimates of rice consumption using the disappearance method are difficult to reconcile with those based on household consumption surveys. See Chapter 2.

2. PHILIPPINE FOOD CONSUMPTION SURVEYS

There are two food consumption surveys that are used extensively to examine food consumption patterns in the Philippines: the Food Consumption Survey of the Special Studies Division (SSD) of the Ministry of Agriculture and the Food and Nutrition Research Institute (FNRI) Nutrition Survey. A third household survey, the National Census and Statistics Office (NCSO) Family Income and Expenditure Survey, also provides data on food expenditures. The National Economic Development Authority (NEDA) Food Balance Sheet is another source of food consumption estimates. All four data sources are discussed below.3/

The SSD conducts quarterly nationwide surveys on food consumption and expenditure of households.4/ The survey, begun in 1970, has the following objectives: to determine the supply and demand of the different agricultural crops; to provide information on the seasonality of several agricultural crops and on how seasonality affects prices; to determine the food consumption patterns of the people, the trends of food prices, and the effects of prices and income on consumption; and to serve as guidelines for policymakers devising food production programs.

The survey covers 1,000 households, which are selected by a random sample, stratified by region, subregion, and jurisdictional unit (cities and municipalities). The twelve official regions are represented in the survey, which is conducted regularly in March, June, September, and December. The personal interview-recall method is used. Basic data requested are the quantity, expenditure and price of foodstuffs consumed by the household during the past week. Socioeconomic information on the household, such as its income, size and age composition, the occupation and education of the principal wage earner, and the age of the wife, are also collected.

3/This section relied heavily on C. L. G. Santos, "Comparative Analysis of Various Food Consumption Surveys in the Philippines," Department of Agricultural Economics, Cornell University, Ithaca, N.Y., 1979.

4/See E. E. Aviguetero et al., "Income and Food Consumption (Summary of 19 Economic Surveys)," Bulletin 78-15, Planning Service, Ministry of Agriculture, Quezon City, 1978; E. E. Aviguetero et al., "Regional Consumption Patterns in Major Foods, 1974-76," Bulletin 78-13, Planning Service, Ministry of Agriculture, Quezon City, 1978; and Philippines, Ministry of Agriculture, Planning Service, Special Studies Division and National Grains Authority Staff, "Food Consumption Patterns (Summary of 9 Economic Surveys)," Bulletin 80-9, Planning Service, Ministry of Agriculture, Quezon City, 1980.

Until 1976 the survey was conducted solely by the SSD. Beginning in 1977, it became a joint project of three agencies in the Ministry of Agriculture: the National Grains Authority (NGA), the Bureau of Agricultural Economics (BAECON), and the SSD. The survey is still conducted during the same months, but during three months the sample is of 1,000 households, and during the fourth month the sample is of 10,000 households. While the earlier surveys concentrated on heavily populated areas, the new sampling concentrates on the rural areas.

The results of the survey up to 1976 are presented by income group and by region. Beginning with the 1977 surveys, the results are reported by stratum, that is to say, by the major economic activity of the barangay (smallest political unit) to which the household belongs: palay, corn, other agriculture, fishing, manufacturing, or another activity.

The SSD food consumption survey, like most sample surveys, suffers from biased memories. Problems in measuring income and prices have been encountered.5/ Another limitation is that the sample size covering the country is small. The bigger sample of 10,000 households may overcome this limitation, though it is likely to create other statistical problems.

The FNRI of the National Science and Development Board has conducted regional food consumption surveys for two decades. The main objective of the survey is to assess the food situation and nutrition of population groups for the formulation of appropriate food and nutrition programs and for development planning and public information.6/

A series of regional surveys was started in 1958 and completed in 1969. A total of 3,002 households in nine regions was covered. A second series of regional surveys covered only Luzon and Visayas in 1975-77. Mindanao was not included because of disorder on the island at the time. The Luzon-Visayas survey had a sample of 4,113 households. The 1978 nutrition survey covered the whole country in one round with a sample of 2,800 households from 10 regions. The FNRI plans to conduct this nationwide survey every five years.

The sampling design used in the surveys varies slightly from year to year. Generally, the multistage stratified design is the basis for selecting sampling units. Stratification is done by region, province, and urban/rural clustering of areas. Sampling units are cities/municipalities, barangays, and households.

5/See M. E. C. Bennagen, "A Study of Food Consumption and Expenditure Patterns in Philippine Households" (M.A. thesis, University of the Philippines, 1980); and J. G. Snell, "Estimating Demand Parameters from Secondary Sources: Problems and Pitfalls--A Philippine Case," University of the Philippines at Los Baños, n.d. (Mimeographed.)

6/C. L. Intengan, "Food Consumption Data as Basic Indicator in Development," The Philippine Statistician 27 (Nos. 1 and 2, 1978).

The food consumption phase of the FNRI nutrition survey consists of collecting data on food intake by the weighing method supplemented by actual observation and interview. Results on household food consumption are expressed in per capita per day consumption by urban or rural area, by income group, and by region.

A major limitation of the FNRI survey is the timing of the field data collection. Surveys are conducted during the summer months (March to June) and therefore the results of the survey do not show seasonal variations in food consumption.7/

The Family Income and Expenditure Survey (FIES) of the NCSO is essentially conducted to gather information on family income and expenditures (food and nonfood) from which socioeconomic and demographic indicators are derived for planning and policymaking by national and regional governments. Data on food expenditures are collected through personal interviews during one week. The survey uses a three-stage sampling design. Thus far, five NCSO nationwide surveys have been conducted.8/

Year	No. of Samples
1957	3,959
1961	6,977
1965	4,747
1971	11,659
1975	15,832

The NCSO survey is the most comprehensive national survey that collects income and expenditure data from households. Unfortunately, the survey is subject to several criticisms, particularly about its income data.9/ Understatement of income, which is a persistent problem in household surveys, has been attributed partly to the reluctance of households to reveal their true income for fear that the information will be used for taxation. A tendency to exaggerate expenditures, particularly on food, has also been observed.

The Food Balance Sheet (FBS) prepared each year since 1953 by the Statistical Coordination Office of the NEDA gives the amount of food available to the nation.10/ Apparent per capita food consumption is

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7/Ibid.

8/Philippines, Bureau of Census and Statistics. Family Income and Expenditure Survey. Manila: Bureau of Census and Statistics, 1957, 1961, 1965, 1971, and 1975.

9/See M. Margahas, "A Critique of the NCSO 1975 Family Income and Expenditure Survey," PREPF Technical Paper, 1978; and E. Tan and G. Tecson, "Patterns of Consumption in the Philippines." IEDR Discussion Paper 74-9, School of Economics, University of the Philippines, Quezon City, 1974.

10/Philippines, National Economic Development Authority, Statistical Coordination Office, Food Balance Sheet (Manila: National Economic Development Authority, 1953-76).

estimated using the disappearance method.11/ The basic data used are provided by several government agencies, such as the Bureau of Agricultural Economics for agricultural commodities, the Foreign Trade Statistics Office for export and import data, and the NCSO for miscellaneous processed products.

Average per capita food consumption figures are computed by the disappearance method. Those based on household surveys show large differences. The discrepancy for rice, in particular, is significant. Household data have consistently shown a higher level of per capita consumption (105-110 kilograms per year) compared to an average of 90-95 kilograms per year from aggregate data. The 1976 Food Balance Sheet (the latest in print) gives a level of per capita supply of rice available for human consumption of 81.4 kilograms per year.12/ Although efforts at reconciling the estimates have been made, the problem still appears unsolved.13/

A COMPARISON OF THE SSD AND FNRI CONSUMPTION ESTIMATES

Table 1 compares the SSD and FNRI average per capita consumption figures for selected foodstuffs. Since these are the most comprehensive existing surveys on food, an attempt is made to check the consistency of the estimates. The SSD estimates are from the March and June 1978 rounds to make them comparable to the FNRI results.

The table shows that for most of the food commodities, the consumption estimates from the two surveys are consistent, particularly for cereals. However, large differences between consumption of root crops, dairy products, and fruits and vegetables can be observed. The exclusion of two Mindanao regions (central and western) from the FNRI survey may partly explain the low average consumption of starchy roots and tubers, especially sweet potatoes. Consumption of root crops in these two regions is high (see the discussion below on regional consumption patterns). The FNRI estimate for corn consumption may be slightly higher for the same reason.

11/Available supply for human consumption equals total available supply (stocks + production + imports - exports) minus uses for feeds, seeds, wastes, and other nonfood uses.

12/Philippines, NEDA, Statistical Coordination Office, Food Balance Sheet.

13/The Inter-Agency Committee assigned with the task of reconciling the differences in per capita food consumption and income elasticity estimates of different government agencies has not reached a consensus about which estimates are valid. The committee is composed of NEDA, the Ministry of Agriculture, the National Grains Authority, the National Food and Agriculture Council, FNRI, and other related agencies (see Philippines, NEDA--United Nations Development Programme/ International Bank for Reconstruction and Development, Regional Planning Assistance Project, "Regional Demand Projections for Major Food Items," Technical Paper 5, Manila, 1977).

