

LATIN AMERICA: TREND HIGHLIGHTS
FOR CIAT COMMODITIES

INTERNAL DOCUMENT ECON 1.5

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PREFACE

THIS DOCUMENT IS AN UPDATED VERSION OF INTERNAL DOCUMENT ECON 1.4. ITS PURPOSE IS TO PROVIDE SUMMARIES OF PRODUCTION TRENDS AND THE MARKET SITUATION OF CIAT'S COMMODITIES AND RELATED COMMODITIES OR INPUTS SUCH AS SORGHUM, POULTRY AND FERTILIZER.

THE DIFFERENT SECTIONS WERE PREPARED BY THE COMMODITY PROGRAM ECONOMISTS ON THE BASIS OF DATA FILES AND MORE DETAILED BACKGROUND PAPERS WITHIN EACH PROGRAM.

Overview of the Latin American Agricultural Sector

In spite of extremely rapid industrial and urban growth in Latin America since World War II, one third to one half of the populations of most Latin American countries are still in rural areas. The economic and political pressures from large population sectors in rural and urban poverty are increasingly being felt. How to improve agricultural performance so that the nutritional problems of the low income groups can be improved while simultaneously slowing or at least not hastening the rural-urban migration is the present dilemma of most of the region. Continuing violence in the hemisphere indicates the importance of a solution to the increasing discontent in a rapidly changing environment.

Structural Transformation of the Latin American Economies

Rapid industrialization and urbanization has characterized the development process in both developed and developing countries. From 1950 to 1975 the industrial sector in Latin America grew from 19 to 25 percent of gross domestic product while agriculture's share fell from 22 to 13 percent. Growth rates in industry were almost twice those in agriculture. Average labor productivity in agriculture in Latin America was still only 34 percent of that in the entire economy at the end of the period (Table 1.1).

Urbanization in Latin America has proceeded at dramatic rates in the last three decades. Even though urban populations have increased at very rapid rates of 4 to 6 percent, rural populations have also continued to grow absolutely in most countries. Overall population growth, though still remaining high in comparison with other more developed regions in the world, has finally fallen slightly in the seventies (Table 1.2). The absolute growth of urban populations were staggering with an increase of 50 million in Brazil and 27 million in Mexico from 1950 to 1976 (Figure 1.1). Nevertheless, except in the countries with the highest per capita incomes over one-third and in many cases over one half of the population still remains in rural areas (Figure 1.2). Since there is a high correlation between the population distribution in rural areas and in agricultural employment (0.87 in 1970), rural population size and

changes over time are utilized as a proxy for agricultural labor.

Ranking the Latin American countries by per capita income levels gives some perspective on the structural transformation taking place. With increasing incomes the percentage of employment in agriculture fell from 49 to 16 percent whereas manufacturing increased from 11 to 18 percent. The big gainer, however, was the lower capital and skill requirements sector, which increased from 30 to 45 percent of employment, with the low skilled services as the most important component increasing from 17 to 24 percent of employment (Table 1.3). The lower capital and skill requirement sector has a higher average labor productivity than agriculture except at the highest levels of per capita income. However, in services this mean labor productivity was always lower than in agriculture over the entire income range (Table 1.4). Since this service sector was expected to be a dumping ground for much of the low income rural sector, the productivity gain from migration was much less than expected from the earlier comparisons of Table 1.1.

Structure and Performance of the Latin American Agricultural Sector:

Compared with Asia, the Middle East, and Europe, Latin America is generally considered to have large expanses of unutilized or underutilized land. Nevertheless, a large segment of the agricultural population has extremely small holdings. In 1950 and 1960, 43 and 50 percent of the farms had less than 2 percent of the land. In Mexico two-thirds of the farms had only 1.1 percent of the land in 1970. Even in Brazil with its vast frontiers 27 percent of the farms had only 1.4 percent of the land in 1970. In Argentina in 1960, 40 percent of farms had only one percent of the land (Table 1.5).

Clearly, not all the land area can be utilized for agriculture but these farm sizes were also estimated as being insufficient to earn an adequate income to support a family. This low income farm sector is expected to be the principal contributor of migrants to the urban areas. How productive is this sector and the rest of Latin American food production sector?

One crude measure of performance is the comparison of demand and supply growth. Demand growing more rapidly than supply implies upward pressures on prices or the necessity to import. Conversely, supply growing more rapidly

than demand will enable exports or decreased imports or falling prices. Technological change in agriculture is expected to enable rapid supply shifts enabling price declines and increasing consumption by low income consumers. However, the picture is further complicated by frequent governmental intervention in Latin American food prices through controls or imports to maintain low prices to urban consumers. This discourages agricultural investment and productivity growth.

In Table 1.6 the population, income elasticity, and income growth determinants of food demand growth are presented. Except in the River Plate countries, Chile, and the Caribbean, demand growth has been very rapid, above four percent in most countries. In most countries food demand growth was greater than supply growth (Figure 1.3). Argentina has been an important exporter, Chile, Venezuela and Guatemala, have been reducing their food imports or experiencing reduced prices according to this analysis. Latin America has been self-sufficient but demand has been increasing faster than supply in both the Andean and the Central American countries.

Considering those commodities principally produced by small farmers performance has been worse. In almost all of Latin America demand has been growing more rapidly than supply. Performance has been especially poor in Mexico and Brazil apparently reflecting a policy orientation towards other crops and farm sizes (Figure 1.4).

The implications of the lagging supply growth of the principal food commodities in Latin America is serious especially given the large segments of the populations in many Latin American countries with nutritional inadequacies. What are the absolute nutritional levels and how have these been changing over time? The critical information on nutrition is the consumption levels among the low income sector and the vulnerable segments of the population especially children and pregnant women. Nevertheless, in several regions of Latin America, including the Caribbean, Central America and most of the Andean countries, even the mean calorie levels are below the minimum requirements. In spite of slight improvements from the sixties to the seventies there was not much movement out of the caloric deficit for those countries with nutritional inadequacies. Over this period there were declines in the per capita consumption of roots and tubers and of dry pulses (Table 1.7).

Strategies to Increase Agricultural Output:

In the last decade most of the production increase in CIAT crops has come from area expansion (this report). Corn was an exception to this as yield increases predominated. Yield increases were also very important in many countries in rice production; however, the larger area and the stagnation of upland rice production resulted in the greater importance for area expansion than of yield increase in the continent. More profitable alternatives have been forcing both beans and cassava into more marginal lands.

Over time with rising land values and the increasing prices for these basic food crops yield increasing technology will become more economically feasible. Presently, rotation between areas on the farm and between regions is often substituted for fertilization. Low densities and tolerant but low yielding materials are utilized instead of chemical control of insects and diseases. Generally, prices received by farmers are kept low by imports to benefit urban consumers or suffer tremendous cyclical fluctuation as price collapse occurs in good harvests and governments do not bother to implement price floors and storage policies.

Even with increasing land and product prices in the future, many food crops will not be produced on the prime land or by the large farmers (except when there are assured export markets) because there will be more profitable alternatives with lower risk levels. Hence, it is not always necessary to make a choice between the urban consumer and the small farmer. Except where demand factors are taken care of as exports of beans from Argentina and Chile or by alcohol production with cassava in Brazil, Latin American large farmers are not expected to be interested in beans or cassava. Raising yields on small farms in these basic commodities helps resolve nutritional problems there and by raising small farmers' incomes slows migration rates.

Animal products account for almost 16 percent of total calories and one-third of total protein intake in Latin America (Tables 1.7 and 1.8). The relative importance of meat and milk in the diet varies quite markedly within Latin America, meat being more important than milk in most of the countries except for the Central American nations (excluding Panama), Colombia and Ecuador (Table 1.8). For low income consumers in twelve of the main urban

centers of the region, beef represented between 12 and 26 percent of their food budget and milk another 7 to 19 percent (Rubinstein and Nores)⁴⁴. The importance of animal products in the consumption basket of urban families of all income groups is high, both because of its large weight in the food budget and due to the high estimated values of income elasticities of demand.

In temperate Latin America livestock production increased faster than domestic demand growth enabling increased exports or falling prices. However, in tropical Latin America demand growth was more rapid than production growth (this report). The rate of growth of the area in pastures has been inferior to the rate of growth in cattle stocks indicating a trend towards more intensive cattle production.

The comparative advantage of livestock production in tropical Latin America is expected to be in those areas with low opportunity costs, i.e. the presently marginal land areas of the "Llanos", Brazilian "Cerrado", and the Amazon region (Valdés and Nores⁵², pp.20-21). Often, the soils in these areas are too poor chemically to support crops without very high and probably uneconomic fertilization. In tropical Latin America there are an estimated 848 million hectares of these types of soils occupying 51 percent of the total area (Nores and Rubinstein³⁹, p.12, estimated by Pedro Sánchez)

Thus, the CIAT pasture program strategy is to increase production through new pasture technology based on grass-legume associations, selected for adaptation to acid, low fertility soils. Increased livestock production in these marginal soil areas can help release more fertile land currently in livestock for crop production in the future.

TABLE 1.1. AGRICULTURAL AND INDUSTRIAL SECTORS: SECTORAL SHARES, GROWTH RATES, AND COMPARATIVE SECTORAL PRODUCTIVITIES, 1950-75

COUNTRY	INDUSTRIAL SECTOR							AGRICULTURAL SECTOR							RELATIVE LABOR PRODUCTIVITY OF AGRICULTURE TO TOTAL ECONOMY ^a
	CONTRIBUTION TO TOTAL GDP				SECTORAL GROWTH RATE			CONTRIBUTION TO TOTAL GDP				SECTORAL GROWTH RATE			
	1950	1960	1970	1975	1950-60	1960-70	1970-75	1950	1960	1970	1975	1950-60	1960-70	1970-75	
----- Percent -----															
MEXICO	18	15	11	9	4.5	3.9	1.8	18	22	27	27	6.2	9.4	6.3	0.24
CARIBBEAN	26	23	18	14	4.2	1.4	2.3	13.	14	14	14	5.6	5.9	8.8	0.27
COSTA RICA	43	26	22	19	0.4	4.3	4.0	11	14	18	20	10.6	8.5	8.6	0.61
EL SALVADOR	N.A.	30	26	25	N.A.	3.0	4.3	N.A.	14	18	18	N.A.	8.8	5.3	0.81
GUATEMALA	33	30	27	27	2.9	4.3	6.2	11	12	15	15	4.5	8.2	5.2	0.86
HONDURAS	48	40	37	32	1.6	6.0	0.1	9	12	13	14	7.0	4.0	4.9	0.97
NICARAGUA	46	37	26	23	3.0	6.7	6.3	10	12	22	23	7.3	11.1	6.1	0.48
PANAMA	28	23	18	16	2.5	5.7	1.2	9	13	17	15	8.8	13.6	2.4	0.42
CENTRAL AMERICA	37	31	25	24	2.4	4.7	4.2	10	13	17	17	7.0	3.7	5.2	0.70
VENEZUELA	7	7	6	6	7.0	5.6	3.8	9	14	16	16	9.8	6.6	5.4	0.30
BOLIVIA	32	29	23	14	-0.6	2.9	3.8	15	14	14	14	-0.4	7.9	6.8	0.29
CHILE	13	11	08	10	N.A.	2.6	-0.1	21	23	24	19	N.A.	5.5	-4.3	0.46
COLOMBIA	40	32	26	25	3.1	3.6	5.4	13	17	18	19	6.5	5.7	7.3	0.70
ECUADOR	38	36	29	21	5.7	2.4	4.0	15	16	18	17	6.1	6.9	9.5	0.42
PERU	22	22	17	13	4.9	3.7	-0.2	13	16	19	25	7.2	6.8	7.2	0.31
ANDEAN	25	22	18	16	3.7	2.7	3.8	16	19	20	20	6.3	6.0	4.7	0.44
BRAZIL	26	22	16	14	4.7	4.4	6.5	20	22	22	23	8.9	6.4	10.5	0.32
ARGENTINA	17	16	13	12	2.1	2.4	1.1	27	31	35	37	4.1	5.7	5.4	0.82
PARAGUAY	39	36	35	34	1.9	3.6	5.3	16	16	15	15	1.9	4.1	6.0	0.68
URUGUAY	17	14	16	15	0.0	1.9	-1.5	19	23	23	24	3.9	1.5	1.1	0.99
RIVER PLATE	17	16	14	12	1.9	2.5	1.2	26	29	33	36	4.0	5.3	4.8	0.71
LATIN AMERICA	22	18	15	13	3.8	3.5	3.9	19	21	24	25	6.5	6.8	7.0	0.34

a/ This was calculated as the GDP produced in agriculture divided by the rural population over the total GDP of the economy divided by the total population.

Source: 1950-1960 data based on Economic Commission for Latin America, *Statistical Bulletin for Latin America*, (9).

1970-1975 data based on Inter-American Development Bank, *Economic and Social Progress in Latin America, 1976 Report*, pp.390, 391, 396, 400, 401 (3).

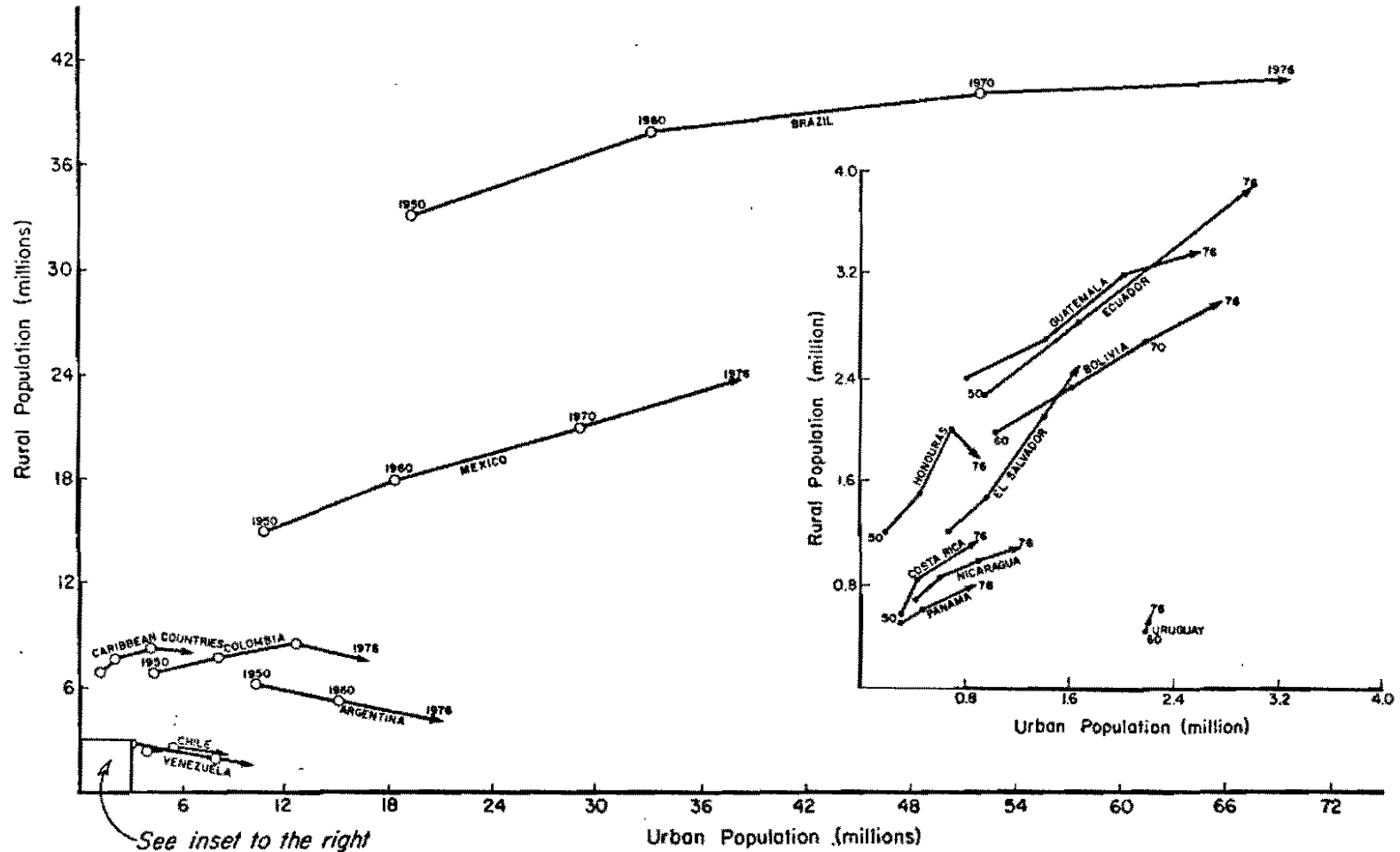
Table 1. Growth Rates of Rural and Urban Population in Latin America during the Three Periods, 1950-1960, 1960-1970, 1970-1976

	P O P U L A T I O N					
	1950-1960		1960-1970		1970-1976	
	RURAL	URBAN	RURAL	URBAN	RURAL	URBAN
MEXICO	1.52	4.88	1.85	4.81	1.79	4.66
CARIBBEAN	1.43	4.50	1.10	6.10	-1.06	5.90
COSTA RICA	3.68	4.16	2.23	4.95	1.71	3.86
EL SALVADOR	2.45	3.34	3.25	3.69	2.97	3.49
GUATEMALA	0.98	5.47	1.73	4.13	1.17	3.79
HONDURAS	2.42	6.18	3.11	4.14	-1.56	5.33
NICARAGUA	1.48	4.08	1.67	4.50	0.66	4.20
PANAMA	2.03	4.39	2.10	4.66	1.58	3.98
CENTRAL AMERICA	2.53	3.20	2.06	4.86	1.09	4.00
VENEZUELA	-0.26	5.69	-0.82	4.92	0.92	2.48
CHILE	0.13	3.68	-0.49	3.48	-3.21	2.41
COLOMBIA	0.90	6.75	1.56	4.18	-2.20	4.47
PERU	-	-	0.05	5.12	0.90	4.60
ANDEAN COUNTRIES	0.85	5.22	0.83	4.41	0.75	3.25
BRAZIL	1.43	5.82	0.57	4.52	0.10	4.93
PARAGUAY	2.12	2.67	2.42	3.22	-	-
RIVER PLATE COUNTRIES	-1.36	3.52	-0.71	2.15	-0.34	1.63
LATIN AMERICA	1.14	4.84	0.89	4.16	0.91	3.71

Source: The 1950, 1960, and 1970 data on total, rural and urban populations were taken from Economic Research Service, Agriculture in the Americas: Statistical Data, F DCD Working Paper, U.S. Department of Agriculture, Washington, D.C., 1976, pp.108 and 111. The 1976 data were taken from Inter-American Development Bank, Economic and Social Progress in Latin America 1976 Report, Washington, D.C., 1977, p.391.

FIGURE 1.1

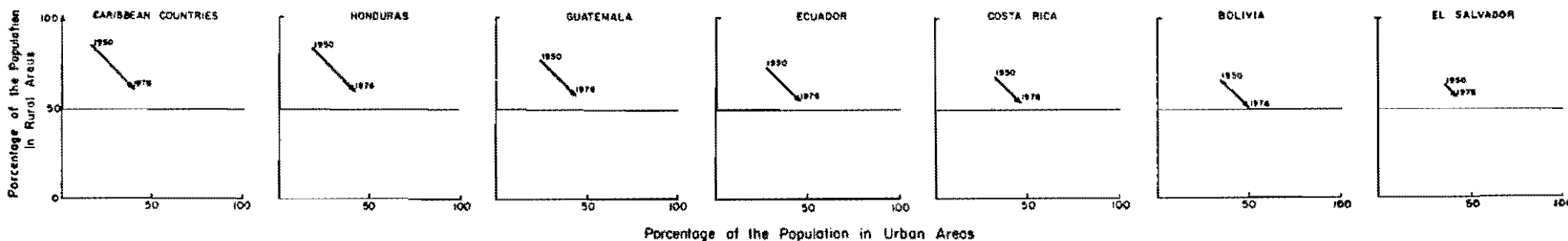
Growth of Rural and Urban Populations in Latin American Countries, 1950-1976



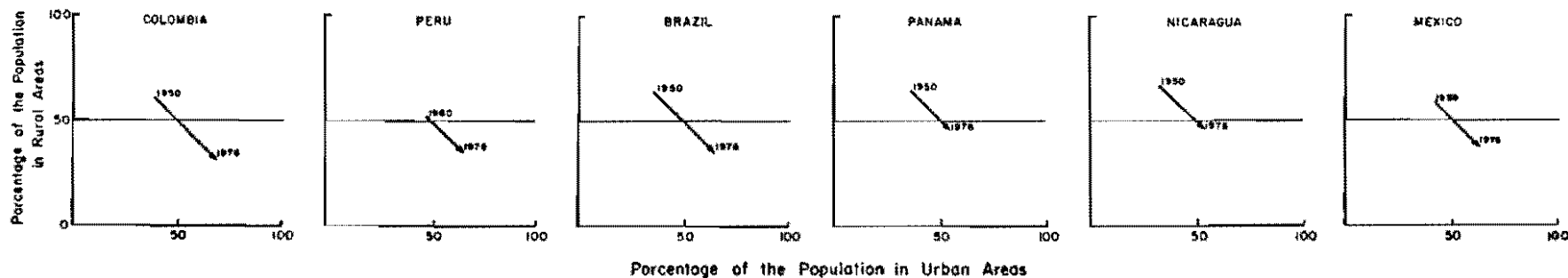
Sources: Same as in Table I.

Population Distribution Between Urban and Rural in Latin America Countries, 1950-1976

Countries with More than 50% of their Population in Rural Areas in 1976



Countries with Less than 50% Rural Population in 1976



Countries with Less than 30% Rural Population in 1976

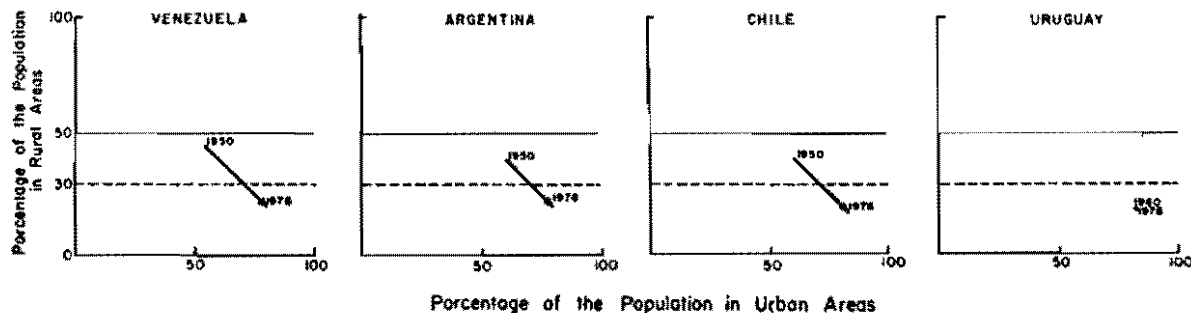


Table 1.3 Percentage Distribution of Employment by Sector in Latin America, 1970

Sector	Means for Countries with Different Per Capital Incomes				Greater than \$1200	Average
	\$251-450	\$451-650	\$651-850	\$851-1200		
	----- Percent -----				--- Percent ---	
Agriculture	49.0	46.2	42.6	22.4	16.2	35.3
Capital and Skill Intensive Urban Employment Sector	15.4	17.4	17.8	22.7	25.7	19.8
Manufacturing	10.9	12.3	12.7	15.2	18.1	13.8
Transport	3.0	3.7	3.7	5.3	6.0	4.3
Lower Capital and Skill Requirement Sector	29.5	28.0	34.9	44.5	45.3	36.4
Construction	4.3	4.1	5.4	6.3	7.2	5.5
Commerce	8.3	8.3	8.2	11.7	14.2	10.1
Services	16.9	15.6	21.3	26.5	23.9	20.8
Highly Skilled Service Employment ^a	5.1	6.4	4.5	7.8	13.0	7.4

a/ Includes banking, insurance, public administration, other business and government services.

Note: The totals may not add to exactly 100 percent due to the exclusion from the sectoral breakdown of the unemployed actively seeking work but entering the labor force for the first time. Since there are other categories in the alpha and beta sectors, they do not sum exactly to the sector total.

Sources:

The employment data were taken from International Labour Organization, (32).

The Latin American countries were grouped according to the levels of gross domestic product per capita from the 1970 data of Inter-American Development Bank, p.396.(31). The countries in the respective categories were:

<u>GDP/Capita Category</u>	<u>Countries</u>
\$251- 450	Bolivia, Guyana, El Salvador, Honduras, Ecuador, Paraguay.
\$451- 650	Dominican Republic, Guatemala, Nicaragua, Colombia, Peru.
\$651- 850	Barbados, Costa Rica, Mexico, Brazil.
\$851-1200	Jamaica, Trinidad and Tobago, Panama, Chile, Uruguay.
More than \$1200	Venezuela, Argentina.

The employment classifications were taken from International Labour Office, p.375 (33).

Table 1.4 Average Labor Productivities by Sector in Latin America Economies, 1970

Sector	Average Labor Productivities in Countries with Different Per Capita Incomes				Greater than \$1200	Average
	\$251-450	\$451-650	\$61-850	\$851-1200		
----- 1973 U. S. Dollars -----						
Agriculture	703	833	755	1495	2529	1263
Capital and Skill Intensive Urban Sector	2309	2968	4018	5906	7076	4455
Lower Capital and Skill Requirements	1352 (1.9)	1837 (2.2)	2250 (3.0)	2545 (1.7)	2279 (0.9)	2053 (1.6)
Construction	1197 (1.7)	1577 (1.9)	2185 (2.9)	3007 (2.0)	2297 (0.9)	2053 (1.6)
Commerce	2970 (4.2)	3534 (4.2)	4475 (5.9)	5107 (3.4)	4254 (1.7)	4068 (3.2)
Services	600 (0.9)	662 (0.8)	629 (0.8)	1304 (0.9)	1103 (0.4)	859 (0.7)
Highly Skilled Service Employment	3983	2492	9484	7015	3956	5386

Note: The figure in parenthesis is the ratio of the sectoral labor productivity to the average labor productivity in agriculture.

Source: The labor productivities are the average productivity for that sector. They are computed by dividing the sectoral GDP as classified by the United Nations, A System of National Accounts, (48) by the sectoral employment. The figures are in constant 1973 U.S. dollars. The source for the employment figures is the International Labour Organization, 1977 Yearbook of Labour Statistics, (32).

Two deletions were made in the data. The beta service sector in Peru and the commerce sector in Mexico were deleted from the group averages. The labor productivities for these two sectors were the highest in Latin America and outside expectations of range for these parameters.

TABLE 1.5: QUANTIFICATION OF THE SUBSISTENCE SECTOR AND ITS IMPORTANCE AS A SHARE OF TOTAL NUMBER AND AREA IN FARMS.

COUNTRY	DEFINITION OF SUBFAMILY FARM (maximum size)	NUMBER OF FARM HOLDINGS			LAND AREA			PERCENT OF TOTAL					
		1950	1960	1970	1950	1960	1970	FARM HOLDINGS			LAND AREA		
								1950	1960	1970	1950	1960	1970
	Hectares	Thousand			100 ha			Percent					
Mexico	5	1005	899	N.A.	1386	1274	N.A.	73.6	66.8	N.A.	1.3	1.1	N.A.
Costa Rica	5	14	23	33	23	52	59	62.4	36.0	43.2	1.3	1.9	1.9
El Salvador	1	70	107	133	35	61	71	40.4	47.2	48.8	2.3	3.9	4.8
Guatemala	5	308	365	N.A.	534	642	N.A.	76.2	74.9	N.A.	9.0	11.6	N.A.
Honduras	1	15	N.A.	27	10	N.A.	19	9.9	N.A.	15.0	0.4	N.A.	0.8
Nicaragua	5	18	52	N.A.	54	133	N.A.	19.8	35.4	N.A.	0.8	1.5	N.A.
Panama	5	44	43	41	96	96	75	52.0	45.8	45.4	8.3	5.4	3.6
Central America	-	469	611	-	752	999	-	54.4	56.9	-	5.7	6.3	-
Venezuela	5	126	156	N.A.	267	357	N.A.	53.7	49.4	N.A.	1.2	0.1	N.A.
Bolivia	5	51	N.A.	N.A.	66	N.A.	N.A.	59.3	N.A.	N.A.	0.2	N.A.	N.A.
Chile	5	56	124	N.A.	78	206	N.A.	36.9	48.7	N.A.	0.2	0.7	N.A.
Colombia	5	505	757	700	927	1239	1147	54.9	62.6	59.5	3.3	4.5	3.7
Ecuador	1	92	N.A.	206	48	N.A.	90	26.8	N.A.	32.6	0.8	N.A.	1.3
Peru	5	N.A.	707	N.A.	N.A.	1073	N.A.	N.A.	82.9	N.A.	N.A.	5.2	N.A.
Andean	-	1204	1868	-	1869	2763	-	54.7	63.2	-	1.8	2.3	-
Brazil	5	459	1029	1800	1171	2537	3897	22.2	30.8	26.6	.5	1.0	1.4
Argentina	20	161	181	N.A.	1908	1760	N.A.	36.5	39.7	N.A.	1.1	1.0	N.A.
Paraguay	5	69	75	N.A.	163	N.A.	N.A.	46.3	46.9	N.A.	0.9	N.A.	N.A.
Uruguay	20	35	40	35	299	320	279	41.2	45.8	45.7	1.7	1.8	1.7
River Plate	-	265	296	-	2370	2257	-	39.4	42.0	-	1.1	1.1	-
Latin America	-	3620	4969	-	7864	10267	-	42.7	49.8	-	1.2	1.4	-

Source: Derived from Economic Research Service, "Agriculture in the Americas: Statistical data", (10).

Table 1.6 Growth Rates of the Demand and Supply of Food in Latin American Countries, 1966-1977.

Country	Population ^a	Per Capita Income ^a	Food Demand		Total Food Production ^d	Food Production by Small Farmers ^{d,e}
			Income Elasticity ^b	Growth ^c		
Mexico	3.5	2.8	0.51	4.8	4.0	1.8
Caribbean	2.1	1.8	0.21	2.5	1.4	2.5
Costa Rica	3.0	2.9	0.51	4.5	4.6	3.6
El Salvador	3.3	1.8	0.62	4.4	3.9	4.3
Guatemala	2.5	2.8	0.53	4.0	5.0	3.2
Honduras	2.3	1.8	0.62	3.4	2.3	1.9
Nicaragua	2.7	3.5	0.76	4.4	3.9	3.8
Panama	3.1	3.8	0.52	4.1	3.4	2.1
Central America	2.8	2.8	0.46	4.1	3.9	3.1
Venezuela	2.9	2.2	0.40	3.8	4.6	2.2
Bolivia	2.8	2.7	0.47	4.1	2.4	2.0
Chile	1.9	0.6	0.44	2.2	2.8	2.2
Colombia	2.6	2.7	0.51	4.0	3.4	4.2
Ecuador	2.9	3.8	0.47	4.7	1.7	2.9
Peru	2.9	2.5	0.62	4.5	1.1	1.7
Andean Countries	2.6	2.1	0.49	3.5	2.6	2.8
Brazil	2.7	4.2	0.50	4.8	4.7	2.6
Argentina	1.3	2.5	0.27	2.0	2.3	0.8
Paraguay	2.8	2.1	0.47	3.8	3.7	2.2
Uruguay	0.6	0.4	0.37	0.7	0.1	3.3
River Plate Countries	1.3	1.9	0.30	1.9	2.2	1.6
Latin America	2.6	3.0	0.34	3.6	3.6	2.5

a/ 1960-1975.

b/ Estimated from the proportional weights of average consumption of vegetable and animal products and the FAO income elasticities of demand.

c/ Calculated as $\dot{d} = \dot{p} + E_y \dot{y}$ where \dot{d} is the rate of demand growth for food, \dot{p} is the rate of population growth, E_y is the income elasticity of demand for food, and \dot{y} is the rate of income growth.

d/ 1966-1977.

e/ The small farmer crops were defined by the USDA as maize (except in Argentina and Uruguay), rice (except in Colombia), potatoes, sweet potatoes, cassava and pulses.

Sources:

1966-70 data based on Economic Research Service, "Agriculture in the Americas: Statistical data", pp.1-8. (10).

1971-77 data based on Economics, Statistics and Cooperatives Service, Indices of Agricultural Production for the Western Hemisphere, 1968-1977, (11).

The income elasticities of demand were estimated from Food and Agriculture Organization of the United Nations (FAO), (16).