Table 1--Comparison of data for average per capita consumption rate of use for specific food groups, 1978

Food Group	FNRI	SSD	Difference	IAPMP[a/]
	(kilograms per year)			
Cereals and cereal products	134.0	135.7	-1.7	148.3
Rice	109.5	107.9	1.6	109.5
Corn grits	13.9	14.7	-0.6	24.7
Wheat and wheat products	7.7	8.9	-1.2	11.6
Starchy roots and tubers	13.5	18.2	-4.7	---
Sweet potatoes	5.1	9.9	-4.8	9.9
Cassava	5.5	4.0	1.5	9.3
Seafood	30.0	24.5	5.5	34.0
Meat (including poultry)	10.3	11.5	-1.2	23.9[b/]
Eggs	2.9	2.5	0.4	---[b/]
Dairy products	12.0	6.6	5.4	---[b/]
Fruits and vegetables	90.0	72.0	18.9	72.9
Cooking oil	2.9	3.6	-0.7	---

a/Estimated by the Integrated Agricultural Production and Marketing Project (IAPMP).

b/The IAPMP gives a figure for meat, eggs, and dairy products together. Separate figures are not available.

It may be useful at this point to compare the set of per capita consumption estimates worked out by the Integrated Agricultural Production and Marketing Project (IAPMP), which is a part of the Ministry of Agriculture. The IAPMP is working out a Food and Nutrition Plan for the Philippines. A volume on food consumption patterns and prospects for the 1980s will be released soon.[14/]

With the exception of rice, the IAPMP estimates given in the last column of Table 1 reflect apparent consumption estimated by the disappearance method. For rice, the project decided to use the 1978 FNRI per capita estimate of 109.5 kilograms per year (rice only) or 112.0 kilograms per year (including rice products) as the national estimate for crop year 1977/78. The estimates for the other years (1969/70 to 1978/79) were then adjusted to reflect this level of consumption, but the year-to-year variation in production trends was maintained.

14/Integrated Agricultural Production and Marketing Project. Food Consumption Patterns and Prospects for the 1980s (Quezon City: Ministry of Agriculture, 1980).

The need to reconcile the consumption estimates of these sources is apparent in the table. An investigation of these inconsistencies is beyond the scope of this paper, but it is a problem that should be the subject of further research.

As the SSD and FNRI consumption estimates are fairly consistent and estimates are available for different population groups, the analysis of food consumption patterns and trends in the next chapter uses the results of these two surveys. This does not imply, however, that such estimates are the only acceptable ones.

3. PATTERNS AND TRENDS IN STAPLE FOOD CONSUMPTION

This section examines the consumption patterns and trends of four staple crops. Rice accounts for approximately 75 percent of the quantity of total staples consumed. Corn, the second major staple, is eaten by about 20 percent of the population. Root crops, particularly sweet potatoes and cassava, are important as rice and corn substitutes in some areas in the Visayas and Mindanao. Although wheat is still far from becoming a staple among Filipinos (average per capita consumption is less than 10 kilograms per year), consumption of wheat products by urban households is significant.

STAPLE CONSUMPTION TRENDS

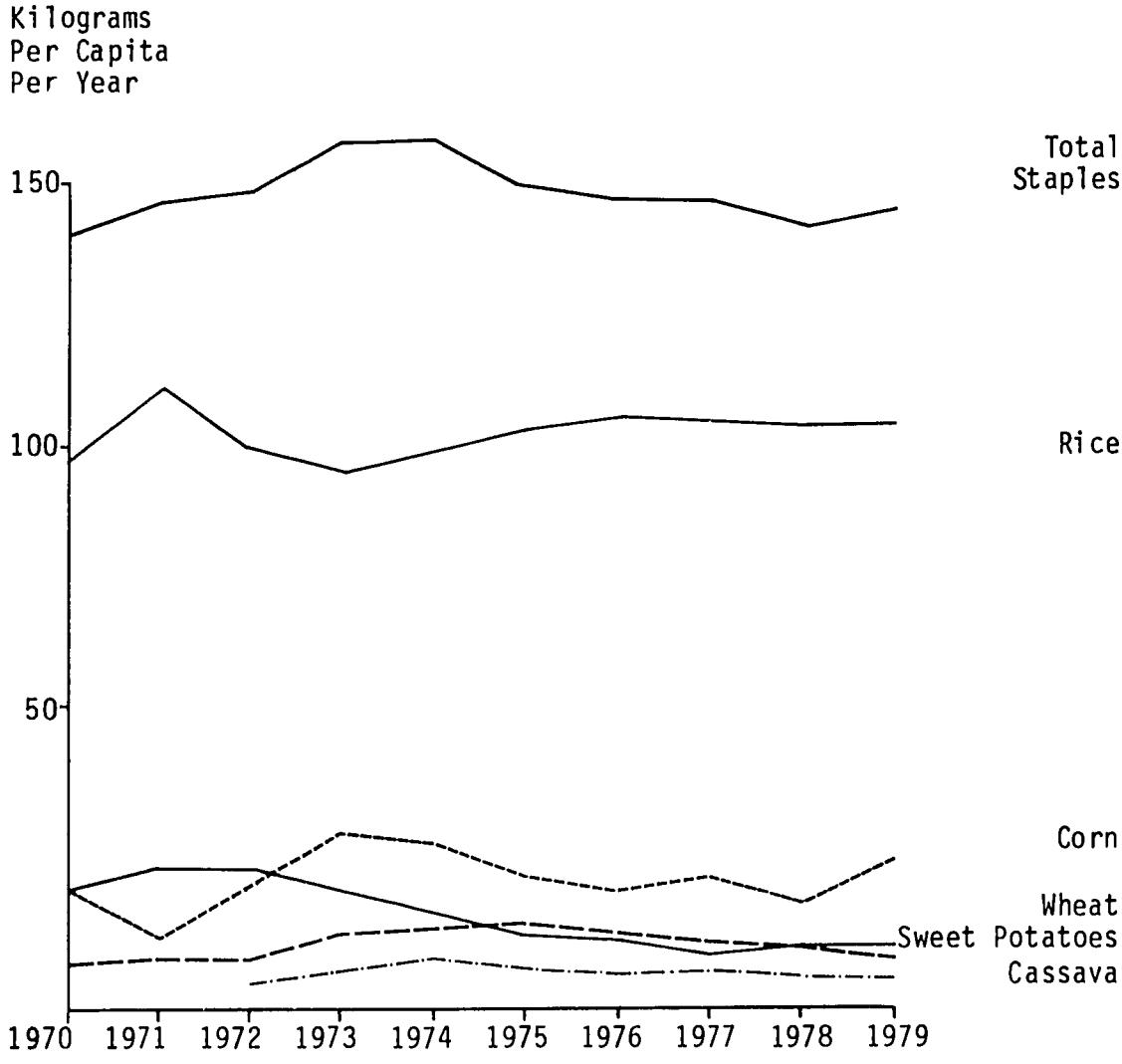
The SSD survey data are an excellent source of food consumption trends in the country. Figure 1 shows the trend in per capita consumption of the four staples during the period 1970-79. Average per capita consumption of rice remained relatively stable at 105 kilograms per year after the rice crisis in 1973.15/ That crisis was brought about by domestic and world grain shortages. Average rice consumption that year dropped significantly, to 96 kilograms per capita.

The trend in corn consumption appears to be strongly influenced by rice availability. Consumption of corn rose markedly during the rice crisis year. With rice missing from the stores and markets, the government was forced to flood the markets with corn grits, most of which were sold mixed with rice. A survey conducted in metropolitan Manila at that time revealed that low-income urban households could be encouraged to consume corn instead of rice, given a large change in relative prices.16/ Similarly, consumption of root crops increased in 1973 but gradually leveled off later.

15/Average rice consumption over the period 1954-69 also exhibited a relatively stable trend. See L. Mears, The Rice Economy of the Philippines (Quezon City: University of the Philippines Press, 1974).

16/The price ratio was up by 85 percent in September 1973. See M. Mangahas, "The Political Economy of Rice in the New Society," Food Research Institute Studies 14 (No. 3, 1975): 295-309; and R. D. Torres and L. B. Darrah, "Low Income Families' Reaction to Corn Grits," Bulletin 74-9, Special Studies Division, Planning Service, Ministry of Agriculture, Quezon City, 1974.

Figure 1. Average per capita consumption of staples, 1970-79



Sources: Computed from data in E. E. Aviguetero et al., "Income and Food Consumption (Summary of 19 Economic Surveys)," Bulletin 78-15, Planning Service, Ministry of Agriculture, Quezon City, 1978; and Philippines, Ministry of Agriculture, Planning Service, Special Studies Division and National Grains Authority Staff, "Food Consumption Patterns (Summary of 9 Economic Surveys)," Bulletin 80-9, Planning Service, Ministry of Agriculture, Quezon City, 1980.

Average per capita consumption of wheat declined appreciably during the past decade. The relative price of wheat (all of which is imported) has not encouraged consumption of more (Table 2). With rice under government price control since 1976, the rice/wheat price ratio is expected to continue to decline and, unless wheat prices are lowered (which would mean lesser government profits from imports), wheat consumption will remain an insignificant part of cereal consumption among Filipinos.

REGIONAL STAPLE CONSUMPTION PATTERNS

Food consumption patterns in an archipelagic country such as the Philippines exhibit wide regional variations. Regional data on agricultural land use patterns in the country show which crops are widely consumed in which regions. Table 3 reports the percent of area planted with staples by region. While rice production shows more dispersion regionally, production of corn, sweet potatoes, and cassava tends to be localized in certain regions, particularly in Visayas and Mindanao.