FIGURE 1.3
GROWTH RATES OF DEMAND AND PRODUCTION OF FOOD IN THE LATIN AMERICAN COUNTRIES,
1966-1977

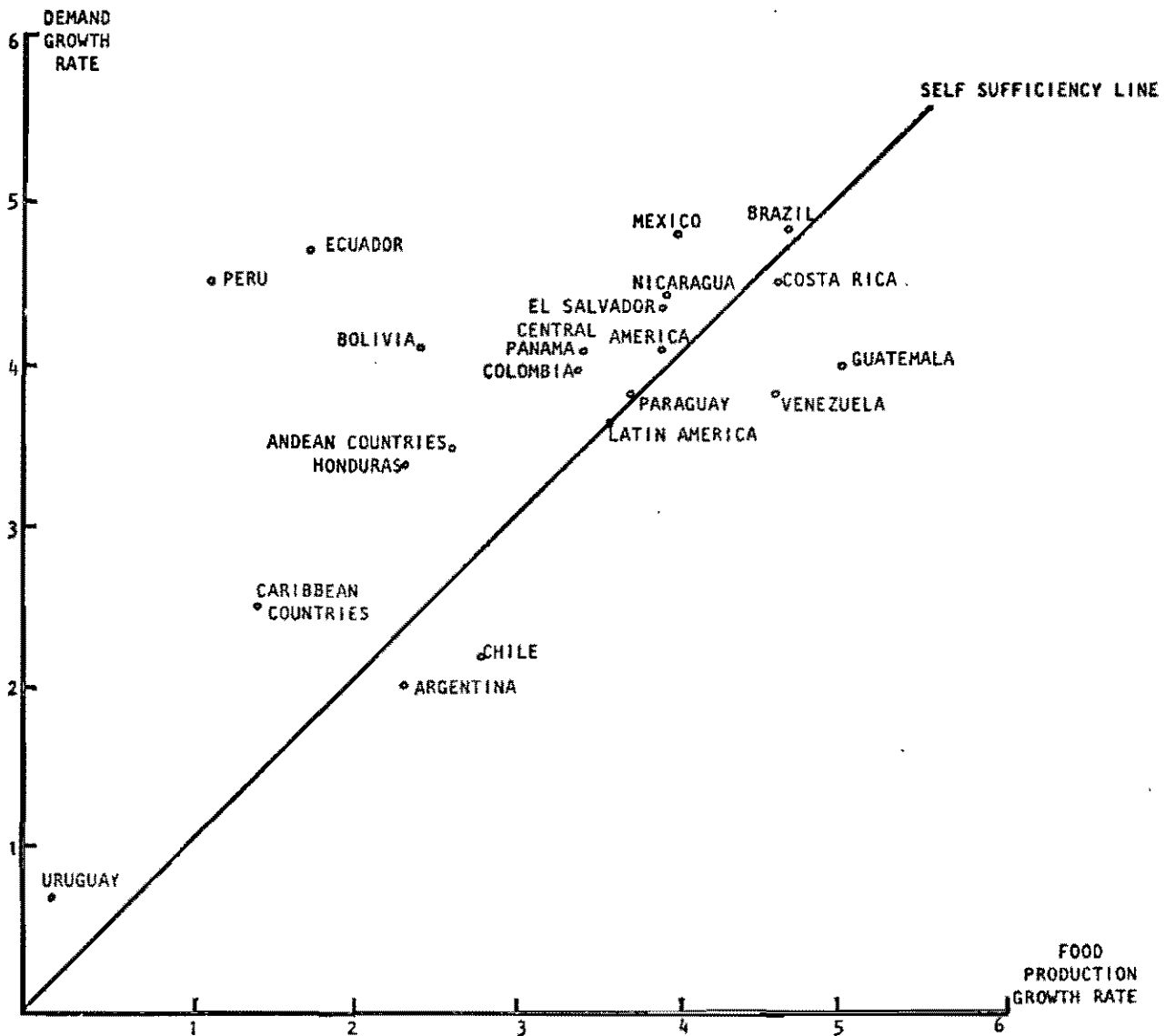
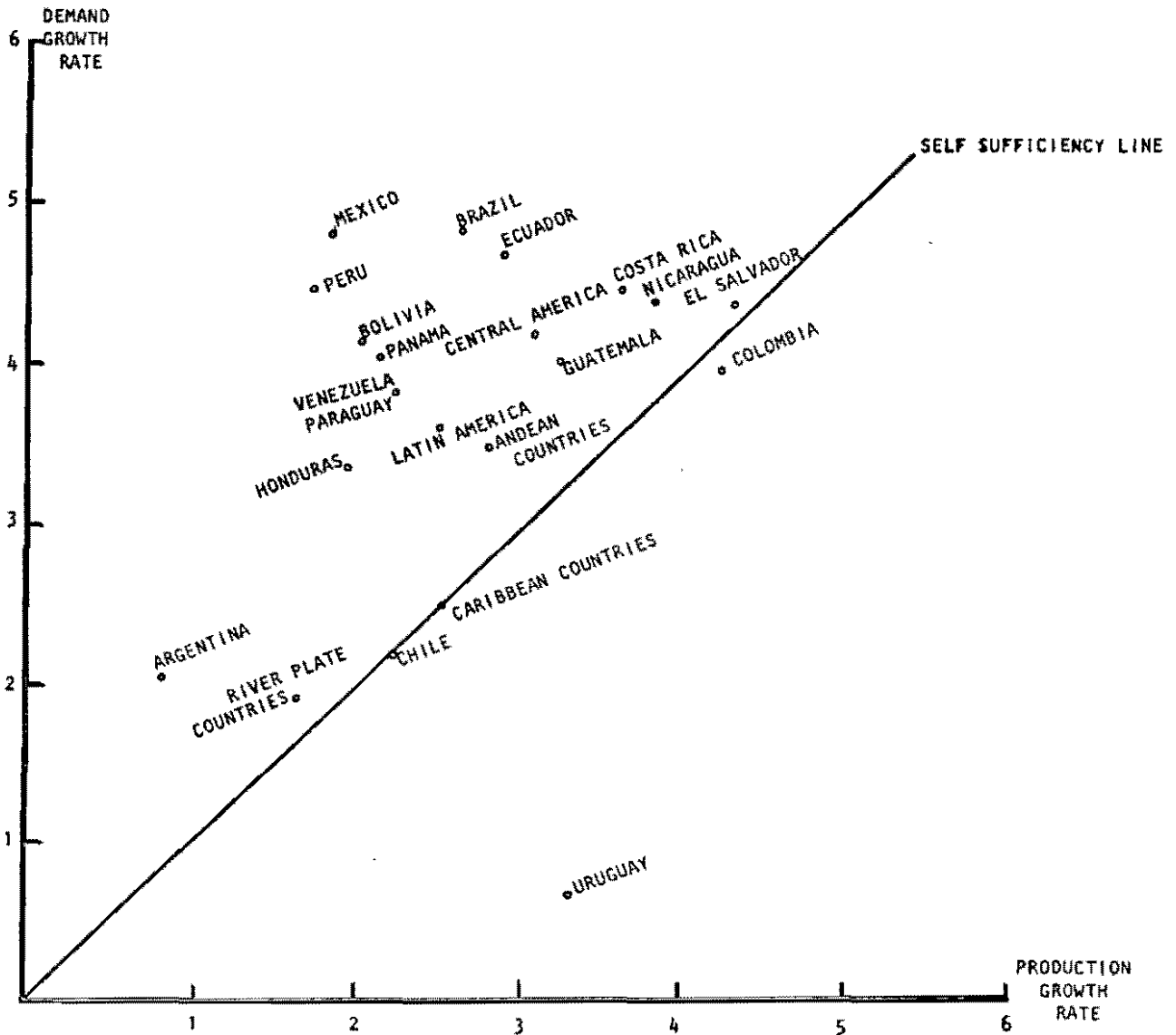


FIGURE 1.4

GROWTH RATES OF DEMAND AND PRODUCTION FOR FOOD PRODUCTS PRINCIPALLY PRODUCED BY SMALL FARMERS^{a/}
IN THE LATIN AMERICAN COUNTRIES, 1966-77



^{a/} THESE INCLUDE CASSAVA, PULSES, MAIZE EXCEPT IN ARGENTINA AND URUGUAY, RICE EXCEPT IN COLOMBIA, POTATOES AND SWEET POTATOES.

TABLE 1.7 AVERAGE CALORIE CONSUMPTION, TOTAL AND BY MAJOR FOOD GROUPS, FOR LATIN AMERICAN COUNTRIES, 1961-65 AND 1972-74.

COUNTRY	MINIMUM CALORIE REQUIREMENT	TOTAL CALORIE CONSUMPTION		TOTAL ANIMAL PRODUCTS		TOTAL VEGETABLE PRODUCTS		CEREALS		ROOTS AND TUBERS		DRY PULSES											
		1961-65	1972-74	1961-65	1972-74	1961-65	1972-74	1961-65	1972-74	1961-65	1972-74	1961-65	1972-74										
		Cal	%	Cal	%	Cal	%	Cal	%	Cal	%	Cal	%										
Mexico	2330	2570	2692	285	11.0	329	12.2	2284	88.8	2362	87.7	1313	51.0	1364	50.6	22	0.8	20	0.7	175	6.8	153	5.6
Caribbean	2260	2123	2241	240	11.3	289	12.0	1882	87.7	1973	88.0	850	38.6	955	38.1	141	6.6	152	6.7	112	5.2	115	5.1
Cuba	2310	2431	2732	449	18.4	555	10.3	1982	81.5	2177	79.6	976	40.1	1189	43.4	145	5.9	127	4.6	106	4.3	112	4.0
Costa Rica	2240	2200	2512	339	15.4	409	16.2	1862	84.6	2104	83.7	881	40.0	950	37.8	38	1.7	28	1.1	93	4.2	95	3.7
El Salvador	2290	1819	1885	237	13.0	292	10.7	1581	86.9	1683	89.2	989	54.8	1057	56.0	11	0.6	16	0.8	83	5.1	76	4.0
Guatemala	2190	1956	1989	197	10.0	192	9.6	1759	89.9	1797	89.8	1245	53.6	1181	59.3	6	0.3	5	0.2	101	5.1	104	5.2
Nicaragua	2260	1937	2051	227	11.7	240	11.7	1709	88.2	1811	88.2	1081	55.8	1090	53.1	32	1.6	41	1.9	112	5.7	97	4.4
Honduras	2250	2244	2281	352	15.6	363	15.2	1892	84.3	2020	84.7	1053	46.9	1097	46.0	21	0.9	31	1.3	183	8.1	192	8.0
Panama	2310	2342	2332	370	15.7	401	17.1	1971	84.1	1930	82.7	1112	47.4	1442	40.3	73	3.1	93	3.9	70	2.9	38	1.0
Central America	2245	2017	2107	257	12.7	262	12.4	1759	87.2	1844	87.5	1097	54.3	1005	51.4	21	1.0	26	1.2	107	5.3	99	4.0
Venezuela	2470	2225	2399	416	18.6	452	18.8	1809	81.3	1946	81.1	770	34.6	880	36.6	128	5.7	91	3.7	76	3.4	53	2.2
Bolivia	2390	1638	1660	241	14.7	276	14.8	1397	84.7	1583	85.1	750	45.7	798	42.9	246	15.0	207	15.4	18	1.0	18	0.9
Chile	2440	2578	2738	432	16.7	451	16.4	2146	83.2	2287	83.4	1217	47.2	1326	48.7	118	4.5	100	3.6	55	2.1	64	2.3
Ecuador	2320	2142	2164	376	17.5	337	15.5	1766	82.4	1827	84.4	606	27.4	661	31.6	190	7.0	176	8.1	41	1.9	42	1.9
Peru	2293	1895	1895	308	16.1	345	16.5	1589	83.8	1731	83.4	575	30.3	679	32.5	194	8.1	178	8.5	105	5.5	80	2.8
Andean	2350	2255	2328	347	15.3	362	15.5	1958	84.6	1964	84.3	900	39.9	915	39.3	318	14.1	301	12.9	89	3.9	56	2.4
Brazil	2350	2179	2269	359	16.4	359	15.8	1819	83.4	1909	84.1	833	38.2	863	38.0	193	8.8	202	8.9	59	2.7	49	2.1
Argentina	2390	2420	2540	335	13.8	339	13.3	2086	86.1	2201	86.6	866	35.7	903	35.5	285	11.7	260	10.2	212	8.7	202	7.9
Paraguay	2650	3247	3280	956	29.4	944	28.7	2291	70.5	2386	71.2	1062	32.7	996	30.3	178	5.4	155	4.7	24	0.7	16	0.4
Uruguay	2310	2312	2773	508	20.1	469	17.2	1961	70.0	2303	82.7	742	29.5	874	32.0	519	20.6	459	16.8	100	3.9	143	5.2
River Plate	2670	2938	2977	1224	41.6	1032	34.6	1714	58.3	1945	65.3	859	29.2	1064	35.7	133	4.5	114	3.8	26	0.8	20	0.6
Latin America	2625	3163	3206	951	30.0	914	28.5	2209	69.8	2292	71.4	1018	32.1	992	30.9	197	6.2	175	5.4	29	0.9	28	0.8
	2380	2439	2544	401	16.4	405	15.9	2096	83.4	2139	84.0	983	39.4	1006	39.5	178	7.2	165	6.4	134	5.4	122	4.7

Source: Food and Agriculture Organization, Monthly Bulletin of Agricultural Economics and Statistics (18).

Table 1.8 Average protein consumption, total and by major food groups, for Latin American countries.
Average 1972-1974 (grammes per day)

Region and Country	Total protein consumption		Cereals		Roots and tubers		Meat and offals		Milk		Other foods	
	Prot.	%	Prot.	%	Prot.	%	Prot.	%	Prot.	%	Prot.	%
Tropical Latin America												
Brazil	62.3	100	20.4	32.3	2.3	3.6	13.0	20.6	5.6	8.9	21.9	34.6
Mexico	65.6	100	35.1	53.5	0.3	0.4	8.9	13.6	6.4	9.8	14.9	22.7
Colombia	47.2	100	16.0	33.9	2.6	5.5	8.7	18.4	10.0	21.2	9.9	21.0
Venezuela	62.6	100	23.1	36.9	1.3	2.1	15.9	25.4	9.0	14.4	13.3	21.2
Cuba	70.1	100	28.6	40.8	1.2	1.7	14.5	20.7	9.5	13.6	16.3	23.2
Paraguay	75.4	100	22.4	29.7	3.6	4.8	24.3	32.2	3.8	5.0	21.3	28.3
Peru	60.6	100	25.5	42.1	6.2	10.2	9.8	16.2	7.0	11.5	12.1	20.0
Ecuador	47.3	100	16.9	35.7	3.5	7.4	7.0	14.8	8.2	17.3	11.7	24.8
Bolivia	48.4	100	21.5	44.4	7.6	15.7	10.2	21.1	2.0	4.1	7.1	14.7
Central America												
Nicaragua	68.6	100	27.8	40.5	0.3	0.4	9.7	14.1	12.2	17.8	18.6	27.2
Costa Rica	59.7	100	22.8	38.2	0.5	0.8	9.7	16.2	12.3	20.6	14.4	24.2
Guatemala	52.7	100	30.6	58.1	0.1	0.2	5.4	10.2	5.6	10.6	11.0	20.9
Honduras	52.1	100	28.2	54.1	0.9	1.7	5.6	10.8	6.8	13.1	10.6	20.3
Panama	57.4	100	21.6	37.6	1.3	2.3	16.0	27.9	6.6	11.5	11.9	20.7
El Salvador	49.7	100	27.2	54.7	0.3	0.6	4.9	9.9	7.2	14.5	10.1	20.3
Dominican Rep.	44.5	100	14.1	31.7	1.7	3.8	6.1	13.7	7.1	16.0	15.5	34.8
Caribbean												
Guyana	54.4	100	25.7	47.2	1.3	2.4	9.1	16.7	5.5	10.2	12.8	23.5
Other Caribbean ^a	56.9	100	25.0	43.9	2.2	3.9	14.5	25.5	4.9	8.6	10.3	18.1
Temperate Latin America												
Argentina	101.7	100	25.7	25.3	4.8	4.7	46.2	45.4	13.4	13.2	11.6	11.4
Uruguay	93.1	100	27.7	29.8	2.2	2.4	38.4	41.2	16.7	17.9	8.1	8.7
Chile	73.5	100	36.2	49.2	2.6	3.5	11.0	15.0	10.3	14.1	13.4	18.2
Latin America	64.8	100	24.8	38.3	2.3	3.5	14.1	21.8	7.5	11.6	16.1	24.8

^{a/} Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

Source: FAO, 'Provisional Food Balance Sheets'.
(20). Average 1972-74.

2. ANIMAL PRODUCTS

2a) INTRODUCTION

Although meat consumption per head in tropical Latin America is only 26% of the level observed in North America, the distribution among different meats is quite similar (Table 2.1 and Figure 2.1). Of a total meat consumption of 28.4 kg/per head/year estimated in 1975/77 for tropical Latin America, 16.7 kg correspond to beef and veal, followed by an almost equal share of pork and poultry meat of 5.9 and 5.1 kg respectively. Sheep and goat meat consumption per head is very similar between tropical Latin America and North America (0.6 and 0.8 kg respectively). The composition of meat consumption in temperate Latin America is markedly different, as beef and veal make up close to 80% of total meat consumption. In turn, sheep and goat meat consumption per head is larger than in North America or tropical Latin America, both in absolute and relative terms, particularly in Uruguay.

Within tropical Latin America, the highest levels of meat consumption per head are observed in Venezuela, Panama and Brazil, followed by Mexico and Colombia. Milk consumption per head is highest in Costa Rica, Nicaragua and Cuba (Tables 2.1 and 2.18).

Because of the different average rates of growth of production and demand observed in Latin America for the different animal products during the last decade (this report), it is expected that the relative importance of beef, poultry, pork, other types of meat, and milk may change in the future. The velocity at which this will take place will depend on how fast and efficiently each sector can adopt improved technology and demand shifts associated with increased incomes and urbanization.

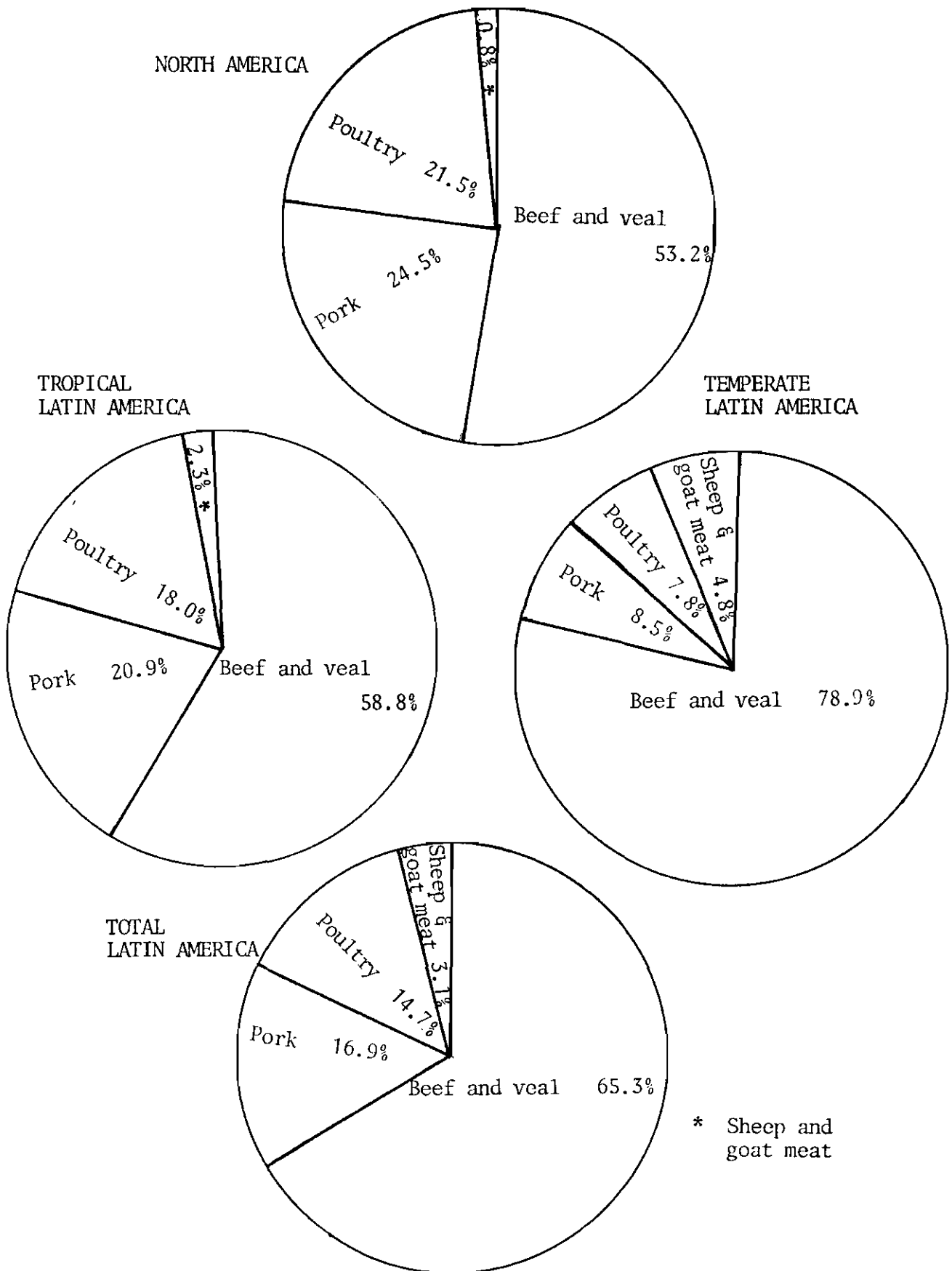
Table 2.1 Meat consumption per head by region and country.
Average 1975/77

Region and Country	Beef and veal	Pork	Sheep and goat meat	Poultry	Total meat ^a
	----- kg/year -----				
North America	58.0	26.7	0.8	23.4	109.0
United States	58.7	27.0	0.8	23.8	110.3
Canada	51.3	24.3	1.1	20.3	97.0
Tropical Latin America	16.7	5.9	0.6	5.1	28.4
Brazil	19.5	7.2	0.5	4.8	32.0
Mexico	15.2	6.4	0.9	5.1	27.6
Colombia	19.9	3.9	0.4	3.0	27.2
Venezuela	22.9	5.3	0.4	12.4	41.0
Peru	5.4	3.3	2.2	7.5	18.4
Dominican Rep.	6.8	4.3	-	7.1	18.2
Central America	9.7	2.8	-	2.2	14.8
Nicaragua	14.4	6.6	-	2.6	23.6
Guatemala	7.9	1.5	-	1.6	11.0
Costa Rica	11.0	3.2	-	2.0	16.2
Honduras	5.9	2.9	-	1.8	10.6
El Salvador	5.5	2.8	-	1.9	9.7
Panama	27.1	2.6	-	5.8	35.5
Temperate Latin America	79.4	8.2	6.9	6.9	86.5
Argentina	87.5	9.3	3.7	8.1	108.6
Chile	20.3	2.8	2.4	4.0	29.5
Uruguay	75.2	6.9	15.5	5.0	102.5
Latin America	23.7	6.1	1.1	5.3	36.3

^{a/} Excludes fish

Source: USDA (50) and FAO (19)

Figure 2.1 Meat consumption distribution. Average 1975-1977



Source: Table 2.1

2b) BEEF

Latin America has 279 million head of cattle stock, the second largest inventory in the world after Asia. Three Latin American countries alone, Brazil, Colombia and Venezuela, possess 10% of the world inventories and produce 7% of world beef supply. The United States and Europe hold each around 10% of the world stock but produce together almost 37% of total annual bovine meat (Table 2.2). Although, more efficient than Asia or Africa, Latin America, especially in the tropical region, is a less efficient producer than the United States, Europe or Oceania.

During 1978, Latin America produced 8.6 million tons of beef, 11% more than the average production of 1974-1977 (Table 2.3). Beef production increased in most countries, but there were large differences in the growth rates of temperate and tropical countries. The average annual growth rate in the tropical area remained fairly constant in the 1960-1978 period at about three per cent, but it increased from 2.3% (1960-1970) to 6.3 (1971-1978) in the temperate region (Table 2.4). The increase in production growth rates observed in the temperate region appears to be a consequence of the cyclical nature of the beef cattle sector (Figure 2.2).

A trend towards intensification of cattle production seems evident since growth rates in production were larger than the observed growth rates of cattle stocks (Table 2.5). Hence, production per head in stock in the temperate zone increased from 43 kg/year in 1974/77 to 50 kg/year during 1978, but only from 25 to 26 kg/year in the tropical region (Table 2.3). This same trend is implied by the slower increase in the area in permanent pastures compared to the growth rate of cattle inventories. Area in pastures even decreased in the temperate region during this decade (Table 2.6). On aggregate, area in permanent pastures did not rise between 1974 and 1977: it decreased in Brazil and increased in Mexico (Table 2.7). An expansion of the livestock sector towards frontier

areas seems to be slowly taking place, while crops are substituting for pastureland in the more traditional cattle raising areas. The increase in livestock production per unit of area is a natural consequence of the increase in land values. For example, in Brazil, in the period 1966-77, the real price of cattle increased at an annual 5% rate while the real price of pastureland rose at a 13% rate (Figure 2.3).

Because of the fast rate of population growth and slow rate of production increases in the tropical region, beef production per capita decreased from 19 to 17 kg/year from 1974/77 to 1978. On the other hand, the slower rate of population growth and faster rate of production growth in the temperate region resulted in an increase in production per capita from 77 to 93 kg/year (Table 2.8). Cattle stock per capita slightly declined in both the tropical and temperate regions during this same period.

The performance of the livestock sector in the tropical region is poor when compared to the growth rates of demand for beef (at constant prices). Except for Mexico, Costa Rica, El Salvador and Panama, demand for beef in the tropical countries during 1970-1978 grew faster than supply (Table 2.9). This implies an upward pressure on domestic beef prices, decreased exports, or increased imports. In the temperate zone during the same period, supply grew faster than demand, and as a result the volume of exports increased in both Argentina and Uruguay while imports decreased in Chile. Except for Chile, all countries located below the self-sufficiency line (Figure 2.4) are net exporters as expected. Between 1960/69 and 1970/78 Nicaragua and Honduras shifted from below to above the self-sufficiency line as a result of a drastic decline in the rate of growth of production, and the opposite took place with Mexico, El Salvador and the countries in the temperate region (Table 2.4). The observed increase in the growth rate of production of beef exporters appears to be a response to the dramatic increase in export prices which took place earlier in the 1970-1973 period (Figure 2.2 and Table 2.10).

As a result of increased production, and in spite of rising prices,

average per capita consumption in the tropical region remained constant and showed a strong increase in the temperate zone (Table 2.11). In Argentina, where consumer prices have been steadily rising since 1975 (Figure 2.5), per capita consumption increased during 1978 and was about maintained in 1979. The domestic price of beef in Uruguay grew even faster than in Argentina but per capita consumption remained constant. In Colombia, per capita consumption has remained unchanged in spite of the continues domestic prices increases (Table 2.11 and Figure 2.6). Brazil and Venezuela which have also undergone steady price increases, may have offset the negative effect of rising prices on per capita consumption via increased imports. During 1978, Brazil shifted from a net exporter to a net importer of beef. Using imports as a tool to close the gap between the growth rates of production and demand may prove to be unfeasible as a long-run policy, due to the increasing balance of payments problems confronted by Brazil and other oil-importing nations.

Beef trade. Although beef is traded by many Latin American countries, beef can be considered a wage-good rather than an export commodity in tropical Latin America, except in Paraguay and Central America. During 1977/78 Brazil, Mexico and Colombia exported less than 4% of their total production (Table 2.12), although this was a period of high volumes traded and high export prices. Beef in these countries is exported as a result of favorable external prices or geographical location. Mexico exports to the United States, while Colombia benefits from its proximity to Venezuela, where most of its exports have been directed in the past years even though Venezuelan imports decreased during 1978. Brazil became a net importer in 1978 for the first time since 1970, a situation maintained during 1979 (Table 2.13).

Except for Colombia and Mexico, with almost 80% of their exports in live cattle, beef is exported by Latin American countries mainly as fresh/chilled/frozen beef (Table 2.14). But the participation of the region in the world market of this type of product has declined recently (Table 2.15). The EEC has gained control of this market (with 53.4% of world exports in 1978). Argentina and Brazil are also important exporters of canned beef supplying each 25% of world exports of canned beef (Table

2.16). Participation in this market is markedly unstable (Figure 2.7). The main importers are United Kingdom, United States and West Germany.

In 1978, world beef production declined for the first time since 1971 and this decline continued during 1979, mainly as a consequence of sharp reductions of cattle inventories in North America and in Oceania, probably as a reaction to the long period of depressed prices prior to 1978. In the EEC, production rose slightly: cattle slaughter declined as a result of some cyclical rebuilding of inventories but this was compensated by higher average slaughter weights. During 1978 beef production continued to increase in Argentina and Uruguay and only began to decline in 1979. In Argentina, beef output rose to a record level during 1978 at the expense of cattle inventories, which after expanding since the beginning of the decade started to decrease during 1978.

Although world beef production decreased, the volume of trade in livestock and meat did not rise significantly during 1978, because the larger imports of the United States and the developing countries were offset by a sharp reduction of purchases by USSR and East Europe, reflecting a recovery of domestic meat supplies in the communist countries [FAO (22)].

The volume of international trade leveled off in 1979. Total meat exports of Australia and Argentina fell by 11 and 3% respectively from the record levels reached in 1978. Uruguay and Mexico (owing to rising domestic demand) also exported less during this year. However, there was some increase in exports from Central America and other countries. Brazil, a net exporter in the past, has been a net importer of meat since 1978. However, its imports in 1979 were not maintained at the high 1978 level. In the developed regions, USSR re-emerged as a large scale buyer.

As a consequence of the growing gap between demand and domestic supplies, United States and Japan raised considerably their beef import quotas during 1978 and even further in 1979. Prices on the United States import market have been rising from the end of 1977 until the present (Table 2.10). Since mid-1978, following the sharp increase in United

States imports quotas, and with the decline in Oceania's production, prices for Australian beef and for Argentina and other exporters have also increased though remaining considerably below those on the United States and Japanese import markets (Figure 2.8). Only in 1979 does the unit value of Argentine beef exports (in all forms, carcass weight equivalent) reach the same level as in the late 1970's and was therefore lower in real terms (Table 2.10). Thus, although the volume of trade leveled off, the nominal values of trade increased substantially. Prices on domestic markets followed rather divergent trends, rising sharply during 1978 in North American and South American exporting countries, but showing little change in Japan and Western Europe until 1979.

The above description of the latest events in the world market for beef supports the view that this market is subject to "large and erratic price changes caused primarily by cyclical changes in production in the developed nations" (Valdés and Nores, p.5). As can be seen from the coefficient of variation of real export prices (Table 2.10), prices in the market "without hoof-and-mouth disease" (United States, Japan) are more stable than those prevailing in the market "with hoof-and-mouth disease" (EEC, USSR, Near East). This may explain the higher long-run rates of growth of production observed in Central America and Mexico, trading in the disease-free market, vis-a-vis Argentina, Uruguay and Mexico (Table 2.4) which sell most of its exports in the market "with the disease".

Table 2.2 Beef cattle: production of bovine meat and stocks, for world and selected regions, 1977

Region	Bovine meat production		Cattle numbers	
	Total	Percentage	Total	Percentage
	'000 ton		'000 head	
World	46,785	100.0	1'216,109	100.0
United States	11,845	25.3	122,810	10.1
Europe	10,045	21.5	134,065	11.0
Latin America	8,250	17.6	278,467	22.9
Tropical Latin America	4,804	10.3	203,877	16.8
Brazil	2,452	5.2	91,000	7.5
Colombia	579	1.2	25,294	2.1
Venezuela	273	0.6	9,933	0.8
Temperate Latin America	3,446	7.3	74,590	6.1
Argentina	2,890	6.2	61,055	5.0
Asia	3,614	7.7	359,261	29.5
Africa	2,563	5.5	166,727	13.7
Oceania	2,559	5.5	41,623	3.4

Source: Estimated from FAO (19)

Table 2.3 Beef cattle: stocks, production and production per head in stock, by country. 1974/77, 1978.

Region and Country	Stocks		Production ^a		Production per head in stock	
	1974/77	1978	1974/77	1978	1974/77	1978
	--- '000 head ---		--- '000 ton ---		---kg/year ---	
United States	127,622	116,225	11,231	11,325	88	97
Tropical Latin America ^b	184,660	185,691	4,638	4,896	25	26
Brazil	94,250	89,000	2,220	2,250	24	25
Mexico	28,503	29,333	940	1,054	33	36
Colombia	23,286	25,294	499	504	21	20
Venezuela	9,467	10,231	263	282	28	28
Cuba	5,492	5,700	-	143	-	25
Paraguay	5,281	5,800	111	134	21	23
Peru	4,226	4,167	89	82	21	20
Ecuador	2,662	2,874	61	70	23	24
Bolivia	2,968	3,772	69	77	23	20
Dominican Rep.	1,947	2,050	39	38	20	19
Central America	10,675	11,622	315	371	30	32
Guatemala	2,091	2,417	70	78	33	32
Costa Rica	1,856	2,002	63	71	34	35
Nicaragua	2,555	2,774	63	85	25	31
Panama	1,354	1,396	-	52	36	37
Honduras	1,725	1,700	42	51	24	30
El Salvador	1,094	1,333	28	34	26	26
Caribbean	1,395	1,548	32	34	23	22
Guyana	279	270	4	3	14	11
Other Caribbean ^c	1,116	1,278	28	31	25	25
Temperate Latin America	73,118	74,196	3,119	3,730	43	50
Argentina	58,800	61,280	2,560	3,192	44	52
Uruguay	10,944	9,424	349	354	32	38
Chile	3,374	3,492	210	184	62	53
Latin America	257,778	259,887	7,757	8,626	30	33

a/ Equivalent carcass weight

b/ Excludes Cuba only

c/ Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

Source: Estimated from FAO (19)

Table 2.4 Beef: growth rates of production in selected periods, by country. 1960/70, 1971/1978 and 1960/77

Region and Country	Growth rates		
	1960/70	1971/78	1960/77
	---- percentage ----		
United States	3.7	2.5	2.8
Tropical Latin America	3.1	3.3	3.5
Brazil	3.2	3.5	3.8
Mexico	4.5	9.3	-
Colombia	2.2	3.0	2.7
Venezuela	4.9	4.1	4.9
Peru	3.5	-3.2	0.6
Ecuador	1.6	2.6	4.0
Paraguay	0.7	3.2	-0.7
Bolivia	0.4	5.9	1.1
Cuba	-0.7	-1.4	-
Dominican Rep.	2.1	1.2	3.4
Central America	5.5	4.1	5.6
Nicaragua	8.3	3.2	5.8
Costa Rica	6.3	6.0	7.2
Guatemala	5.1	3.5	4.5
El Salvador	0.0	4.9	2.1
Honduras	6.0	2.7	7.4
Panama	5.4	5.4	5.8
Caribbean	1.9	1.5	0.8
Guyana	3.9	2.4	1.9
Haiti	1.0	3.9	0.9
Jamaica	2.1	-0.1	0.0
Trinidad & Tobago	1.1	-1.9	1.0
Temperate Latin America	2.3	6.3	1.0
Argentina	2.8	6.5	1.0
Uruguay	-1.2	4.7	0.3
Chile	1.8	6.2	1.9
Latin America	2.7	4.5	2.4

Source: Estimated from FAO (19) and USDA (10)

Table 2.5 Beef cattle: growth rate of cattle stock in Latin America, by country. 1960/70 - 1971/78

Region and Country	Growth rate	
	1960/70	1971/78
	- percentage -	
United States	1.4	0.6
Tropical Latin America	1.6	2.2
Brazil	2.0	1.9
Mexico	3.7	1.8
Colombia	2.8	2.8
Venezuela	3.1	2.8
Paraguay	-0.4	4.3
Peru	2.6	0.9
Ecuador	4.6	2.1
Bolivia	-1.3	7.0
Cuba	3.1	-1.2
Dominican Rep.	-0.4	6.9
Central America	3.4	3.3
Nicaragua	4.7	4.2
Guatemala	2.6	5.6
Costa Rica	4.7	3.5
Honduras	1.2	1.5
Panama	5.4	1.4
El Salvador	2.7	1.4
Caribbean	2.9	1.7
Guyana	5.7	1.0
Trinidad & Tobago	2.9	2.0
Haiti	3.5	2.1
Jamaica	-1.1	0.8
Temperate Latin America	1.5	2.7
Argentina	1.9	2.7
Chile	0.0	3.2
Uruguay	0.3	2.4
Latin America	1.6	2.4

Source: Estimated from FAO (19)

Table 2.6 Annual growth rates of area in annual and permanent crops^a and permanent pastures^b. 1961/65-1970 and 1971/77

Region and Country	Annual and permanent crops		Permanent pastures	
	1961/65-1970	1971/77	1961/65-1970	1971/77
	----- percentage -----			
Tropical Latin America	1.79	1.25	0.85	0.80
Brazil	1.67	2.80	2.25	1.04
Mexico	2.18	-2.51	-0.93	1.24
Bolivia	5.87	5.96	-0.38	-0.24
Peru	2.60	3.32	-0.44	0.00
Colombia	0.01	1.43	0.34	0.39
Venezuela	0.17	0.19	1.51	0.85
Paraguay	1.49	2.78	0.71	0.56
Cuba	4.11	2.77	0.37	2.42
Dominican Rep.	-0.79	4.00	4.30	0.50
Central America	-0.95	1.43	0.87	0.13
Honduras	0.33	1.34	0.00	0.00
Nicaragua	-5.25	0.80	0.00	0.00
Costa Rica	0.26	-0.24	4.99	1.92
Panama	-0.47	0.70	3.46	0.13
Guatemala	0.96	2.58	-1.42	-0.83
El Salvador	-0.71	1.95	0.42	-1.43
Caribbean	3.42	0.90	0.09	-1.32
Guyana	0.47	0.31	0.00	0.00
Other Caribbean ^c	4.47	1.07	0.20	-2.92
Temperate Latin America	2.40	0.67	-0.08	-0.03
Argentina	2.41	0.56	-0.20	-0.09
Uruguay	0.57	0.52	-0.17	-0.10
Chile	3.06	1.44	1.59	0.87
Latin America	1.97	1.07	0.52	-0.03

a/ As defined by FAO. Arable land and permanent crops, include annual fallow land

b/ Native and improved permanent pastures

c/ Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

Source: Estimated from FAO (19)

Table 2.7 Area in annual and permanent crops and in permanent pastures, 1974 and 1977

Region and Country	Annual and permanent crops ^a		Permanent pastures ^b	
	1974	1977	1974	1977
	----- '000 ha -----			
Tropical Latin America	97,284	99,819	355,555	355,425
Brazil	36,060	40,720	166,900	160,000
Mexico	27,390	23,220	67,500	74,449
Bolivia	3,217	3,305	27,200	27,100
Peru	2,880	3,433	27,120	27,120
Colombia	5,090	5,505	17,300	17,550
Venezuela	5,179	5,337	16,920	16,830
Paraguay	970	1,120	15,000	15,100
Cuba	3,720	3,150	2,700	2,270
Ecuador	4,324	5,089	2,200	2,200
Dominican Rep.	995	1,230	1,450	1,480
Central America	5,259	6,006	8,090	9,582
Honduras	870	915	2,000	2,000
Nicaragua	960	1,505	1,800	3,384
Costa Rica	501	490	1,570	1,558
Panama	555	565	1,150	1,150
Guatemala	1,700	1,800	900	880
El Salvador	673	731	670	610
Caribbean	2,200	1,704	3,175	1,744
Guyana	845	379	2,380	999
Haiti	805	870	560	520
Jamaica	260	265	220	210
Trinidad & Tobago	157	157	11	11
Barbados	33	33	4	4
Temperate Latin America	42,024	42,738	169,000	168,850
Argentina	34,420	35,000	143,800	143,500
Uruguay	1,862	1,910	13,600	13,550
Chile	5,742	5,828	11,600	11,800
Latin America	139,308	142,557	524,555	524,275

a/ Arable land and permanent crops, including annual fallow land

b/ Native and improved permanent pastures

Source: Calculated from FAO (19)