Table 4 gives the average per capita consumption of staples by region. It can be seen that rice consumption is low in Visayas and Mindanao, where a smaller area is planted with rice, than in Luzon. On the other hand, corn consumption is highest in regions where the area devoted to corn is highest: in Cagayan Valley, Central Visayas, and in the Mindanao regions. The same is true for sweet potatoes and cassava, where both consumption of the crop and the area planted with it are highest in Bicol, Central and Eastern Visayas, and in regions of Mindanao.

Table 2--Average retail prices of rice, corn, and wheat, 1969/70 to 1978/79

Crop Year	Rice	Corn	Wheat	Rice/ Corn	Rice/ Wheat
	(pesos per kilogram)				
1969/70	0.80	0.49	1.33	1.63	0.60
1970/71	0.96	0.76	1.54	1.26	0.62
1971/72	1.26	0.99	1.79	1.27	0.70
1972/73	1.22	0.88	1.80	1.39	0.68
1973/74	1.91	1.31	2.74	1.46	0.70
1974/75	1.97	1.31	2.74	1.50	0.72
1975/76	1.95	1.45	3.87	1.34	0.50
1976/77	2.11	1.58	4.13	1.33	0.51
1977/78	2.10	1.59	4.24	1.32	0.49
1978/79	2.16	1.58	4.56	1.37	0.47

Source: Data from the Philippine Bureau of Agricultural Economics.

Table 3--Percent of area planted with staples, by region, crop year 1978

Region	Palay	Corn	Sweet Potatoes	Cassava
			(percent)	
Ilocos	9	1	6	1
Cagayan Valley	12	10	5	1
Central Luzon	12	2	4	1
Southern Luzon	12	7	4	4
Bicol	8	5	16	15
Western Visayas	13	7	4	6
Central Visayas	2	16	15	16
Eastern Visayas	5	4	23	13
Western Mindanao	4	6	5	13
Northern Mindanao	5	6	10	9
Southern Mindanao	5	22	6	5
Central Mindanao	13	13	2	16

Source: Data from the Philippine Bureau of Agricultural Economics.

Table 4--Average per capita consumption of staples, by region, 1974-76

Region	Rice	Corn	Sweet Potatoes	Cassava	Wheat	Total
			(kilograms per year)			
Ilocos	132.5	1.4	5.1	1.5	7.4	147.9
Cagayan Valley	121.1	14.6	5.3	1.9	11.1	154.0
Central Luzon	127.4	0.2	4.9	1.6	7.8	141.9
Southern Luzon	119.1	0.1	3.3	2.3	13.9	138.7
Metropolitan Manila	97.4	0.2	4.2	2.5	20.5	124.8
Bicol	113.7	1.2	11.1	7.6	8.2	141.8
Western Visayas	113.7	9.5	10.2	5.5	10.0	148.9
Central Visayas	41.4	81.0	15.1	7.5	9.9	154.9
Eastern Visayas	98.8	28.7	30.8	13.7	10.4	182.4
Western Mindanao	81.7	42.5	18.2	10.0	11.0	163.4
Northern Mindanao	89.4	47.4	17.4	8.2	8.8	155.2
Eastern Mindanao[a]	76.0	47.3	10.4	4.9	10.1	148.7
Central Mindanao	100.2	17.0	15.6	11.0	9.5	153.3

Source: E. E. Aviguetero et al., "Regional Consumption Patterns in Major Foods, 1974-76," Bulletin 78-13, Planning Service, Ministry of Agriculture, Quezon City, 1978.

a/This region is described in other tables as Southern Mindanao.

Wheat consumption does not show marked differences between regions except in metropolitan Manila, where average consumption is about twice as high as in the other regions.

By grouping the regions into the three major islands (that is, Luzon, Visayas, and Mindanao), the following pattern is observed (Figure 2). Where rice consumption is high, consumption of the less-preferred staples is insignificant. This is true in Luzon. And where rice consumption is low, consumption of corn and root crops is high, a pattern observed in Visayas and Mindanao.

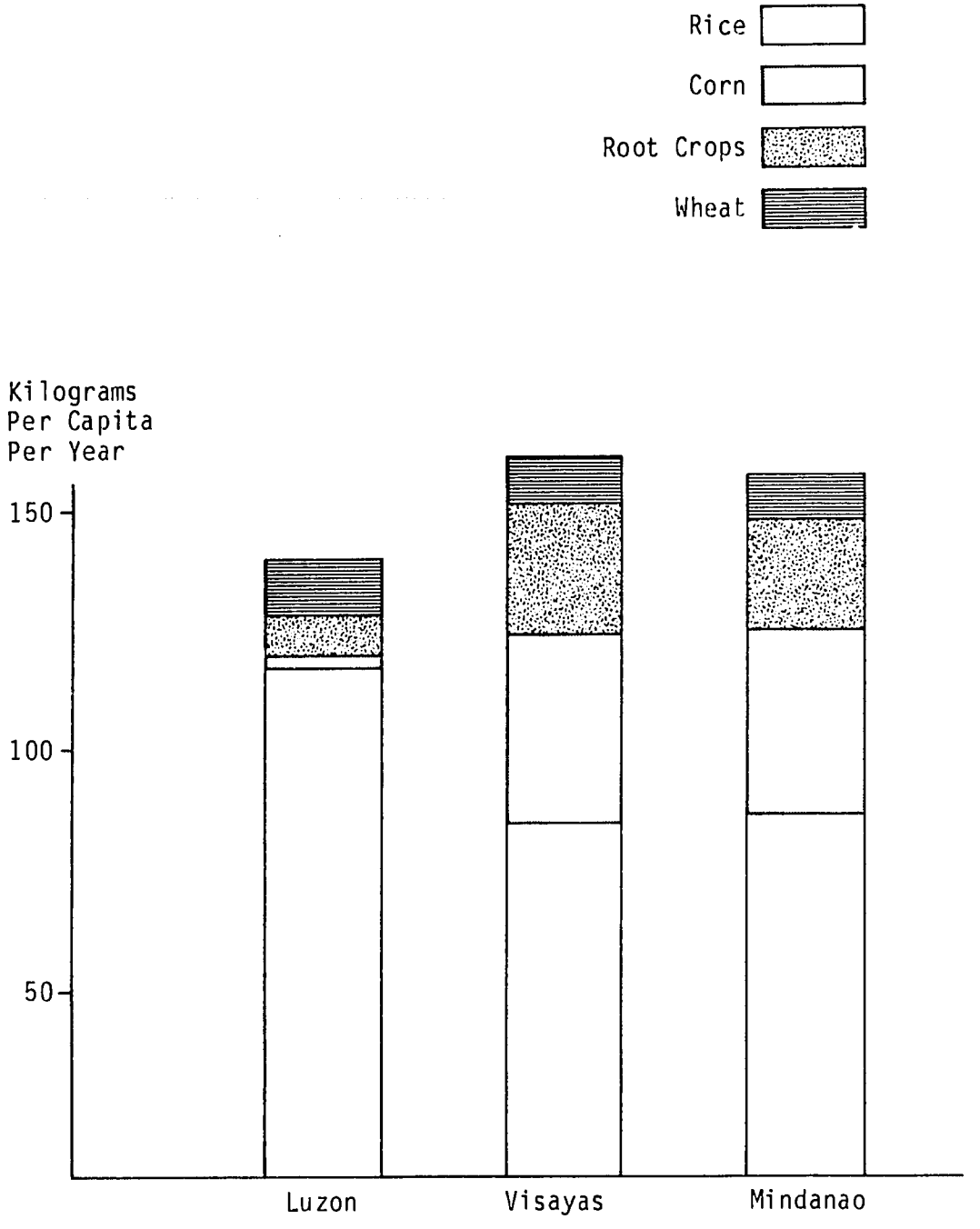
URBAN AND RURAL VARIATIONS IN STAPLE CONSUMPTION

The urban/rural data show striking differences in staple consumption (Figure 3). For total staples the pattern characteristically shows higher consumption in rural households, with consumption decreasing as households become more urbanized. Rice consumption in rural households is about 20 kilos more or 25 percent higher than among urban (metropolitan Manila) households. Also, rural households consume more than twice the amount of the less-preferred staples (that is, corn and root crops) than their urban counterparts. The rate of adoption of wheat products increases significantly with urbanization.

Food consumption patterns among urban and rural Filipino households are compared in Table 5. While urban households consume fewer staples, they consume more of other foods--particularly fish, meat and poultry, dairy products, eggs, and sugars and syrups--than their rural counterparts. Rural households derive almost 80 percent of their calorie intake from staples. Urban households reportedly meet 91 percent of their energy needs and 111 percent of their protein needs, while rural households meet only 87 percent of their energy needs and 99 percent of their protein needs.17/

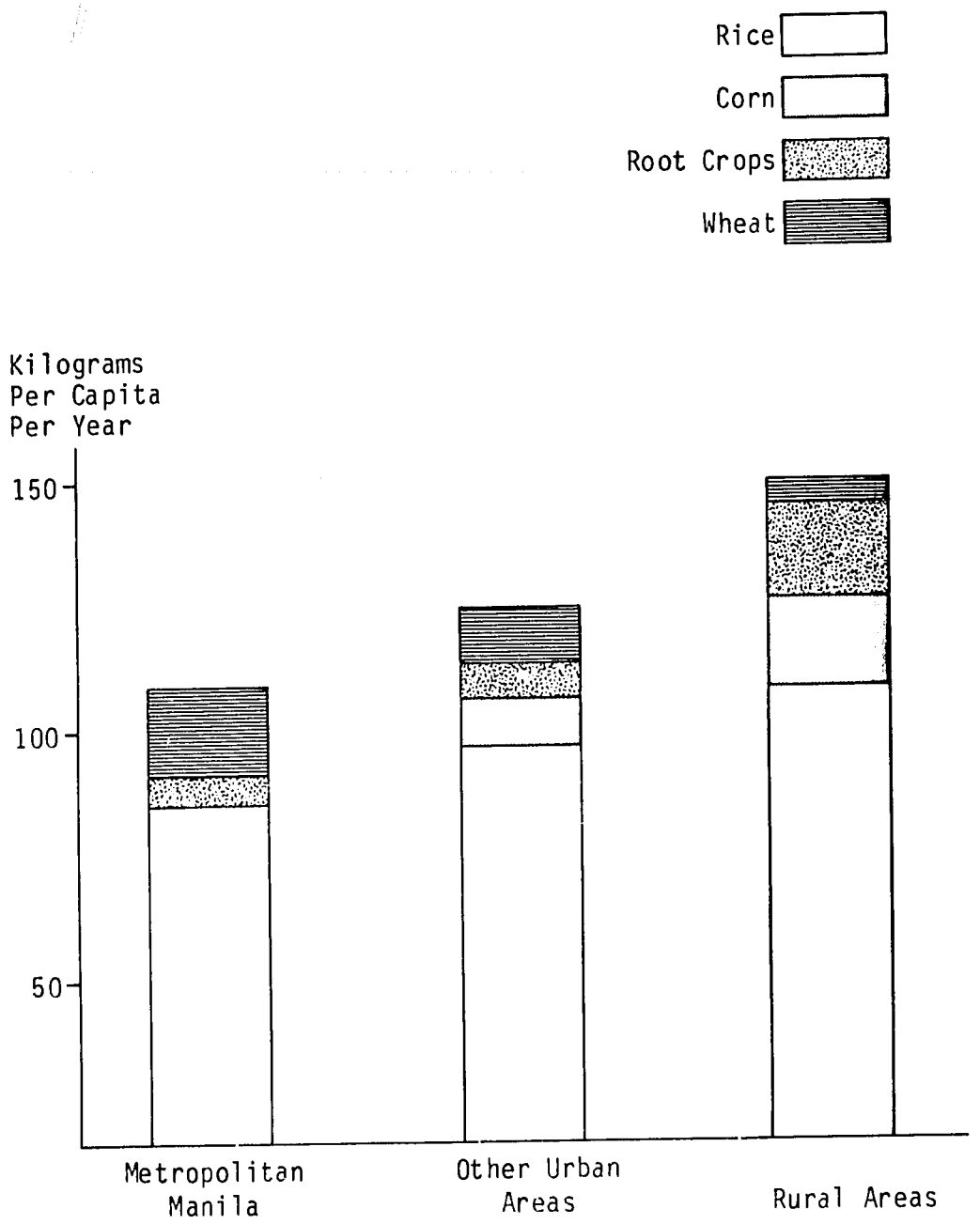
17/FNRI, First Nationwide Nutrition Survey, 1978.

Figure 2--Average per capita consumption of staples, by island group, 1974-76



Source: E. E. Aviguetero et al., "Regional Consumption Patterns in Major Foods, 1974-76," Bulletin 78-13, Planning Service, Department of Agriculture, Quezon City, 1978.

Figure 3--Average per capita consumption of staples in metropolitan Manila, other urban areas, and rural areas, 1975-79



Source: G. Villavieja, "A Food Consumption Profile of the Philippines," Food and Nutrition Research Institute, Manila, 1978.

Table 5--Average per capita food consumption in urban and rural areas, 1978

Food	Urban		Rural	
	(kg.)	(kilocalories)	(kg.)	(kilocalories)
Energy foods				
Cereals and cereal products	118	1,106	142	1,336
Starchy roots and tubers	7	21	17	49
Sugars and syrups	16	106	7	46
Fats and oils	7	137	4	70
Body-building foods				
Fish, meat, and poultry	61	171	42	118
Eggs	5	19	2	7
Milk and milk products	20	157	8	63
Dried beans, nuts, and seeds	3	22	3	22
Regulating foods				
Fruits and vegetables	93	81	91	79

Source: Food and Nutrition Research Institute, First Nationwide Nutrition Survey, 1978: A Summary Report, FNRI Publication GP-11 (Manila: FNRI, 1979).

Given these variations in food consumption by location, it is important that the effects of migration on consumption be thoroughly investigated. It may be of interest to mention, for example, that in his study of the rice economy in the Philippines, Mears partly attributed the marginal increases in per capita consumption of rice in 1954-69, which occurred in spite of increases in real income, to two types of population shifts:18/ from rural to urban areas, and to frontier corn-eating areas. Recent migration trends point to a decline in migration between rural areas, greater mobility between urban areas, and increasing migration from urban and metropolitan areas to rural areas.19/ These new migration patterns, if persistent, could significantly alter the country's food demand structure in the future.

18/Mears, Rice Economy of the Philippines.

19/G. T. Castillo, Beyond Manila: Philippine Rural Problems in Perspective, vol. 1 (Los Baños: University of the Philippines, 1977); and E. M. Pernia and C. W. Paderanga, Jr., "Urbanization and Spatial Development in the Philippines: A Survey," Discussion Paper 80-01, University of the Philippines School of Economics, Quezon City, 1980.

STAPLE CONSUMPTION PATTERNS BY INCOME LEVEL

Figure 4 shows average consumption of staples by income group. Preferred staples include rice and wheat; less-preferred staples include corn, sweet potatoes, and cassava. The importance of the less-preferred staples in the diet of low-income households is obvious. Furthermore, seasonal substitution between preferred and less-preferred staples is pronounced among the poorer households.

Figure 4 also shows how staple consumption reflects harvesting schedules. Rice consumption (represented by the preferred staple line) is lower in September, before the main harvest, and higher in June, just after the off-season harvest. Consumption of less-preferred staples is higher in March (February and March are peak production months for sweet potatoes) and lower in June, when the first crop of corn is planted. Whether less corn is consumed in June because corn is not available or because corn consumers shift to rice soon after the main rice harvest in June is not known.

Average per capita consumption and expenditure shares for major food groups by income are given in Tables 6 and 7.20/ Significant differences between low- and high-income households are observed in the expenditure shares for cereals and red meat.

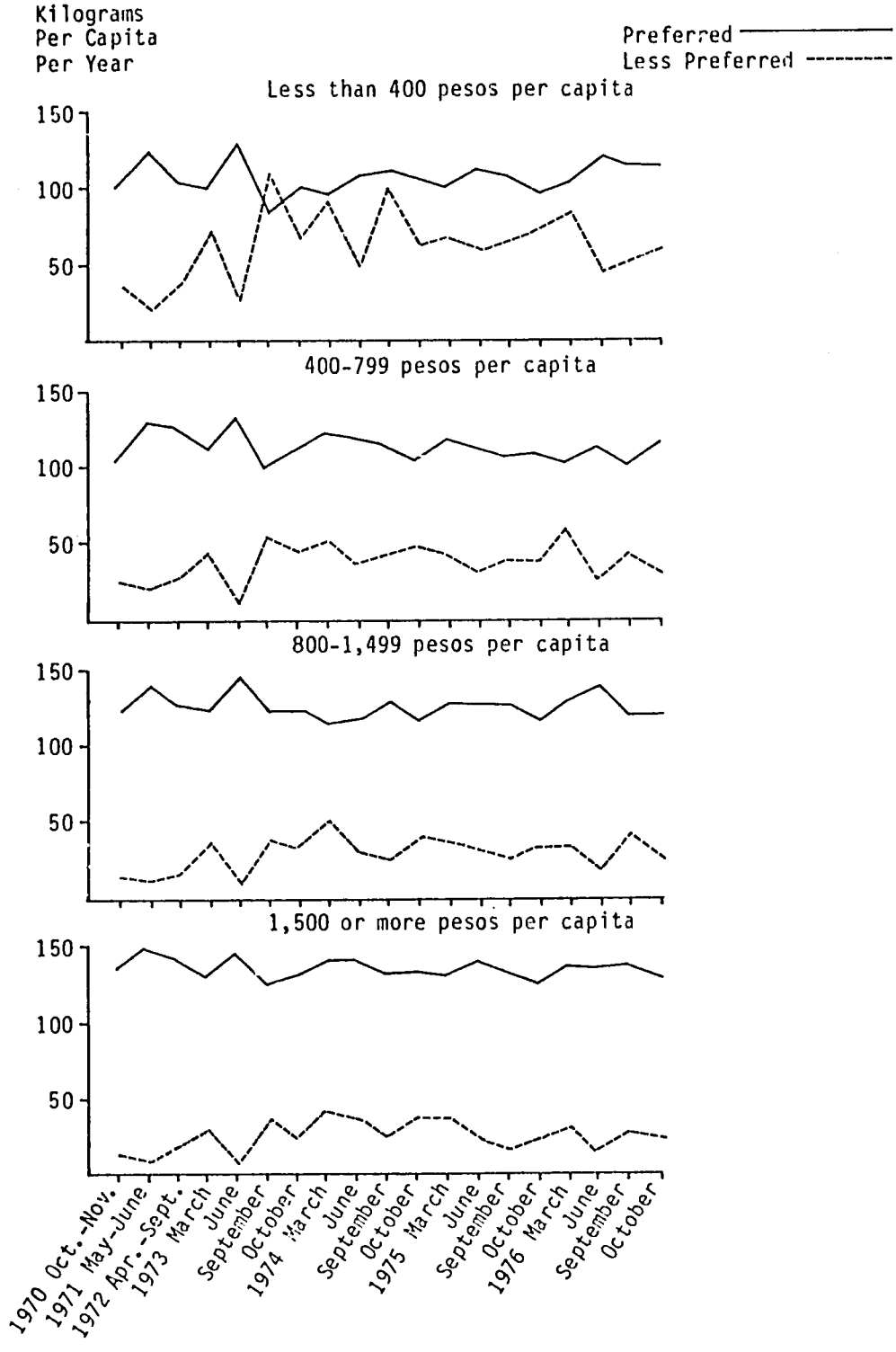
SUMMARY

Average per capita consumption of rice has been stable during the past five years. Corn and root crops are substituted for rice during rice shortages. This was particularly evident during the rice crisis in 1973. Trends in wheat consumption appear to be influenced by price trends; per capita wheat consumption falls if wheat prices are high and staple prices are stable. Total staple consumption in general has remained stable with a slight tendency to decrease.