Table 2.8 Beef: per capita cattle stock and production by country. 1978

Region and Country	Stock per capita	Production per capita
	head	kg/year
United States	0.53	52
Tropical Latin America	0.63	17
Brazil	0.74	19
Mexico	0.45	16
Colombia	0.97	19
Venezuela	0.77	21
Cuba	0.56	14
Paraguay	2.00	46
Peru	0.25	5
Ecuador	0.37	9
Bolivia	0.77	16
Dominican Rep.	0.36	7
Central America	0.58	18
Guatemala	0.40	13
Costa Rica	0.94	33
Nicaragua	1.08	33
Panama	0.76	28
Honduras	0.55	17
El Salvador	0.29	8
Caribbean	0.17	4
Guyana	0.32	4
Other Caribbean ^a	0.16	4
Temperate Latin America	1.85	93
Argentina	2.32	121
Uruguay	3.27	123
Chile	0.34	17
Latin America	0.78	26

^{a/} Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

Source: Estimated from FAO (19)

Table 2.9 Beef: growth rates of demand and production in Latin America, by country. 1970-1978

Region and Country	Growth rate of:		Income elasticity of demand for beef ϵ_y	Growth rate of:	
	Per capita GNP \dot{Y}	Human population \dot{P}		Demand $\dot{d}^a/$	Production
	percentage			percentage	
Tropical Latin America	-	-	-	5.9 ^b	2.2
Ecuador	4.8	3.5	1.0	8.3	2.6
Venezuela	3.1	3.1	0.5	4.6	4.1
Colombia	3.3	2.8	0.7	5.1	3.0
Mexico	1.7	3.5	0.6	4.5	9.3
Peru	2.7	3.0	0.9	5.4	-3.2
Brazil	7.4	2.8	0.6	7.2	3.5
Bolivia	3.4	2.7	1.0	6.1	5.9
Paraguay	3.8	2.7	0.2	3.5	3.2
Dominican Rep.	5.7	2.9	0.8	7.5	1.2
Central America	-	-	-	4.6 ^b	3.3
Guatemala	3.0	2.9	0.8	5.3	3.5
El Salvador	2.1	3.1	0.8	4.8	4.9
Nicaragua	2.5	3.3	0.7	5.0	3.2
Honduras	0.5	2.7	0.8	3.1	2.7
Costa Rica	3.0	2.5	0.7	4.6	6.0
Panama	1.3	3.1	0.7	4.0	5.4
Caribbean	-	-	-	4.0 ^b	1.7
Guyana	1.9	1.8	1.1	3.9	2.4
Other Caribbean ^c	-	-	-	4.0	2.1
Temperate Latin America	-	-	-	1.7 ^b	2.7
Argentina	1.8	1.3	0.1	1.5	6.5
Chile	1.1	1.8	0.6	2.5	6.2
Uruguay	0.5	0.7	0.1	0.7	4.7
Latin America	-	-	-	5.4 ^b	2.4

a/ $\dot{d} = \dot{P} + \epsilon_y \dot{Y} + \epsilon_y \dot{P} \dot{Y}$

b/ Average, weighted by population

c/ Includes: Trinidad & Tobago, Jamaica, Haiti and Barbados

Source: Income and population data were from the World Bank (54).
Income elasticities of demand and production data were from
FAO (16) and (19).

Table 2.10 Beef: real and nominal export prices of Central America and Argentina, 1960/1977

Year	Price of		USA wholesale price index ^c	Real price ^d	
	U.S. imports ^a	Argentine exports ^b		USA	Argentina
	----- US\$/ton -----		1963=100	----- US\$/ton -----	
1960	828	459	100.5	823.8	456.7
1961	827	413	100.1	826.2	412.6
1962	783	406	100.3	780.6	404.8
1963	828	406	100.0	828.0	406.0
1964	851	601	100.1	850.1	600.4
1965	881	653	102.2	862.0	638.9
1966	1,028	573	105.7	972.6	542.1
1967	1,041	534	105.9	983.0	504.2
1968	1,085	601	110.7	980.1	542.9
1969	1,223	555	114.4	1,069.0	485.1
1970	1,304	728	118.7	1,098.5	613.3
1971	1,346	895	123.1	1,093.4	727.1
1972	1,480	1,080	127.2	1,163.5	849.1
1973	2,008	1,617	135.9	1,485.2	1,189.8
1974	1,582	1,970	166.1	952.4	1,186.0
1975	1,325	819	185.2	715.4	442.2
1976	1,580	898	197.0	802.0	455.8
1977	1,509	1,178	207.3	727.9	568.2
1978	2,142	1,164	219.0	978.0	531.5
1979 ^e	2,928	1,950	236.7	1,237.0	823.8
Average	1,328.9	875.0		961.4	619.0
Coefficient of variation (%)	40.8	55.5		19.8	37.5

a/ Imported frozen boneless cowmeat, 90% lean, Chicago, equivalent to export price of Central America.

Source: USDA (49)

b/ Chilled quarters price

Source: Junta Nacional de Carnes (35)

c/ IMF (34)

d/ Deflated by U.S. wholesale price index

e/ First semester

Source: Rivas and Nores (42)

Table 2.11 Beef: per capita apparent consumption. Averages 1970/74, 1974/77 and 1978

Region and Country	1970/74	1974/77	1978
	----- kg/head/year -----		
Tropical Latin America ²	13	15	16
Brazil	18	19	19
Mexico	12	14	15
Colombia	17	20	18
Venezuela	20	22	23
Paraguay	21	27	33
Peru	7	6	5
Ecuador	9	9	9
Bolivia	11	12	15
Dominican Rep.	6	7	7
Cuba	-	25	20
Central America	8	10	12
Nicaragua	14	19	21
Guatemala	7	9	9
Costa Rica	10	17	15
Honduras	7	7	10
El Salvador	5	6	7
Panama	-	-	27
Caribbean	6	5	5
Guyana	5	5	4
Other Caribbean ^a	6	6	6
Temperate Latin America	51	66	72
Argentina	68	84	93
Uruguay	61	81	81
Chile	18	21	18
Latin America ^b	18	23	23

a/ Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

b/ Excludes Cuba only

Source: FAO (19) and (21)

Table 2.12 Beef: net exports as a proportion of beef production. Averages 1960/64, 1970/74 and 1977/78

Country	1960/64	1970/74	1977/78
Argentina	23.9	24.2	21.2
Uruguay	36.2	42.3	34.0
Mexico	9.2	10.1	3.6
Paraguay	37.7	52.8	40.1
Costa Rica	32.0	62.0	49.3
Nicaragua	21.9	54.1	35.2
Guatemala	10.2	37.1	28.1
Colombia	n.a	5.2	4.0
Honduras	16.7	50.0	38.1
El Salvador	n.a	16.7	6.7
Dominican Rep.	4.0	19.4	1.3
Brazil	2.9	10.5	2.2

Source: FAO (19), (21)

Table 2.13 Beef: production, trade and apparent per capita consumption^a in Latin America, by country. 1978

Country	Production	+Imports -Exports	Per capita consumption
	----- '000 ton -----		
<u>Exporting:</u>	5,797	-1,094	-
Argentina	3,192 (3,073)	- 740 (720)	93
Uruguay	354 (270)	- 120 (90)	81
Mexico	1,054	- 46	15
Paraguay	134	- 40	33
Costa Rica	71	- 39	15
Nicaragua	85	- 32	21
Guatemala	78	- 25	9
Colombia	504	- 24	18
Honduras	51	- 21	10
El Salvador	34	- 4	7
Panama	52	- 2	27
Dominican Rep.	38	- 1	7
Ecuador	70	-	9
Bolivia	77	-	15
Guyana	3	-	4
<u>Importing:</u>	2,972	+ 191	-
Brazil	2,250 (2,150)	+ 70 (+30)	19
Cuba	143	+ 63	20
Venezuela	282	+ 22	23
Other Caribbean ^b	31	+ 20	6
Chile	184	+ 14	18
Peru	82	+ 20	5
Latin America	8,769	- 902	23

a/ Carcass weight equivalent

b/ Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

Figures in parenthesis are preliminary 1979 FAO estimates

Source: Estimated from FAO (19) and (21)

Table 2.14 Beef cattle: composition of net exports for Latin America, by country. 1977

Region and Country	Bovine cattle ^a (CWE)	Bovine meat fresh, chilled or frozen (CWE)	Canned meat ^b (CWE)	Total (CWE)
----- '000 ton -----				
Tropical Latin America ^a	134	104	132 ^d	370
Brazil	- 1	-	170	169
Mexico	99	31	- 2	128
Colombia	63	21	- 2	82
Venezuela	-60	-47	- 2	-109
Paraguay	13	27	40	80
Peru	-	- 5	-	- 5
Ecuador	-	-	-	-
Bolivia	9	-	-	9
Dominican Rep.	-	-	-	-
Cuba	- 1	-	-63	-64
Central America	12	89	3	104
Nicaragua	3	23	-	26
Guatemala	-	15	5	20
Costa Rica	5	31	-	36
Honduras	-	18	- 2	16
El Salvador	4	-	-	4
Panama	-	2	-	2
Caribbean	-	-12	-12	-24
Guyana	-	-	-	-
Other Caribbean ^c	-	-12	-12	-24
Temperate Latin America	7	381	175	563
Argentina	4	278	175 ^e	457
Uruguay	3	107	-	110
Chile	-	- 4	-	- 4
Latin America ^{at}	141	485	307	933
%	15.1	52.0	32.9	100.0

a/ Estimated using average carcass weight by country from FAO (19)

b/ A estimated assuming: 1 ton canned meat = 2.5 ton C.W.

c/ Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

d/ Agropecuaria (25)

e/ Junta Nacional de Carnes (35) and the rest from FAO (19)

Table 2.15 Exports of fresh/chilled/frozen bovine meat as a percentage of world exports for selected countries and regions^a, 1967-1975

Region and Country	1967	1970	1973	1975	1978
	----- percentage -----				
North America	2.10	4.09	3.73	2.33	4.00
Canada	<u>0.96</u>	<u>3.00</u>	<u>1.49</u>	<u>0.43</u>	<u>0.96</u>
Latin America	21.48	26.66	24.90	9.03	13.66
Argentina	<u>14.66</u>	<u>12.62</u>	<u>12.40</u>	<u>2.74</u>	<u>6.75</u>
Brazil	0.04	3.66	3.55	0.23	0.28
Mexico	1.47	2.23	1.17	0.18	1.27
Uruguay	2.15	3.75	2.86	1.86	1.39
Western Europe	<u>37.26</u>	<u>35.01</u>	<u>34.40</u>	<u>62.00</u>	<u>53.43</u>
Eastern Europe and USSR	-	-	<u>6.06</u>	<u>6.67</u>	<u>5.22</u>
Oceania	22.33	26.32	27.45	17.37	20.72
Australia	<u>16.06</u>	<u>17.23</u>	<u>20.32</u>	<u>11.97</u>	<u>15.50</u>
Africa	2.21	1.50	1.62	1.35	1.50
Asia	13.53	5.34	0.07	0.08	0.60

a/ Participation in world trade is measured in terms of export values

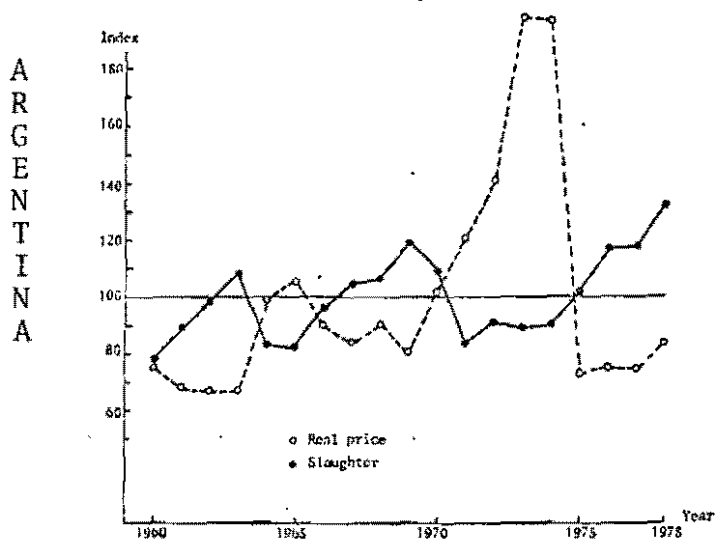
Source: FAO (21)

Table 2.16 Exports of canned beef as a percentage of total world
canned beef exports by selected regions and countries,
1962, 1970 and 1976

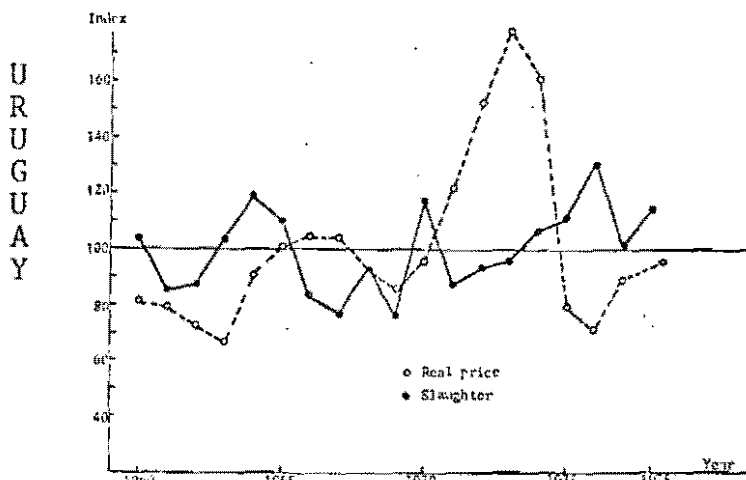
Region or Country	Percent of total world canned beef exports, by year		
	1962	1970	1976
<u>Region:</u>			
Africa	9	7	5
Asia & Oceania	8	10	9
Europe	27	28	30
North America	7	1	2
Latin America	<u>49</u>	<u>54</u>	<u>54</u>
Total	100	100	100
<u>Selected country:</u>			
Argentina	34	41	26
Australia & New Zealand	8	10	9
Brazil	6	8	25
France	5	6	6
Paraguay	8	6	4
Poland	13	7	5
United States	1	2	2
Uruguay	7	1	1
Yugoslavia	2	4	3
Others	<u>16</u>	<u>15</u>	<u>19</u>
Total	100	100	100

Source: Simpson and Mirowsky (47)

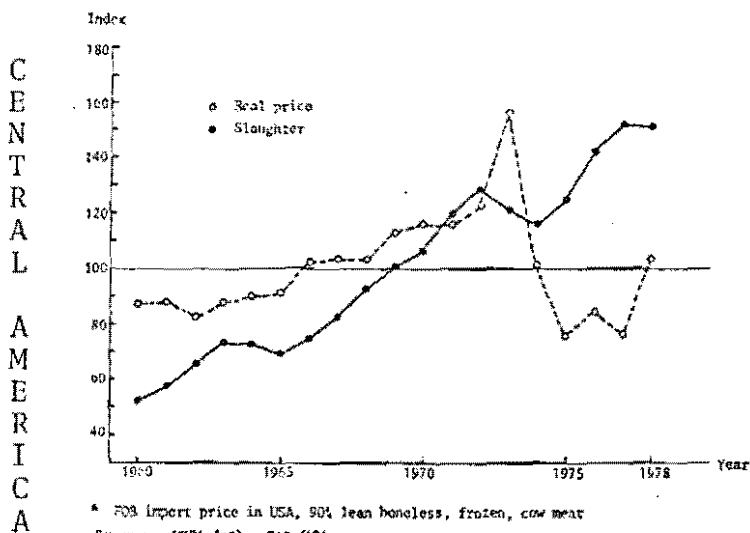
Figure 2.2 Indexes of bovine slaughter and real export prices*.
Base: average 1960-1978 = 100



* FOB export price of chilled quarters, deflated by U.S. wholesale price index
Source: USDA (10), FAO (81) and Junta Nacional de Carnes (35)