There are wide variations in the staple consumption of the different population groups. Land use patterns largely determine regional consumption patterns. Consumption of all staples except wheat decreases with urbanization. Consumption of nonstaples is higher in urban households. Substitution between preferred and less-preferred staples among the low-income households is evident.

20/Bennagen, "A Study of Food Consumption."

Figure 4--Average per capita consumption of preferred and less-preferred staples by income group, 1970-76



Source: E. E. Aviguetero et al., "Income and Food Consumption (Summary of 19 Economic Surveys)," Bulletin 78-15, Planning Service, Ministry of Agriculture, Quezon City, 1978.

Table 6--Average per capita consumption of major food groups by income

Food Group	Annual Income: Low (<4,000 pesos)	Middle (4,000-8,000 pesos)	High (>8,000 pesos)
	(kilograms per year)		
Cereals	134.0	134.1	141.6
Red meat	6.2	9.7	16.6
Poultry	2.6	3.2	5.8
Eggs	1.8	3.2	5.1
Dairy products	5.3	7.3	10.1
Seafood	22.0	25.2	28.9
Fruits	42.3	41.4	52.7
Vegetables	32.6	36.6	41.9
Root crops, bulbs, and tubers	20.3	16.2	17.3
All food	267.0	277.1	320.0

Source: M. E. C. Bennagen, "A Study of Food Consumption and Expenditure Patterns in Philippine Households" (M.A. thesis, University of the Philippines, 1980).

Table 7--Expenditure shares for major food groups by income

Food Group	Annual Income: Low (<4,000 pesos)	Middle (4,000-8,000 pesos)	High (>8,000 pesos)
	(percent)		
Cereals	45.9	41.1	33.7
Red meat	9.5	12.6	17.6
Poultry	4.0	4.3	5.4
Eggs	2.9	3.7	4.0
Dairy products	4.7	5.6	6.9
Seafood	16.4	16.4	16.6
Fruits	5.9	5.6	6.2
Vegetables	7.3	7.8	7.1
Root crops, bulbs, and tubers	3.3	2.8	2.6

Source: M. E. C. Bennagen, "A Study of Food Consumption and Expenditure Patterns in Philippine Households" (M.A. thesis, University of the Philippines, 1980).

4. DEMAND ELASTICITIES: A REVIEW OF THE LITERATURE

A few empirical estimates of the demand elasticities for rice and other foodstuffs are available for years before the seventies. A U.S. Department of Agriculture long-term projection study estimated food demand parameters based on a household survey conducted in 1960.21/ The sampling included 1,220 households in 30 precincts in the Greater Manila area, 32 urban precincts in 22 chartered cities and provincial capitals, 60 precincts within poblaciones of municipalities, and 60 barrios within the sample municipalities. Ten households were drawn from each precinct. Supplementary interviews were conducted to gather data from rural households in chartered cities and provincial capitals. A total of 1,472 households was covered in the survey, which was conducted between the months of March and December.

The results indicate that the income elasticity of demand for rice is low (or even negative) for the three categories of population studied (see Table 8). The coefficients for corn are negative in all categories; for wheat flour they are all positive. Although doubts have been raised about their reliability, these initial estimates gave some evidence that the income elasticity of demand for rice in the country was low.22/

Using aggregate time-series data on rice production, imports, and prices for the period 1955/56-1966/67, Nasol estimated a demand function for rice in the Philippines.23/ Apparent per capita rice consumption was assumed to be equal to per capita production plus imports (data series on stocks were limited). Price and income elasticities were estimated from a system of simultaneous equations and a series of trial regressions. The results indicated that demand for rice was inelastic. The price elasticities ranged from -0.47 to -0.23. The income elasticities that were statistically significant ranged from 0.08 to 0.20. Preliminary analysis included the price of corn in the model, but this was dropped later because of serious multicollinearity among the independent variables.

In the same study Nasol estimated the income elasticity of demand for rice using cross-section household data from the 1961 NCSO-FIES survey. The average income and consumption of 18 income classes for 10 regions were the data used. Sagun's study also made use of the

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21/U.S. Department of Agriculture, Long-Term Projections of Supply of and Demand for Selected Agricultural Products: The Philippines, ERS-Foreign 34 (Washington, D.C.: USDA, n.d.).

22/Mears, Rice Economy of the Philippines.

23/R. L. Nasol, "Price and Demand Analysis for Rice in the Philippines" (Ph.D. dissertation, University of Newcastle upon Tyne, 1970).

Table 8--Income elasticities for selected agricultural products, 1960

Food Crops	Manila	Urban	Rural
Rice	0.001	0.12	-0.15
Corn cereal	-0.64	-0.14	-0.10
Wheat products	0.37	0.40	0.60
Root crops	0.21	0.23	-0.07

Source: U.S. Department of Agriculture, Long-Term Projections of Supply of and Demand for Selected Agricultural Products: The Philippines, ERS-Foreign 34 (Washington, D.C.: USDA, n.d.).

Note: These figures were estimated using this equation:

$$\log C = a + b \log Y + c \log H,$$

where C = quantity consumed, Y = household income, and H = household size. The standard errors of the coefficients were not reported.

NCSO-FIES survey.24/ He examined the regional differences in the income elasticity of demand for rice. The study was based on a subsample of the 1965 NCSO-FIES survey and used original observations.

The elasticity estimates from the studies by Nasol and Sagun are reported in Table 9. In both studies the consumption function was specified in double-log form, and the variables were expressed in per capita terms. No price variables were specified in the models. Sagun's equations included a dummy for location (that is, rural or urban areas), and rice producers were separated from nonrice producers in the analysis. Although the estimates are not strictly comparable, it can be seen that Sagun's estimates are lower and that, for both sets of estimates, the regional elasticities corroborate the hypothesis that the income elasticity varies inversely with consumption. The estimates for Visayas and Mindanao, where average rice consumption is relatively lower, are higher than those for Luzon.

24/R. de Sagun, "Regional Differences in the Income Elasticity of Demand for Rice in the Philippines" (M.S. thesis, College of Agriculture, University of the Philippines, n.d.).

Table 9--Estimates of the income elasticity of demand for rice by region

Region	Nasol		Sagun	
	Quantity[a/]	Expenditure[b/]	Rice Producers[c/]	Nonrice Producers
Manila	n.s.	n.s.	---	0.13
Ilocos	0.23	0.25	n.s.	n.s.
Cagayan Valley	n.s.	n.s.	0.47	-0.06
Central Luzon	0.21	0.33	n.s.	0.06
Southern Tagalog	0.13	0.14	n.s.	n.s.
Bicol	n.s.	n.s.	n.s.	0.12
Eastern Visayas	0.62	0.64	0.17	0.17
Western Visayas	0.16	0.18	0.14	0.08
Northern and Eastern Mindanao	0.28	0.30	0.27	n.s.
Southern and Western Mindanao	0.09	0.12	---	0.11
Philippines	0.22	0.24	0.14	0.09

Source: R. L. Nasol, "Price and Demand Analysis for Rice in the Philippines" (Ph.D. dissertation, University of Newcastle upon Tyne, 1970); R. de Sagun, "Regional Differences in the Income Elasticity of Demand for Rice in the Philippines" (M.S. thesis, College of Agriculture, University of the Philippines, n.d.).

Note: Where n.s. appears, the elasticity was not significant.

a/The quantity elasticity is the percent increase in quantity consumed of rice from a 1 percent increase in household income.

b/The expenditure elasticity is the percent increase in expenditure on rice from a 1 percent increase in income.

c/Rice producers here are those who reported income from the production of rice.

Nasol's estimates of expenditure elasticities are higher than the estimates of quantity elasticities. The expenditure elasticity captures the effects of quality increases in addition to the increases in quantity accompanying income increases. The implied quality elasticities or the difference between the two elasticities, however, appear negligible.25/

The difference between the estimated elasticities for rice and nonrice producers in Sagun's study does not appear to be large.

These cross-section estimates of the income elasticity of demand for rice are consistent with Nasol's estimates based on time-series data presented earlier.

The evidence presented in the two studies indicates that the income elasticity of demand for rice is low, falling in the range of 0.1 to 0.2. Between regions, of course, the range is wider: 0.1 to 0.6 (Nasol) and 0.04 to 0.5 (Sagun).

The SSD food consumption surveys provide a large data base on which more recent food consumption studies are based. While none focus on rice, these studies provide elasticity estimates for a large number of highly disaggregated foodstuffs. These estimates can be useful for food planning and policymaking. Seven of these studies are discussed below.

The SSD series of household surveys (33 rounds since 1970) allow own-price and cross-price elasticities as well as the usual demand parameters to be estimated. The use of survey data series in the estimation of price elasticities does not have the collinearity problems and insufficient aggregation found in aggregated time-series data.26/ Some of the demand studies discussed below consider the influence of prices on food consumption explicitly.

Table 10 gives the estimates of the price and income elasticities of demand for rice from selected food consumption studies based on SSD data.

Aragon used the first round of the SSD survey (October-November 1970).27/ Average consumption and income data were used. The households were grouped into four income groups, and the consumption of households belonging to each group was computed. The elasticities computed are arc elasticities; that is, the average changes in consumption as income increases. The formula used was,

$$(Q_H - Q_L / Q_L) \ / \ (Y_H - Y_L / Y_L)$$

25/The quality elasticity represents the proportionate increase in the average price paid per unit associated with a one unit increase in income. Prais and Houthakker showed mathematically that this elasticity is equal to the difference between the income-expenditure and the income-quantity elasticities (S. J. Prais and H. S. Houthakker, The Analysis of Family Budgets [Cambridge: Cambridge University Press, 1955]).

26/S. A. Hassan and S. R. Johnson, "Urban Food Consumption Patterns in Canada," Economics Branch Publication 77/1, Agriculture Canada, Ottawa, 1977.

27/C. T. Aragon, "Cereals Consumption Patterns of Philippine Households" (M.S. thesis, College of Agriculture, University of the Philippines, 1972).

Table 10--Comparison of price and income elasticity estimates for rice using Special Studies Division survey data

Study	Survey Used	Type of Data Used	Elasticity: Price	Elasticity: Cross-Price	Elasticity: Income
Aragon	1970 (1 round)	Grouped data	---	---	0.05 (quantity) 0.20 (expenditure)
Aviguetero et al.	1970-76 (19 rounds)	Grouped data	---	---	0.09
Bennagen	1976 (4 rounds)	Original	---	---	0.01 (quantity) 0.01 (expenditure)
Ferrer	1970-73 (4 rounds)	Original	-0.53	0.10[a/]	-0.02
Kunkel et al.	1970-73 (4 rounds)	Original	-0.53	0.10[a/]	-0.02
San Juan	1974-76 (9 rounds)	Grouped data	-0.40	0.36[b/]	0.31
Snell	1970-76 (19 rounds)	Grouped data	-0.53	0.31[a/]	0.14

Sources: C. T. Aragon, "Cereals Consumption Patterns of Philippine Households" (M.S. thesis, College of Agriculture, University of the Philippines, 1972); E. E. Aviguetero et al., "Income and Food Consumption (Summary of 19 Economic Surveys)," Bulletin 78-15, Planning Service, Ministry of Agriculture, Quezon City, 1978; M. E. C. Bennagen, "A Study of Food Consumption and Expenditure Patterns in Philippine Households" (M.A. thesis, University of the Philippines, 1980); K. J. Ferrer-Guldager, "The Demand for Selected Agricultural Products for Household Consumption, 1970-80" (M.S. thesis, Asian Social Institute, 1977); D. E. Kunkel, J. C. Alix, and V. Orogo, "Estimates of Demand Elasticities for Selected Agricultural Products in Major Philippine Areas: Manila, Urban and Rural Areas, 1970-80," Journal of Agricultural Economics and Development 8 (November 1978); E. San Juan, "A Complete Demand Model for the Philippines" (M.S. thesis, University of the Philippines at Los Baños, 1978); and J. G. Snell, "Estimating Demand Parameters from Secondary Sources: Problems and Pitfalls--A Philippine Case," University of the Philippines at Los Baños, n.d. (Mimeographed.)

a/Price of corn.
b/Price of wheat.

where the subscript H refers to the highest income groups and L to the lowest. Both income-quantity and income-expenditure elasticities were computed.

Ferrer estimated the demand for selected agricultural crops based on original data from the first four rounds (October-November 1970, May-June 1971, August-September 1972, and February-March 1973).28/ The study was undertaken for Project ADAM (Agricultural Diversification and Markets).29/ The analysis was made in two stages: the data were pooled and fitted into different functional forms; then the data were analyzed by round. Consumption was regressed on household income, household size, the price of each commodity, and the prices of related goods. The results reported in Table 10 are from the first stage. Round-by-round analysis resulted in higher values of the price elasticity (-0.85) in one of the surveys (February-March 1973).

Kunkel et al. also made their estimates for Project ADAM.30/ The study used the same survey rounds and methodology followed by Ferrer, which explains the results in Table 10.31/ Data were analyzed, however, for three population groups: Manila, urban, and rural.

The study by Aviguetero et al. was made by the SSD staff.32/ Arc elastiticites for about 80 foodstuffs are reported by region. No price elasticities were estimated.

San Juan estimated a complete demand model for the Philippines using both aggregate time-series and household-series data.33/ For the food commodity group, average data from nine survey rounds were used. Income and price elasticities of demand for 22 food commodities were estimated by regression analysis and were used, with budget proportions and under different assumptions of want-independence among the commodities, to construct the full demand matrix.34/ The construction was based on restrictions implied by consumer theory. The specific procedures used by San Juan in constructing the demand matrix are discussed below.

28/K. J. Ferrer-Guldager, "The Demand for Selected Agricultural Products for Household Consumption, 1970-80" (M.S. thesis, Asian Social Institute, 1977).

29/Project ADAM (1972-78) was primarily involved with the construction of a mathematical programming model for the Philippine agricultural sector. A set of technical papers highlighting the major findings of the project is presented in a special issue of the Journal of Agricultural Economics and Development 8 (November 1978).

30/Kunkel et al., "Estimates of Demand Elasticities."

31/Ferrer-Guldager, "Demand for Agricultural Products."

32/Aviguetero et al., "Income and Food Consumption."

33/E. San Juan, "A Complete Demand Model for the Philippines (M.S. thesis, University of the Philippines at Los Baños, 1978).

34/R. I. Frisch, "A Complete Scheme for Computing All Direct and Cross Demand Elasticities in a Model with Many Sectors," Econometrica 27 (April 1959): 177-196.

Bennagen examined the food consumption patterns of Philippine households.35/ The analysis included 34 foodstuffs. Original data from four survey rounds were fitted into the semi-log function, and income, expenditure, quality, and household elasticities were estimated. Analysis was done for Luzon, Visayas, and Mindanao and, with less disaggregation, by income group.

Snell used published average data from 19 rounds to estimate demand parameters for cereals.36/ Fitted linear models were used for the variables and parameters, and constraints were applied to the parameters. The estimates given in Table 10 are from the most constrained model (undeflated) fitted across all income groups with an intercept shifter to account for seasonal variation in consumption. The dependent variable was the per capita annual rate of consumption. Independent variables were annual per capita income and mean (implicit) prices of rice, corn, wheat, and pork. For rice, the cross-price elasticities for wheat and pork were not statistically significant.

The income elasticity estimates reported in Table 10 are all low and support the evidence presented earlier that the demand for rice is highly inelastic with respect to income. The estimates of the price elasticity of demand for rice are also low (-0.4 to -0.5), suggesting that rice has no close substitutes. This is consistent with the observation of Mears that a majority of the rice-eating population are likely to shift to lower quality rice rather than to other cereals when the price of rice increases and to higher quality rice as the price of rice falls.37/

How well specified were the consumption models from which these estimates were derived? As pointed out earlier, the models of Ferrer, Kunkel, San Juan, and Snell explicitly included both own-price and cross-price variables aside from income. The other estimates therefore suffer from some bias as a result of the exclusion of prices from the model.38/ Prices and income in San Juan's model were appropriately deflated by a food price index, while the rest used undeflated data.

The use of original data rather than grouped data also introduces some bias in the estimates.

The evidence on the cross elasticity of demand for rice is somewhat vague. The only attempt at constructing a full demand system for the Philippines is the work by San Juan.39/ Table 11 presents the complete elasticity matrix for food and for other groups.

35/Bennagen, "A Study of Food Consumption."

36/Snell, "Estimating Demand Parameters."

37/Mears, Rice Economy of the Philippines.

38/P. Rao and R. L. Miller, Applied Econometrics (Belmont, Cal.: Wadsworth Publications, 1971).

39/San Juan, Complete Demand Model.