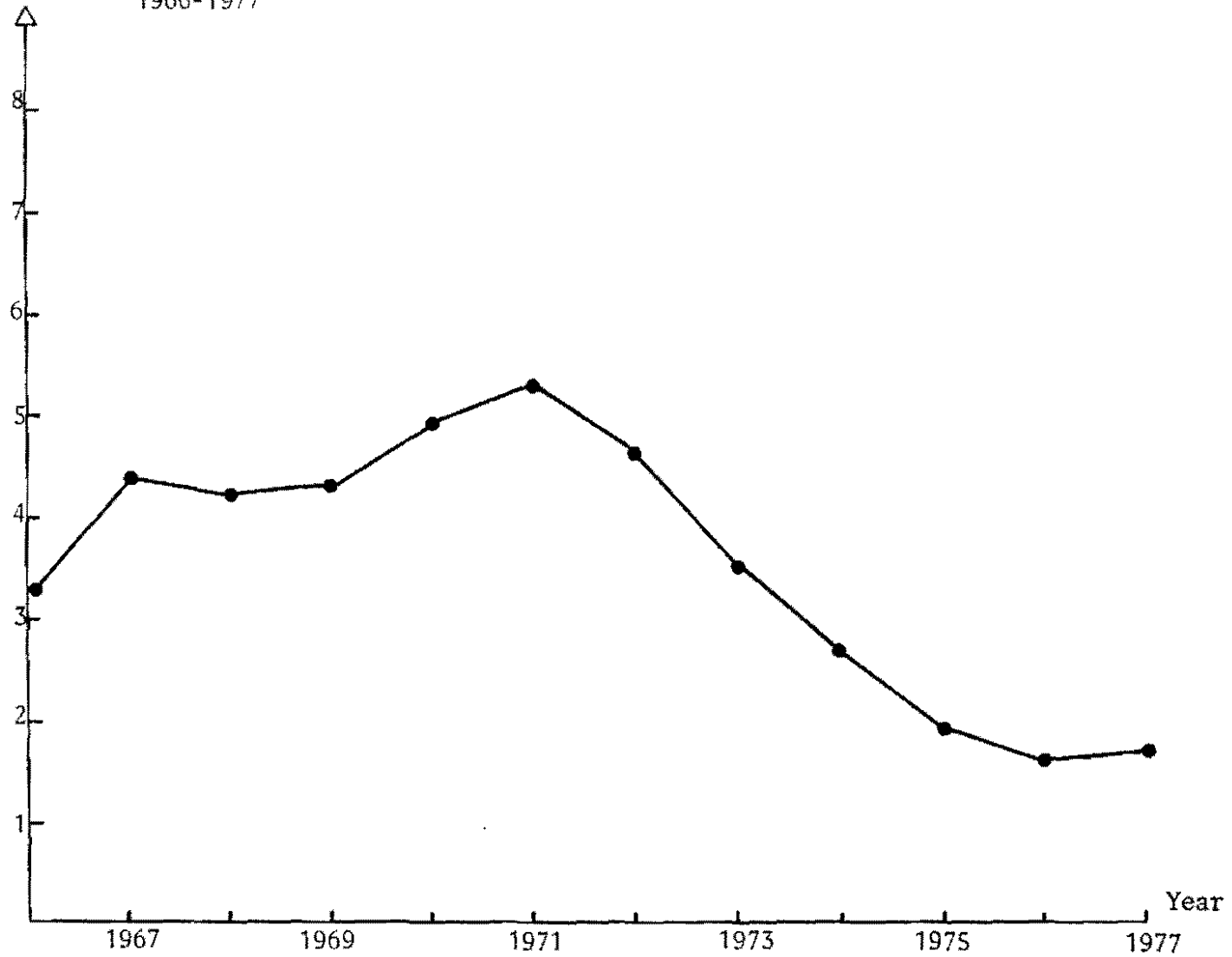


* FOB export price of chilled quarters, deflated by U.S. wholesale price index
Source: USDA (10), FAO (21) and Benchmark Uruguay (46)



* FOB import price in USA, 90% lean boneless, frozen, cow meat
Source: USDA (49), FAO (19)

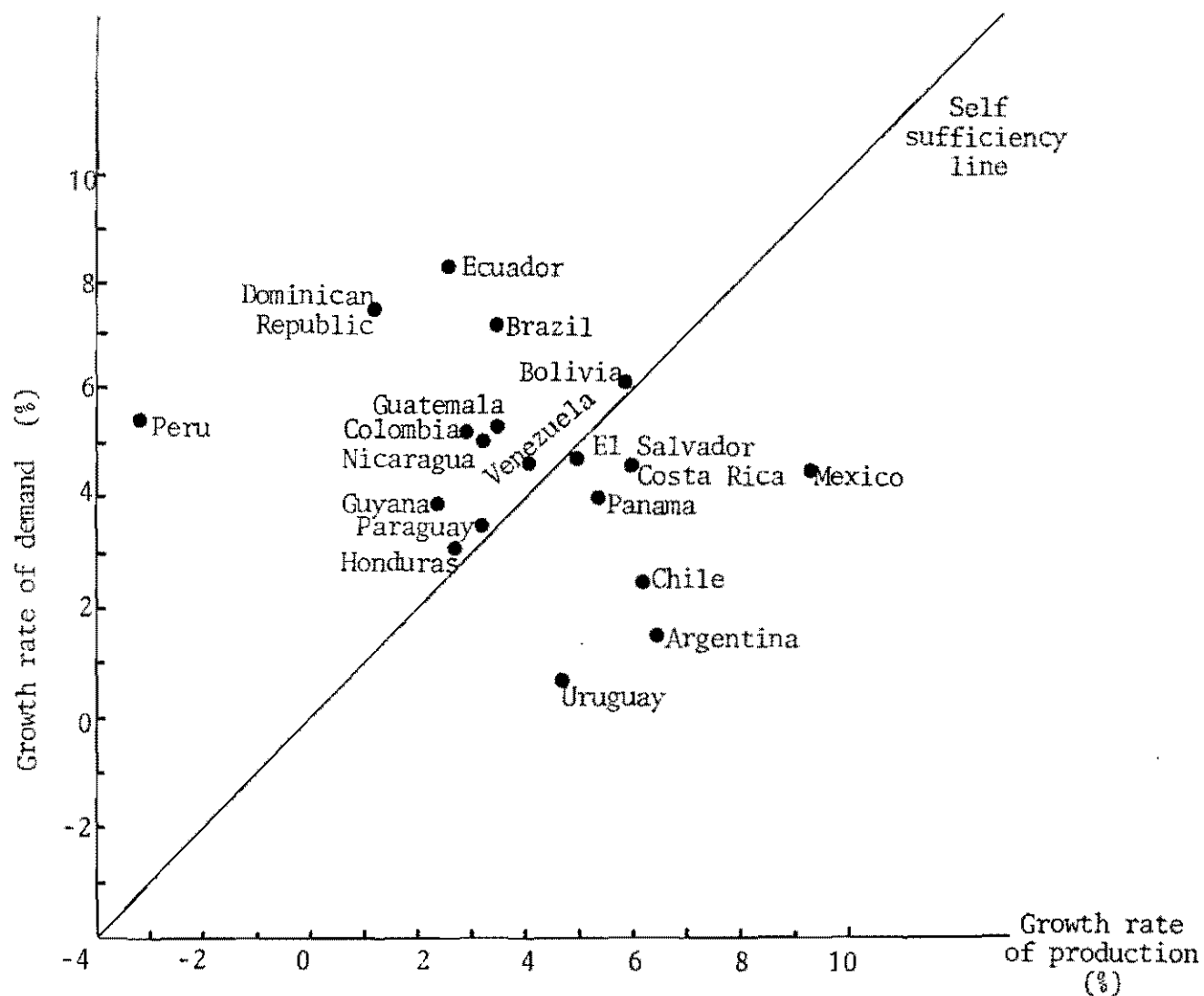
Figure 2.3 Brazil: evolution of cattle price relative to price of pastureland^a.
1966-1977



a/ Price of liveweight (ton) divided by price of pastureland (ha)

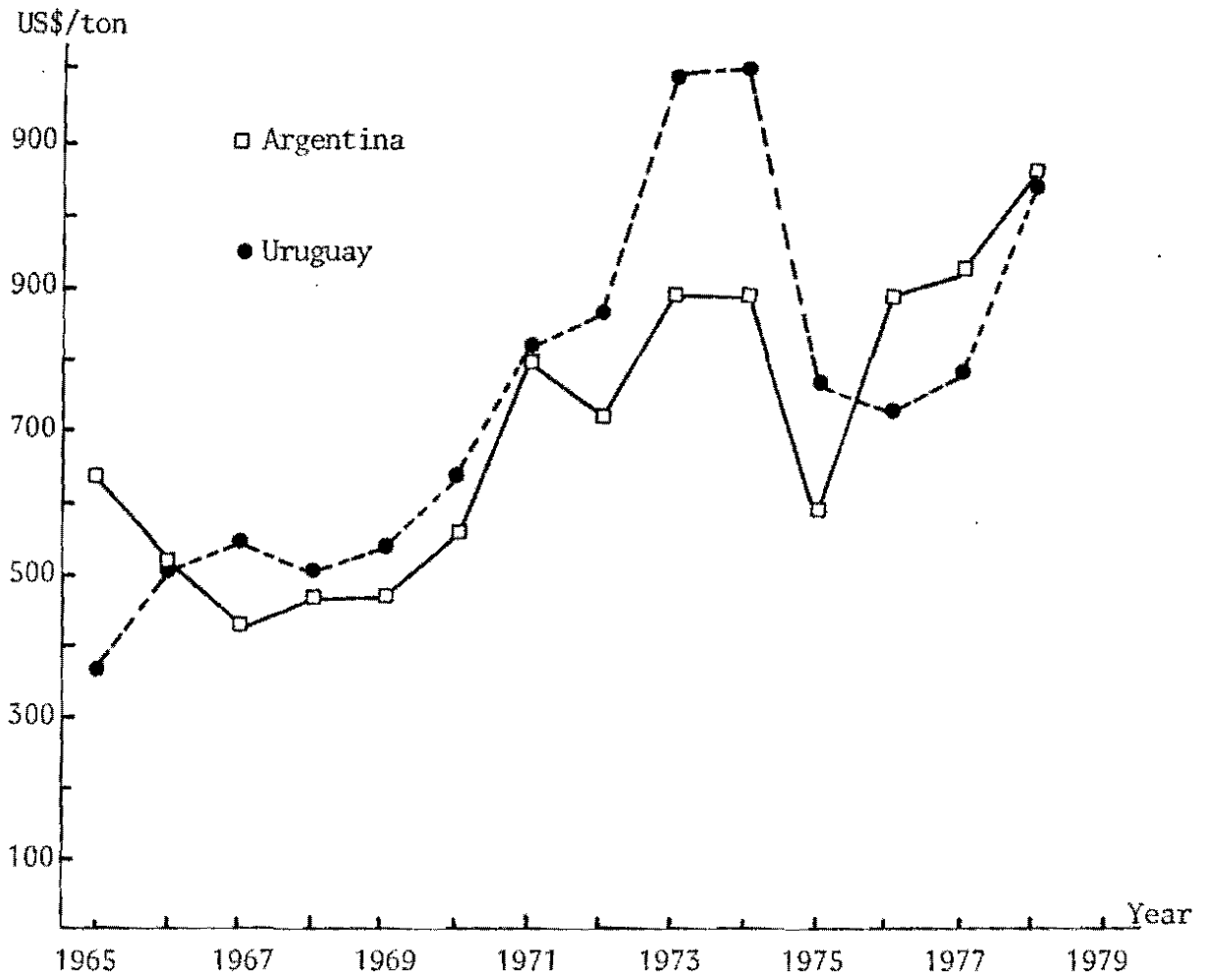
Source: FGV (23) and (25)

Figure 2.4 Beef: growth rates of demand and production in Latin America, by country. 1970-1978



Source: Estimated from: USDA (10), FAO (16) and (19), and World Bank (54)

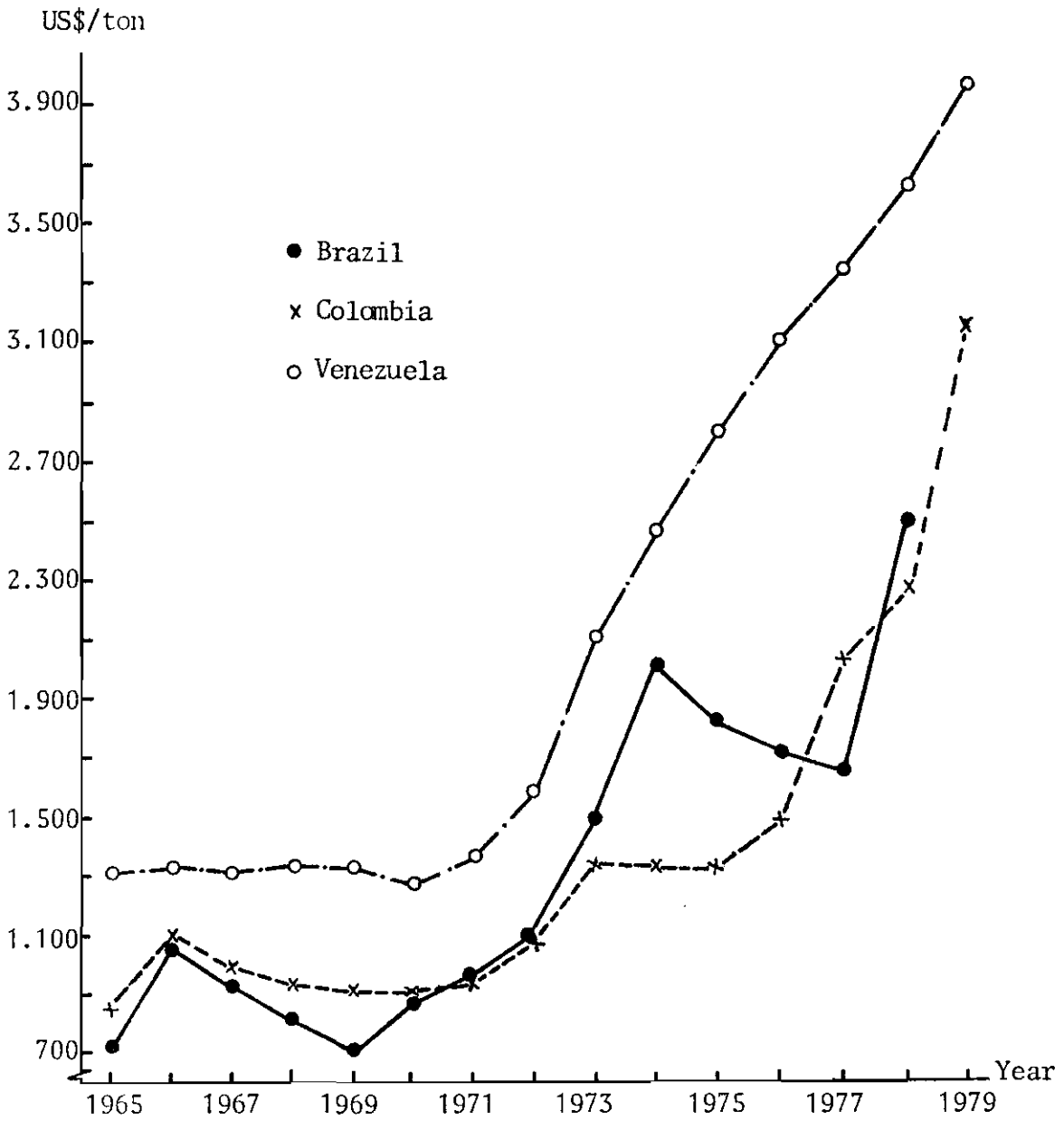
Figure 2.5 Consumer beef prices in Argentina and Uruguay, 1965-1979*



* First semester

Source: Junta Nacional de Carnes (35)
Ministerio de Agricultura y Pesca de Uruguay (37)

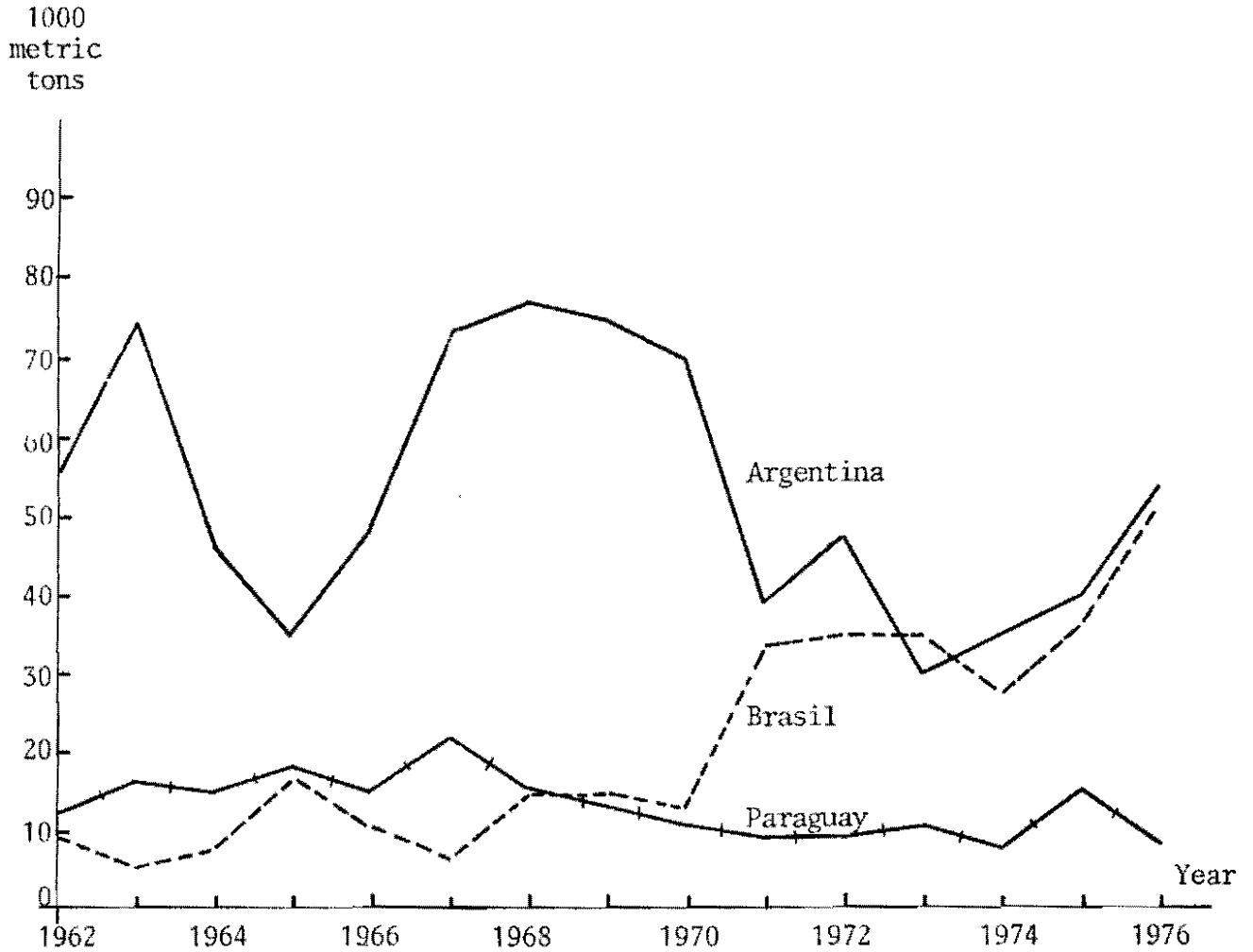
Figure 2.6 Consumer beef prices in Brazil, Colombia and Venezuela. 1965-1979*