Table 11--Elasticity matrix for food and nonfood commodities

Commodity	Rice	Wheat	Corn	Pork	Beef	Poultry	Fresh Fish	Processed Fish	Crustaceans
Rice	-0.4015	0.0225	-0.0071	0.0254	0.0232	0.0077	0.0361	-0.0028	0.0062
Wheat products	0.0469	-1.6534	0.0390	0.1630	0.2312	0.0540	0.3700	+0.0570	-0.0020
Corn	-0.0075	-0.0237	0.0688	-0.0120	-0.0380	-0.0040	-0.0600	-0.0200	0.0090
Pork	+0.0317	0.1214	-0.0224	-1.2851	0.5300	0.0100	0.0700	0.0000	0.0015
Beef-carabeef	0.1056	0.4064	-0.0746	1.2595[a/]	-3.1562	0.6735	0.1288	0.0089	-0.0006
Poultry and poultry products	0.0234	0.0901	-0.0165	0.0275	0.605	-0.9776	-0.0655	-0.0250	0.0051
Fresh fish	0.0468	0.1802	-0.0331	0.0549	0.0396	-0.0189	-1.5243	0.1624	-0.0078
Processed fish	0.0231	0.0888	-0.0163	0.0271	0.0195	-0.0093	0.4475	-0.6040	0.0113
Crustaceans	-0.0004	-0.0147	0.0027	-0.0045	-0.0032	0.0015	-0.0738	0.0034	-0.6047
Eggs	0.0011	0.0041	-0.0007	0.0012	0.0009	-0.0004	0.0205	-0.0009	0.0004
Dairy products	0.0018	0.0070	-0.0013	0.0021	0.0015	-0.0007	0.0353	-0.0016	0.0007
Fruits	-0.0009	-0.0034	0.0006	-0.0010	-0.0007	0.0004	-0.0172	0.0008	-0.0004
Vegetables	0.0328	0.1264	-0.0232	0.0385	0.0277	-0.0132	0.6364	-0.0294	0.0134
Miscellaneous	0.0280	0.1079	-0.0198	0.0329	0.0237	-0.0113	0.5482	-0.0251	0.0114
All food	-0.0730	-0.0229	-0.0135	-0.0308	-0.0138	-0.0133	-0.0435	-0.0120	-0.0093
Nonfood	-0.2410	-0.0545	-0.0554	-0.0726	-0.0293	-0.0359	-0.1215	-0.0547	-0.0176
Expenditure proportions	0.1402	0.0355	0.0303	0.0475	0.0200	0.0223	0.0747	0.0291	0.0126

a/This is a prespecified cross elasticity.

Table 11--Continued

Commodity	Eggs	Dairy Products	Fruits	Vegetables	Miscel-laneous	All Food	Nonfood	Income
Rice	0.0058	0.0050	0.0031	0.0176	0.0098	-0.2578	-0.0478	0.3056
Wheat products	0.0023	0.0020	-0.0189	0.1771	0.1050	-0.5120	-0.0940	0.6060
Corn	0.0080	0.0030	0.0128	-0.0260	-0.0160	-0.1100	-0.0200	-0.9396
Pork	0.0005	-0.0026	-0.0131	0.0316	0.0168	-0.5209	-0.0955	0.6224
Beef-carabeef	-0.0010	-0.0045	-0.0191	0.0567	0.0317	-0.6120	-0.1110	0.7230
Poultry and poultry products	0.0020	-0.0012	-0.0047	-0.0355	-0.0238	-0.4174	0.0755	0.4929
Fresh fish	0.0079	0.0135	-0.0156	0.4463	0.2729	-0.3880	-0.0709	0.4589
Processed fish	0.0098	0.0100	0.0179	-0.0343	-0.0206	-0.0384	-0.0077	0.0461
Crustaceans	-0.0033	-0.0082	-0.0242	-0.0339	0.0169	-0.6970	-0.1280	0.8250
Eggs	-0.5473	-0.0031	-0.0708	-0.0084	0.0067	-0.5272	-0.0956	0.6228
Dairy products	0.0005	-0.4452	-0.0055	0.0143	0.0069	-0.4020	-0.0740	0.4760
Fruits	0.0214	-0.0030	-0.4006	0.0255	0.0143	-0.3217	-0.0586	0.3803
Vegetables	0.0009	0.0094	0.0227	-1.1388	-0.0333	-0.3468	-0.0632	0.4138
Miscellaneous	0.0078	0.0081	0.0194	-0.0441	-0.9918	-0.3171	-0.0570	0.3741
All food	-0.0119	-0.0163	-0.0276	-0.0296	-0.0207	-0.3305	0.0620	0.3925
Nonfood	-0.0280	-0.0446	-0.0841	-0.0874	-0.0594	-1.0070	-0.9074	1.907
Expenditure proportions	0.0183	0.0276	0.0502	0.0527	0.0280	0.5990	0.4010	

Source: E. San Juan, "A Complete Demand Model for the Philippines" (M.S. thesis, University of the Philippines at Los Baños, 1978).

The demand matrix was constructed using prespecified own-price and income elasticities and some cross-price elasticities, together with expenditure proportions and a money-flexibility estimate. It was based on restrictions implied by consumer theory. The specific procedure used is identical to the one used by Hassan for the Canadian economy:40/

- Income elasticity for food was calculated as a weighted average of the income elasticities of the 14 food commodities, the weights being expenditure proportions.

- The income elasticity for all nonfood commodities was derived using the Engel Aggregation Condition. Direct and cross-price elasticities for total food and total nonfood commodities were calculated on the basis of want, independence, and a money-flexibility estimate of -3.12.

- Cross-price elasticities for individual food commodities with respect to nonfood prices were calculated on the assumption that the marginal utility of each food commodity is not affected by the quantities of nonfood commodities.

- Cross-price elasticities showing the effects of individual food commodity prices on consumption of nonfood were obtained by using the symmetry relationship.

- Finally, cross-price elasticities were calculated for each food commodity in the following manner: the sum of the food cross elasticities in each row was obtained by applying the homogeneity condition (denote this sum as S_1 [i=1..., 14]); the column vector of cross elasticities was calculated by means of Cournot Aggregation and by assuming that the individual cross elasticities are proportional to S_i; given a column vector of cross elasticities, the corresponding row vector was calculated by the symmetry relationship. (A number of cross elasticities in San Juan's study were prespecified, however.)

The cross-price elasticities for rice reported in Table 11 suggest that in general the effect of changes in the prices of other foodstuffs on rice consumption is minimal. This is consistent with the fact that rice is the main staple. Demand for rice appears to be most affected by changes in the prices of fish, pork, beef, and wheat.

Elasticity estimates based on the 1978 FNRI survey are reported in Table 12.41/ These are income-quantity elasticities estimated by regression analysis using original observations. Prices were not considered in the model. The estimates were made by the FNRI staff.

40/S. A. Hassan and S. R. Johnson, "Consumer Demand for Major Foods in Canada," Economics Branch Publication 76/1, Agriculture Canada, Ottawa, 1976.

41/FNRI, First Nationwide Survey.

Table 12--Estimated income elasticities for staples based on the FNRI survey, 1978

Staple	Philippines	Urban	Rural	Per Capita Income: 500 Pesos	500-1,500 Pesos	1,500 Pesos
Rice	0.09	0.01	0.19	0.12	0.15	-0.08
Corn	-0.19	-0.09	-0.30	-0.21	-0.21	-0.15
Sweet potatoes	---a/	-0.03	0.02	-0.07	0.02	0.02
Cassava	-0.08	-0.06	-0.09	-0.09	-0.16	-0.03
Wheat and wheat products	0.42	0.46	0.37	-0.19	0.67	0.26

Source: Food and Nutrition Research Institute, First Nationwide Nutrition Survey, 1978: A Summary Report, FNRI Publication GP-11 (Manila: FNRI, 1979).

a/Inclusive 0.0004.

The estimates in general are low. The income elasticity of demand for rice (0.10) is within the range of values reported earlier using different data sets. Rural estimates are higher than urban ones except for wheat. The elasticity estimates by income for rice, corn, and cassava appear to be reasonable. For rice, the income elasticity is positive for the two lower income groups and negative for the highest. For corn and cassava, the elasticities are negative for all income groups. The consumption patterns described earlier suggested that these crops are among the less-preferred or inferior staples. The estimates for sweet potatoes and wheat, however, are questionable.

Expenditure elasticities by income group for five food categories are reported in Table 13. These are from Ranade and Goldman's study based on NCSO grouped data (1971 survey).42/ The estimates indicate that the size of the income effect on food consumption varies significantly between income groups and between rural and urban households.

If the expenditure elasticity of demand for cereals is 1.05 for the lower 40 percent of the rural population, Ranade and Goldman believe that the expenditure elasticity of demand for rice would be at least 0.40 for the group. This is markedly above the estimates of FNRI for households with incomes less than 500 pesos per capita (0.12) and SSD's estimate of 0.08 for the lowest income group. Given the skewed income distribution existing in the country, the estimates of Ranade and Goldman appear valid. Furthermore, their estimates clearly support the hypothesis that the income elasticity of demand for food varies inversely with income.

42/H. W. Goldman and C. G. Ranade, "Food Consumption Behavior by Income Class in Rural and Urban Philippines." Occasional Paper 90, Department of Agricultural Economics, Cornell University, Ithaca, N.Y., 1976.

Table 13--Expenditure elasticities for foodstuffs, BCS-FIES, 1971

Food Group	Rural		Urban	
	Lower 40 Percent	Upper 10 Percent	Lower 40 Percent	Upper 10 Percent
Cereals and cereal products	1.05	0.41	0.26	0.37
Seafood and fish	1.53	0.62	0.48	0.54
Meat and eggs	1.63	1.09	1.87	0.97
Milk and dairy products	2.34	1.04	1.32	0.75
Fruits and vegetables	1.01	0.67	0.67	0.67

Source: H. W. Goldman and C. G. Ranade, "Food Consumption Behavior by Income Class in Rural and Urban Philippines," Occasional Paper 90, Department of Agricultural Economics, Cornell University, Ithaca, N.Y., 1976.

Note: Reported elasticities reflect total expenditures.

Using a combination of econometric and simulation techniques, price and income elasticities were estimated for some foodstuffs for the IAPMP project.43/ Both time-series and cross-section data were used (from SSD, FNRI, and FBS). Elasticities based on surveys and judgment were tested against the observed patterns and trends of use and variations in prices and consumer income. The estimates reported in Table 14 are within the range of earlier estimates.