* First semester

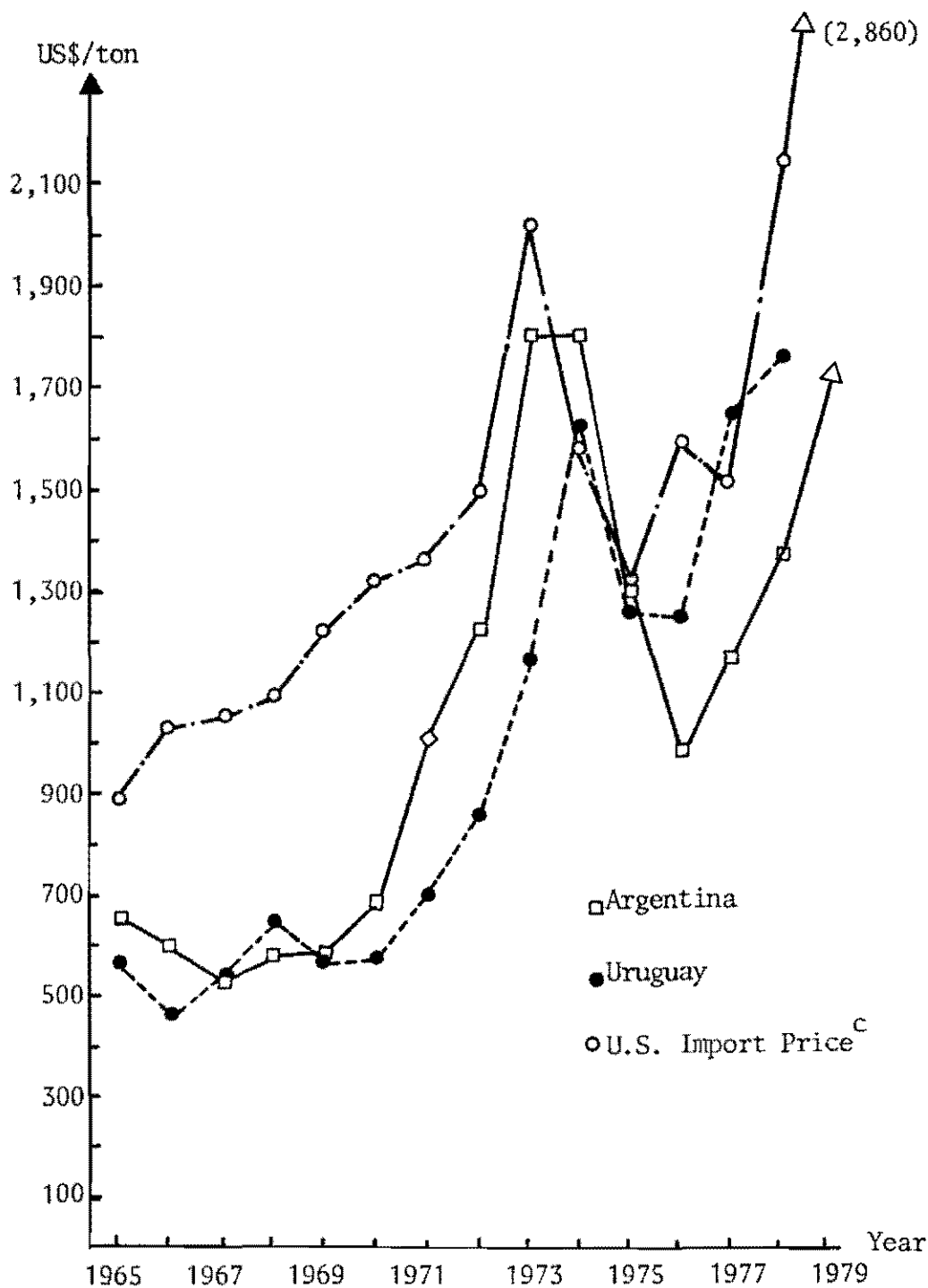
Source: FGV (24), DANE (6), MAC (36)

Figure 2.7 Exports of canned beef by selected countries, 1962-1966



Source: Simpson and Mirowsky (47)

Figure 2.8 Average international price of beef carcasses^a in Argentina, Uruguay and United States. 1965-1979^b



a/ Average FOB prices for all carcass beef exports

b/ Preliminary data for 1979

c/ This is the Central America export price

Source: Estimated from FAO (21) and USDA (49)

2c) MILK

Milk production in Latin America is very low in comparison to other regions, corresponding to less than 8% of world production (Table 2.7). Within Latin America, the tropical area supplies 80% of the region's fresh milk production, with Brazil, Mexico and Colombia being the largest producers. Argentina is the major milk producer in the temperate area (Table 2.18).

During 1978 milk production increased in all tropical countries but declined in the temperate area, as compared to the 1974/77 average. This resulted in an increase of milk production per capita in the tropical area from 79 kg in 1974/77 to 89 kg in 1978, and a decrease in the temperate area from 185 to 170 kg (Table 2.18). Milk production per capita in the tropical zone is still only 35% of the milk available per person in the United States. The corresponding figure for temperate Latin America is 52% of apparent United States per capita consumption (Table 2.18). Production per milking cow in the temperate zone is twice that of tropical Latin America (but still very low in comparison with the United States), which may be partly explained by the difference in cattle breeds and the higher specialization of this sector in the temperate zone (Table 2.19).

In Brazil, pure milking cows represent only 15% of the total breeding herd. Yet dual-purpose herds are 35% of the nation's breeding stock and supply from 20 to 35% of total milk and milk products (Rivas and Nores, p.11). In the North Coast of Colombia, the country's main cattle raising area, 66% of beef cattle ranches can be classified as milk producers. In contrast, milk production with beef cattle herds is almost non-existent in the temperate zone. Milk production from beef cattle herds in tropical Latin America should not be overlooked as an important product.

Average productivity in milk production has remained virtually

stagnant since 1961/65, changing from 956 to 970 kg/animal, with cyclical fluctuations around these values (Table 2.19).

The production of milk in Latin America during the period 1970-78 grew at an annual average rate of 5.5%, 6.6% in the tropical area and only 0.1% in the temperate zone. During this period, the highest rates of growth in production were observed in El Salvador, Bolivia and Mexico, while growth rates were negative in Peru, Colombia, Guyana and Chile (Table 2.20). Although production increased fairly rapidly during this decade, there was also a rapid increase in the demand for milk. Paraguay, Mexico, Bolivia, Nicaragua and El Salvador have recently achieved growth in milk production exceeding the rates of growth in demand (Figure 2.9). If production continues to grow at its 1970-78 rate, production in these countries will exceed projected consumption in the long-run. The higher rates of growth in milk production observed in the last few years appear to be, as with beef, more a result of the cyclical nature of the cattle sector than a consequence of increase productivity, as indicated earlier by the almost unchanged volume of production per milking cow.

Latin America is a net importer of milk: Mexico, Venezuela and Cuba import more than half of all imports of dry milk (Table 2.21). In 1978, imports reached 326,136 ton of dry milk. Trade in liquid and condensed milk are of lesser importance. Nicaragua and Costa Rica are the only net exporters of milk.

Because of direct government intervention in the domestic markets for milk, changes in the price of milk over time often do not reflect the gap between supply and domestic demand. Nevertheless, the real price of milk has risen during this decade (Table 2.22). Milk is relatively cheaper in Brazil and more expensive in Venezuela, in comparison to beef. The beef/milk price ratio in selected countries ranged from around 4 to 6 during 1978, showing less divergence between countries than in earlier years (Table 2.23).

Table 2.17 Fresh milk: world production of fresh milk of selected regions. 1977

Region	Total	Percentage
	'000 ton	%
World	407.546	100.0
United States	55.655	13.7
Europe	165.599	40.6
Latin America	31.987	7.8
Tropical Latin America	26.678	6.5
Brazil	10.783	2.6
Mexico	5.000	1.2
Colombia	2.300	0.6
Temperate Latin America	7.035	1.7
Argentina	5.309	1.3
Asia	29.345	7.2
Africa	9.659	2.4
Oceania	12.624	3.1

Source: Estimated from FAO (19)

Table 2.18 Fresh milk: total and per capita production in Latin America by countries. Average 1974/77 and 1978

Region and Country	Total		Per capita	
	1974/77	1978	1974/77	1978
	- '000 ton -		- kg/year -	
United States	53,763	55,305	254	253
Tropical Latin America	22,811	26,884	79	89
Brazil	10,134	11,970	94	100
Mexico	4,910	6,216	80	95
Colombia	2,345	2,500	96	96
Venezuela	1,171	1,276	91	96
Peru	855	840	54	50
Ecuador	800	830	117	106
Cuba	626	1,080	65	107
Paraguay	120	126	45	44
Bolivia	50	57	9	12
Dominican Rep.	331	340	68	60
Central America	1,356	1,532	69	76
Nicaragua	254	297	113	116
Costa Rica	262	290	132	136
Guatemala	315	314	51	52
El Salvador	270	360	64	80
Honduras	183	196	56	64
Panama	72	75	42	41
Caribbean	112	117	12	13
Guyana	12	13	15	15
Other Caribbean ^a	100	104	12	13
Temperate Latin America	7,202	6,804	185	170
Argentina	5,472	5,176	214	196
Chile	991	928	93	86
Uruguay	739	700	266	243
Latin America	30,013	33,688	91	99

^{a/} Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

Source: FAO (19)

Table 2.19 Fresh milk: production per milking cow in Latin America by country. 1974/77 and 1978

Region and Country	Production per milking cow	
	1974/77	1978
	- kg/year -	
United States	4,845	5,098
Tropical Latin America	896	870
Brazil	770	840
Mexico	1,306	750
Colombia	918	1,061
Venezuela	1,103	1,276
Cuba	626	1,317
Paraguay	205	209
Peru	1,297	1,323
Ecuador	1,348	1,383
Bolivia	1,346	1,289
Dominican Rep.	1,296	1,388
Central America	810	821
Guatemala	914	788
Costa Rica	1,052	1,018
Nicaragua	632	654
Panama	911	904
Honduras	546	558
El Salvador	1,028	1,220
Caribbean	995	618
Guyana	765	765
Other Caribbean ^a	850	605
Temperate Latin America	1,755	1,779
Argentina	1,903	1,979
Uruguay	1,616	1,556
Chile	1,327	1,221
Latin America	1,003	970

a/ Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

Source: Estimated from FAO (19)

Table 2.20 Fresh milk: growth rates of demand and production in Latin America, by country. 1971-1978

Region and Country	Growth rate of		Income elasticity of demand for milk ey	Growth rate of		
	Per capita GNP \dot{Y}	Human population \dot{P}		Demand \dot{d}	Production 1971-1978	1966-1978
	percentage			- percentage -		
Tropical Latin America	-	-	-	6.0 ^b	6.2	4.8
Brazil	7.4	2.8	0.6	7.4	7.1	4.5
Ecuador	4.8	3.5	0.7	7.0	7.3	5.7
Peru	2.7	3.0	1.1	6.0	-1.6	2.0
Bolivia	3.4	2.7	0.9	5.8	12.7	6.3
Mexico	1.7	3.5	0.7	4.7	10.7	7.8
Paraguay	3.8	2.7	0.9	4.7	5.9	3.8
Colombia	3.3	2.8	0.5	4.5	-0.7	1.5
Venezuela	3.1	3.1	0.4	4.4	3.4	5.8
Dominican Rep.	5.7	2.9	0.7	7.0	1.2	3.9
Cuba	-	-	-	-	12.8	8.4
Central America	-	-	-	4.7 ^b	5.2	3.0
Guatemala	3.0	2.9	1.0	6.0	2.3	3.8
El Salvador	2.1	3.1	1.0	5.3	13.8	5.4
Panama	1.3	3.1	0.8	4.2	1.6	0.5
Nicaragua	2.5	3.3	0.3	4.1	6.1	1.7
Costa Rica	3.0	2.5	0.3	3.4	3.6	4.1
Honduras	0.5	2.7	1.0	3.2	1.6	1.8
Caribbean	-	-	-	3.6 ^b	0.3	0.6
Guyana	1.9	1.8	0.9	3.5	-4.8	-4.6
Other Caribbean ^c	-	-	-	3.7	0.9	0.8
Temperate Latin America	-	-	-	1.7 ^b	0.1	1.3
Chile	1.1	1.8	0.7	2.6	-1.8	0.6
Argentina	1.8	1.3	0.1	1.5	0.6	1.6
Uruguay	0.5	0.7	0.0	0.7	0.1	0.2
Latin America	-	-	-	5.5 ^b	4.8	3.9

a/ $\dot{d} = \dot{P} + e_y \dot{Y} + e_y \dot{P} \dot{Y}$

b/ Average, weighted by population

c/ Includes: Trinidad & Tobago, Jamaica, Haiti and Barbados

Source: Income and population data were from the World Bank (54).
Income elasticities of demand and production data were from
FAO (16) and (19)

Table 2.21 Dry milk: net trade of dry milk in Latin America, by countries. Average 1974/77 and 1978

Country	1974/77	1978
----- metric ton -----		
<u>Importing:</u>	<u>286,696</u>	<u>326,136</u>
Mexico	56,275	86,400
Venezuela	45,806	74,000
Cuba	52,701	35,000
Other Caribbean ^a	22,684	23,035
Chile	21,520	20,000
Colombia	5,911	18,960
Peru	27,496	17,640
Brazil	28,422	11,801
El Salvador	5,896	11,100
Bolivia	2,393	8,000
Guatemala	4,965	4,700
Panama	1,683	3,700
Ecuador	2,863	3,500
Honduras	2,915	3,100
Argentina	-	2,500
Uruguay	-	1,800
Guyana	928	700
Paraguay	238	200
<u>Exporting:</u>	<u>2,879</u>	<u>3,800</u>
Nicaragua	2,879	3,400
Costa Rica	-	400

^{a/} Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

Source: FAO (21)

Table 2.22 Milk prices at the producer level in selected countries.
1970-1978 (US\$/kg)

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978
Brazil (Sao Paulo)	0.07	0.07	0.08	0.09	0.14	0.16	0.16	0.19	0.18
Venezuela	0.26	0.26	0.26	0.26	0.33	0.39	0.39		
Chile				0.09	0.16	0.18	0.20	0.24	0.28
Uruguay	0.06	0.08	0.06	0.08	0.12	0.10	0.11	0.11	0.14
Ecuador	0.06	0.07	0.08	0.08	0.08	0.11	0.13	0.17	
Nicaragua	0.11	0.18	0.13	0.14	0.18	0.18	0.19	0.22	
Colombia	0.13	0.12	0.12	0.13	0.14	0.17	0.19	0.24	0.30

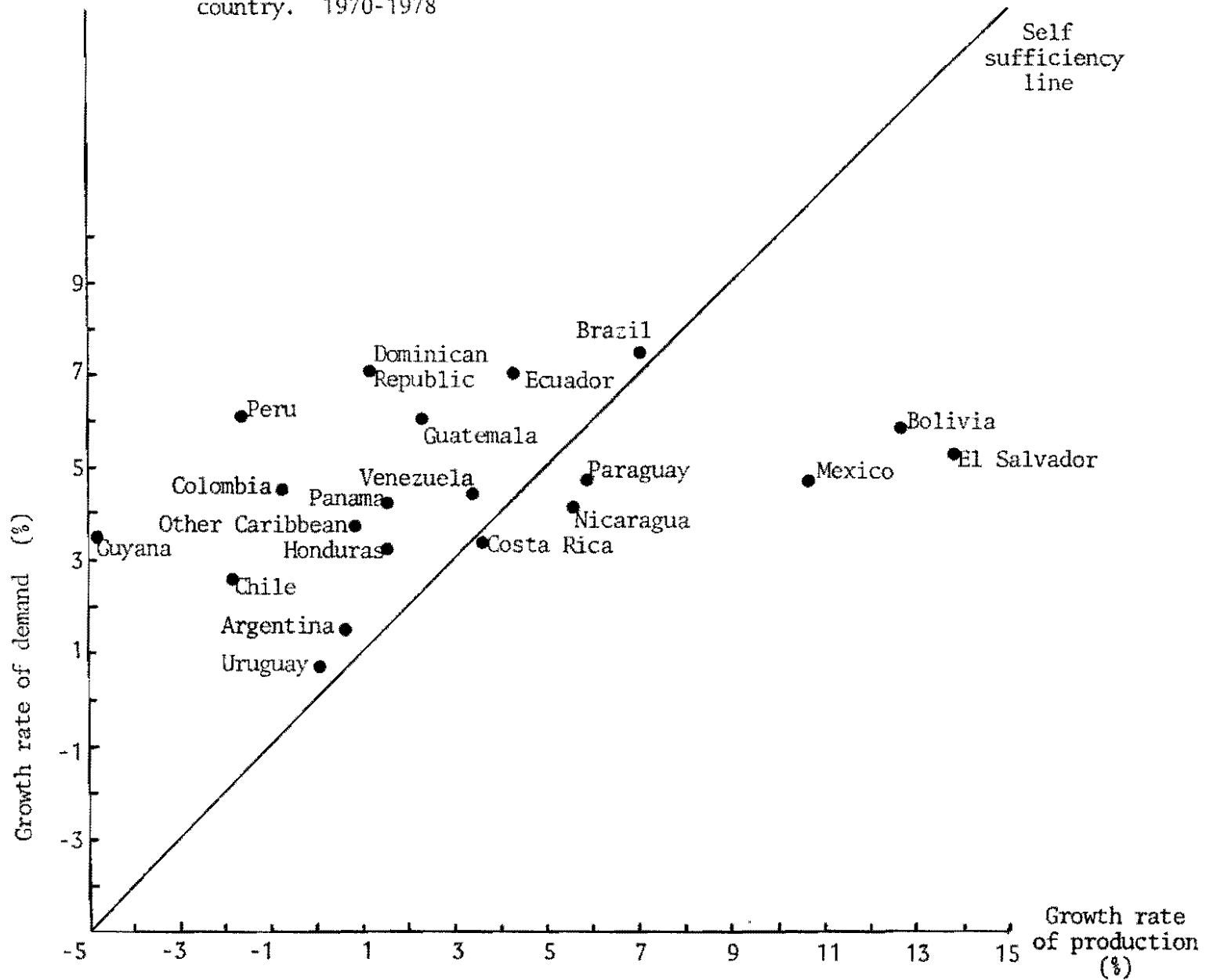
Source: F.G.V. (27), MAC (36), Universidad Católica de Chile (51), Pérez and Secco (40), Kamal Dow (8), Banco Central de Nicaragua (2), DANE (6)

Table 2.23 Relative beef/milk price at the producer level in selected countries. 1970-1978

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978
Brazil	5.30	6.82	7.12	8.50	7.38	5.27	5.01	4.22	5.99
Colombia	2.83	3.04	3.92	4.21	3.89	3.20	3.55	3.54	3.94
Panama	3.96	4.18	4.84	3.81	3.61	3.59	3.27	3.82	4.00
Venezuela	1.56	1.61	1.64	1.93	1.60	1.69	1.98	n.a	n.a
Nicaragua	2.92	3.35	3.00	3.54	2.64	2.23	2.27	n.a	n.a
Chile	n.a	n.a	n.a	8.77	7.43	3.00	3.95	4.08	3.79

Source: Milk prices: Table 2.22.
Beef prices: F.G.V. (27), FADLEGAN (15), Banco Nacional de Panamá (3), MAC (36), Banco Central de Nicaragua (2), Universidad Católica de Chile (51).