The most recent estimation work on the demand for cereals was done by Bouis at Stanford University for his Ph.D. dissertation.44/ He used the SSD survey series (1970-76). A priori analysis of the expected sign and amount of the demand parameters for cereals was undertaken by combining demand theory with descriptive statistical information on the same data, such as budget shares, per capita consumption, and the proportion of population reporting consumption. This was then subjected to empirical verification. However, the empirical results have not yet been reported completely.

Working from the Slutsky equation (the own-price elasticity is equal to the income-compensated price effect plus the constant-prices income effect), several results were expected.

For both the nonfarming and farming sectors, the income elasticity is positive for rice and wheat but is negative for corn.

For nonfarmers and farmers, the own-price elasticity for rice and wheat is unambiguously negative; for corn it is negative as long as the expenditure share of corn is small. For farmers the own-price elasticity is negative for wheat, while for rice it is negative when the proportion of income from rice is small.

43/IAPMP, Food Consumption Patterns.

44/H. E. Bouis, "The Estimation of Demand Parameters for Cereals for the Philippines by Income Group and By Farming and Non-Farming Occupations," Food Research Institute, Stanford, Cal. (Mimeographed.)

Table 14--Estimates of price and income elasticities for staples

Staple	Income Elasticity	Price Elasticity	Cross-Price Elasticity
Rice	0.20	-0.37	0.43 (with corn)
Corn, food	-0.20	-0.40	0.30 (with rice)
Corn, feed	0.84	-0.65	0.83 (with livestock)
Sweet potatoes	0.25	-0.25	---
Cassava	0.20	-0.20	---
Wheat	0.45	-1.30	0.68 (with rice)

Source: Integrated Agricultural Production and Marketing Project, Food Consumption Patterns and Prospects for the 1980s (Quezon City: Ministry of Agriculture, 1980).

For both sectors, cross-price elasticities are positive as long as the expenditure shares of corn and wheat are small. An exception is made for the cross-price elasticity of wheat with rice, which may be positive or negative.

Among nonfarmers, the absolute value of the own-price and cross-price elasticities across income groups is higher for lower income groups. This suggests that poor households are more sensitive to prices than rich households. For the farming sector, nothing was concluded a priori.

For both sectors for a given income group, cross-price elasticities of rice with respect to corn and wheat are smaller than cross-price elasticities of corn and wheat with respect to rice.

SUMMARY

The evidence presented in this section indicates that the demand for rice is inelastic with respect to both income and prices. Based on available estimates, it may be reasonable to assume that the income elasticity of demand for rice is between 0.1 and 0.2 while the price elasticity is between -0.3 and -0.5 (Table 15). Although the evidence on the cross elasticity of demand for rice is lacking, rice consumption appears to be little affected by changes in the prices of other foodstuffs. The patterns described in Chapter 3 do provide some evidence that substitution between staples has occurred, particularly between rice and the less-preferred staples such as corn and root crops. The rice crisis in 1973 in particular revealed that some segments of the population will consume the less-preferred staples as substitutes for rice if the changes in their relative prices are significant. Future government food price policies and some underlying economic forces that affect relative prices could determine the degree and rate of such substitution.

Table 15--Summary of income and price elasticities for rice

Data Used	Income Elasticity	Price Elasticity
SSD	-0.02 to 0.30	-0.40 to -0.50
FNRI	0.10	---
NCSO	0.10 to 0.20	---
Time series[a/]	0.08 to 0.20	0.20 to 0.50

a/Aggregate production data.

There is some evidence about the differing effects income and prices have on the amount of rice consumed by different population groups. Low-income households are more sensitive to changes in income and prices than high-income households. Likewise, rural households respond more readily to income changes than urban households do. (There are no available estimates of the price elasticity of demand for rice of urban and rural households.)

The regional estimates appear to indicate that the income elasticity of demand for rice is inversely correlated to consumption. Hence, differences in elasticity by region were observed to result from differences in rice consumption. Income elasticities were higher in regions where rice consumption was lower and lower where rice consumption was higher.

The evidence on the demand for corn clearly suggests that corn is an inferior cereal in the Philippines. Income elasticity estimates are negative in all of the studies reviewed. The evidence for sweet potatoes is less definite, but available estimates suggest that income elasticity is low or even negative. The income elasticity of demand of wheat is strongly positive.

5. DEMAND PROJECTIONS FOR STAPLES

Table 16 presents the estimated growth rates of demand for rice, corn, sweet potatoes, cassava, and wheat. The basic assumption in the projection model is that, with prices constant, demand increases with population and income growth. That is,

$$Q_r = P_r + (Y_r \cdot e_y),$$

where:

Q_r = growth rate of demand;

P_r = population growth rate;

Y_r = per capita growth rate; and

e_y = income elasticity of demand.

The estimated growth rate for rice suggests that future demand for rice in the country will be influenced mainly by population growth. A strong demand for wheat is projected. The trend of per capita consumption of corn will continue to decline, while root crop consumption will barely increase.

Demand for rice in the Visayas and Mindanao regions is projected to increase faster than in Luzon as rice is substituted for corn in the corn-eating regions. The projected increased demand for wheat throughout the country is explained by the strong positive income elasticity of demand for wheat described earlier.

It is to be noted that the projections made here do not account for the influence of other important variables of demand. In particular, the model does not account for the effects of changes in relative prices or of such long-term forces that affect demand as changes in tastes and demographic shifts. The future demand for staples in particular and for food in general will be determined by the interplay of these factors.

Table 16--Estimated growth rates of demand for staples, by region, 1990

Region	Rice	Corn	Sweet Potatoes	Cassava	Wheat
			(percent)		
Ilocos	1.48	-6.38	1.55	-1.56	5.71
Cagayan Valley	2.80	-4.08	3.82	-1.34	9.45
Central Luzon	2.52	a/	6.04	4.74	5.61
Southern Luzon	1.90	a/	5.50	1.02	5.76
Metropolitan Manila	3.35	a/	5.06	0.16	4.57
Bicol	1.50	a/	1.17	-1.07	3.34
Western Visayas	3.55	-0.42	3.02	2.57	7.19
Central Visayas	4.76	-0.37	0.83	0.32	5.45
Eastern Visayas	2.78	-1.20	-0.63	-0.99	6.96
Western Mindanao	2.68	-0.91	0.24	2.28	4.82
Northern Mindanao	2.95	-2.66	1.49	2.46	7.26
Eastern Mindanao	7.56	-1.80	1.32	0.92	7.28
Central Mindanao	2.52	-0.79	2.66	4.38	3.50
Philippines	2.92	-1.23	0.56	0.15	5.80

Notes: Regional elasticities used are those computed by the Special Studies Division staff reported in Table 17. Population data used are revised 1980 estimates from the National Census and Statistics Office. Per capita income data used are old National Economic and Development Authority estimates as the revised income estimates are not yet available for release (Philippines, National Economic Development Authority--United Nations Development Programme/International Bank for Reconstruction and Development, Regional Planning Assistance Project, "Regional Demand Projections for Major Food Items," Technical Paper 5, Manila, 1977). The income projections being revised are much lower than those used here.

a/Elasticities were not computed due to low level of use.

Table 17--Income elasticities used in the projection of growth rates of demand for staples

Region	Rice	Corn	Sweet Potatoes	Cassava	Wheat
Ilocos	-0.01	-1.20	0.00	-0.47	0.63
Cagayan Valley	0.06	-0.82	0.19	-0.47	0.91
Central Luzon	0.02	a/	0.59	0.38	0.52
Southern Luzon	-0.01	a/	0.40	-0.11	0.43
Metropolitan Manila	0.05	a/	0.58	-0.94	0.43
Bicol	0.03	a/	-0.06	-0.67	0.53
Western Visayas	0.15	-0.46	0.07	0.00	0.71
Central Visayas	0.61	-0.50	-0.24	-0.35	0.76
Eastern Visayas	0.13	-0.43	-0.35	-0.40	0.72
Western Mindanao	0.22	-0.50	-0.27	0.14	0.65
Northern Mindanao	0.17	-0.52	-0.01	0.11	0.70
Eastern Mindanao	0.84	-0.78	-0.24	-0.31	0.79
Central Mindanao	0.19	-0.79	0.23	0.74	0.48
Philippines	0.13	-0.59	-0.28	-0.35	0.63

Source: E. E. Aviguetero et al., "Regional Consumption Patterns in Major Foods, 1974-76," Bulletin 78-13, Planning Service, Ministry of Agriculture, Quezon City, 1978.

a/This elasticity was not computed due to low level of use.

6. DIRECTIONS FOR RESEARCH IN STAPLE CONSUMPTION

A thorough investigation of the problem of inconsistencies in per capita consumption estimates from different sources needs to be undertaken. Until accurate and acceptable estimates are obtained, it will be difficult to formulate effective food plans and programs.

More estimates of the demand for staples by different population groups should be made. In particular, the different effects of prices on rural and urban households, on income groups, and on regions need to be studied further. The pooling of the SSD survey series and of the NCSO surveys may help.

Demand projections can be improved by accounting for changes in relative prices and for shifts in the location and age structure of the population. There is evidence that rice consumption, for example, varies among different population age groups.45/ Given that the population growth rate is projected to decline in the next decade, changes in the age structure of the population would affect future demand for staples and for food in general in the country.

Long-term substitution possibilities between rice and its substitutes need to be investigated further. Enough data exist to make extensive work in this area possible.

45/Mears, Rice Economy of the Philippines.

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