Figure 2.9 Fresh milk: growth rates of production and demand in Latin America, by country. 1970-1978



Source: Table 2.20

2d) SWINE

The swine population in Latin America is 10.2% of world swine inventory, larger than that of the United States, Africa and Oceania put together, but half that of Europe (Table 2.24). Yet, it supplies only 4.4% of world pork production, which is one third of production in the United States. Brazil, Mexico and Argentina dominate the market with 60% of Latin American production. Two other tropical countries, Colombia and Venezuela, follow with 9.2% of production (Table 2.25). These countries are also the main producers of animal feed such as maize or sorghum.

Production per head in stock in the tropical region is half that of the temperate zone. Productivity levels in Ecuador, and some Central American countries are extremely low. Countries with the highest extraction of pork per head in stock during 1978 were Argentina (56 kg), Colombia (52 kg) and Paraguay (51 kg) (Table 2.25).

Pork production has either increased or remained stagnant over time, except in Chile, Uruguay, Guatemala and Honduras where production has decreased in the 1970-78 timespan. From 1970/74 to 1975/76 only Colombia, Venezuela and the temperate zone had shown noticeable improvement in swine productivity (1979 CIAT Trend Highlights). However, from 1975/76 till 1978 this trend was reversed, with productivity declining in the temperate zone but increasing in some of the tropical countries such as Brazil, Mexico and Costa Rica (Table 2.25). In Paraguay, the country with the highest per capita consumption in Latin America (Figure 2.10), total production increased somewhat but at the expense of inventories. In Ecuador, the absolute level of production decreased (although inventories increased) reaching a low extraction of 11 kg of meat per head in stock during 1978. Both stock and production decreased in Argentina.

Trade in pork continues to be unimportant in the region, except in

the cases of Venezuela and Panama in 1978 which imported around 10% of their pork. Brazil, Mexico and Argentina export very small amounts of pork, but the region is on average a net importer (Table 2.26).

In spite of the fact that production in Brazil, Mexico and Colombia has increased (Figure 2.11), output per capita has remained stagnant (Brazil, Colombia) or even slightly decreased (Mexico). With the exception of Paraguay, production per capita fluctuates between 2 and 7 kg in the tropics, and between 3 and 9 kg in the temperate region. These levels have been much the same in the last 20 years (Table 2.27). The long-run growth rates of demand and production during 1960-1976 have been almost identical (Rivas and Nores, Table 1.8), but this trend seems to be changing during the last decade, with production growth rates declining vis-a-vis a sustained demand growth (Table 2.28). This is true for both the tropical and temperate regions. The highest rates of growth in production during the 1970-1978 period were found in Paraguay, Venezuela, Colombia and in a few Central American countries. Recently growth rates have decreased substantially in the three largest producing countries: Brazil, Mexico and Argentina, as well as in some other smaller countries. In Argentina and Mexico, maize production (major animal feed) decreased in the period from 1971/73 to 1976/78 (Table 6.4). In Argentina, a net exporter of maize, exports increased in spite of the decline in production. In Mexico, as production stagnated, maize imports were substantially increased. Thus, it is possible that prices of feed grains have been under upward pressure in both countries. This has clearly occurred in Brazil. The relative price of concentrates increased in Brazil during the period 1970-1978 (Figure 2.12). This may have contributed to the slower growth rate in swine production in recent years.

In Colombia and Venezuela the situation is different as production growth has accelerated during the last years (Table 2.28). Although growth rates of maize production are rather low in these countries, sorghum production has increased dramatically (Table 6.5). The profitability of swine production in Colombia has clearly improved, as shown by the rising swine/concentrates price ratio (Figure 2.12).

The price of pork (in dollars) has increased, in Brazil, Venezuela, Argentina and Colombia (Table 2.29). Moreover, the beef/pork price ratio has gone down in these same countries (Table 2.30), except in Colombia, where it has remained fairly constant over time. In relation to poultry, pork has become more expensive in Brazil [F.G.V. (27)] and in Colombia (Figure 2.13). The same trend could be occurring in other countries in part as a result of the superior feed conversion efficiency in the production of poultry.

Table 2.24 Swine: world production of pork and swine stocks of selected regions. 1977

Region	Pork production		Swine stock	
	Total	Percentage	Total	Percentage
	'000 ton		'000 ton	
World	47,237	100.0	706,926	100.0
United States	6,009	12.7	54,934	7.8
Europe	16,458	34.8	160,657	22.7
Latin America	2,100	4.4	72,285	10.2
Tropical Latin America	1,816	3.8	67,352	9.5
Brazil	834	1.8	36,800	5.2
Mexico	410	0.9	11,986	1.7
Colombia	100	0.2	1,876	0.3
Venezuela	90	0.2	1,955	0.3
Temperate Latin America	284	0.6	4,933	0.7
Argentina	238	0.5	3,563	0.5
Asia	16,526	35.1	336,498	47.6
Africa	325	0.7	8,280	1.2
Oceania	254	0.5	4,510	0.6

Source: Estimated from FAO (19)

Table 2.25 Swine: total stock, production and production per head in stock, by country. 1975/76 and 1978

Region and Country	Stock		Production		Production per head in stock	
	1975/76	1978	1975/76	1978	1975/76	1978
	- '000 head -		- '000 ton -		- kg/year -	
Tropical Latin America	74,319	69,534	1,647	1,851	22	27
Colombia	1,923	1,966	100	103	52	52
Paraguay	800	1,190	51	61	64	51
Venezuela	1,922	2,057	68	91	35	44
Cuba	1,455	1,800	39	63	27	35
Mexico	12,550	12,321	385	414	31	34
Peru	2,110	2,030	54	70	26	34
Dominican Rep.	702	810	20	23	28	28
Brazil	44,250	37,600	772	850	17	23
Bolivia	1,172	1,351	25	29	21	21
Ecuador	2,400	3,150	42	36	18	11
Central America	2,834	2,784	51	71	18	26
Costa Rica	215	215	6	9	28	42
Panama	172	190	5	6	29	32
El Salvador	422	435	11	14	26	32
Nicaragua	660	710	10	20	15	28
Honduras	515	530	10	14	19	19
Guatemala	850	704	9	12	11	17
Caribbean	2,201	2,475	40	40	18	16
Other Caribbean ^a	2,078	2,340	38	38	18	16
Guyana	123	135	2	2	16	15
Temperate Latin America	5,363	5,196	305	265	57	51
Argentina	4,150	3,800	252	211	61	56
Chile	795	951	27	38	34	40
Uruguay	418	445	26	16	62	36
Latin America	79,682	74,730	1,952	2,116	24	28

a/ Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

Source: FAO (19)

Table 2.26 Swine: trade in pork in Latin America. Averages
1970/73, 1974/77 and 1978

Country	1970/73	1974/77	1978
----- metric ton -----			
<u>Exporting:</u> (net exports)	<u>5,679</u>	<u>15,385</u>	<u>7,539</u>
Brazil	1,784	7,828	4,895
Mexico	598	1,024	1,400
Argentina	3,297	6,365	1,243
Nicaragua	-	162	-
Guyana	-	6	1
<u>Importing:</u> (net imports)	<u>5,742</u>	<u>3,371</u>	<u>12,511</u>
Venezuela	600	1,530	10,551
Panama	37	7	750
Trinidad	672	296	642
Other Caribbean ^a	74	268	558
Chile	4,224	1,051	-
Peru	128	125	-
Costa Rica	1	81	-
El Salvador	-	10	-
Honduras	-	3	-
Guyana	6	-	-
Balance (Exports - Imports)	<u>63</u>	<u>12,014</u>	<u>-4,972</u>

^{a/} Includes: Trinidad & Tobago, Jamaica, Haiti and Barbados

Source: FAO (21)

Table 2.27 Pork: per capita production^a in Latin America, by country. Averages 1960/64, 1970/74 and 1975/78

Region and Country	Production per capita		
	1960/64	1970/74	1975/78
	----- kg -----		
Tropical Latin America	5	6	6
Paraguay	11	19	21
Mexico	4	7	6
Brazil	6	7	7
Ecuador	4	6	5
Bolivia	4	4	5
Venezuela	3	4	6
Colombia	4	4	4
Cuba	6	4	6
Dominican Rep.	2	3	4
Peru	4	3	4
Central America	3	3	4
Nicaragua	5	8	5
Honduras	3	2	3
El Salvador	4	3	3
Costa Rica	4	4	4
Panama	3	3	3
Guatemala	2	2	2
Caribbean	3	3	4
Guyana	2	1	2
Other Caribbean ^b	3	3	4
Temperate Latin America	7	8	7
Argentina	8	9	9
Uruguay	9	7	6
Chile	3	4	3
Latin America	5	7	6

a/ Slaughter only

b/ Includes: Trinidad & Tobago, Jamaica, Haiti and Barbados

Source: Estimated from USDA (10) and FAO (19)

Table 2.28 Swine: growth rates of demand and production in Latin America, by country. 1970-1978

Region and Country	Growth rate of:		Income elasticity of demand for pork ϵ_y	Growth rate of		
	Per capita GNP \dot{Y}	Human population \dot{P}		Demand \dot{d}	Production 1970/1978 1960/1975	
	percentage			- percentage -		
Tropical Latin America	-	-	-	4.8 ^b	3.0	4.2
Ecuador	4.8	3.5	0.8	7.3	0.0	4.6
Bolivia	3.4	2.7	0.8	5.4	7.6	2.0
Brazil	7.4	2.8	0.3	5.0	1.7	4.1
Colombia	3.3	2.8	0.6	4.8	8.8	3.1
Peru	2.7	3.0	0.6	4.6	2.3	1.0
Paraguay	3.8	2.7	0.5	4.6	14.0	2.4
Mexico	1.7	3.5	0.5	4.3	1.3	7.0
Venezuela	3.1	3.1	0.4	4.3	10.6	5.6
Dominican Rep.	5.7	2.9	0.7	6.9	9.3	6.5
Central America	-	-	-	4.1 ^b	5.6	2.2
Nicaragua	2.5	3.3	0.5	4.5	13.1	6.2
Guatemala	3.0	2.9	0.5	4.4	-2.0	1.0
El Salvador	2.1	3.1	0.5	4.2	11.8	0.0
Costa Rica	3.0	2.5	0.5	4.0	8.2	3.3
Panama	1.3	3.1	0.6	3.9	6.3	1.0
Honduras	0.5	2.7	0.5	3.0	-1.7	-0.4
Caribbean	-	-	-	3.6 ^b	2.6	-0.2
Guyana	1.9	1.8	0.8	3.3	0.0	0.0
Other Caribbean ^c	-	-	-	3.6	2.8	-
Temperate Latin America	-	-	-	2.1 ²	-1.2	2.7
Chile	1.1	1.3	0.8	2.2	-5.4	5.7
Argentina	1.8	1.8	0.2	2.2	0.0	2.6
Uruguay	0.5	0.7	0.4	0.9	-7.2	-1.0
Latin America	-	-	-	4.5 ²	2.4	4.1

a/ $\dot{d} = \dot{P} + \epsilon_y \dot{Y} + \epsilon_y \dot{Y} \dot{P}$

b/ Average, weighted by population

c/ Includes: Trinidad & Tobago, Jamaica, Haiti and Barbados

Source: Income and population data were from the World Bank (54).
Income elasticities of demand and production data were from
FAO (16) and (19)

Table 2.29 Pork prices at the producer level in selected countries (US\$/kg). 1970-1978

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978
Brazil	0.58	0.43	0.51	0.62	1.02	0.84	0.75	0.97	0.98
Venezuela	n.a	n.a	0.61	0.71	0.85	0.98	1.09	n.a	n.a
Argentina	0.33	0.35	0.35	0.43	0.66	0.27	0.58	0.64	0.90
Bolivia	1.51	1.68	1.51	1.00	1.30	1.45	1.65	1.70	n.a
Colombia	0.50	0.56	0.60	0.74	0.80	0.82	0.89	1.69	1.49

n.a.: not available

Source: F.G.V. (27), MAC (36), Junta Nacional de Carnes (35), Ministerio de Industria, Comercio y Turismo de Bolivia (38), Empresas varias de Bogotá (14).

Table 2.30 Beef/pork price ratios at the producer level in selected countries. 1970-1978

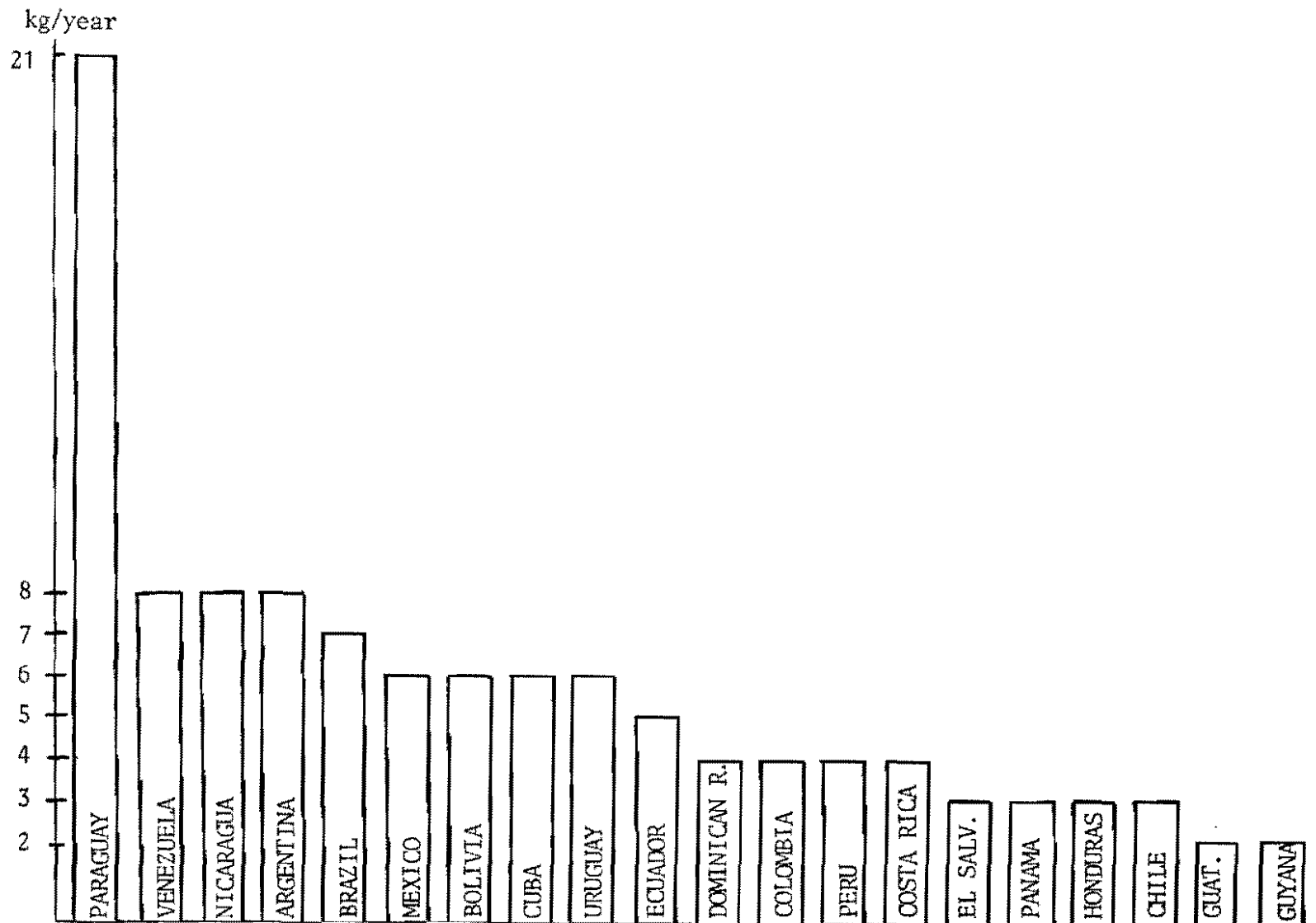
Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	Growth rate
Brazil	0.87	1.24	1.12	1.34	1.00	1.04	1.07	0.81	1.19	-0.6
Colombia ^{a/}	0.67	0.65	0.81	0.73	0.67	0.68	0.77	0.72	0.63	-0.2
	0.80	0.81	0.85	0.87	0.87	0.85	0.86	0.85	0.74	-0.1
Argentina	0.82	1.15	1.06	1.08	0.73	0.92	0.76	0.64	0.52	-7.3
Bolivia ^a	0.67	0.90	0.90	0.90	0.83	0.83	0.73	0.74	n.a	-0.8
Venezuela	n.a	n.a	0.71	0.72	0.63	0.68	0.71	n.a	n.a	-0.6
Chile	n.a	n.a	n.a	n.a	n.a	n.a	0.71	0.76	0.85	n.a
Mexico ^b	n.a	n.a	n.a	n.a	n.a	n.a	n.a	0.82	0.86	n.a

a/ At consumer level

b/ Wholesale level

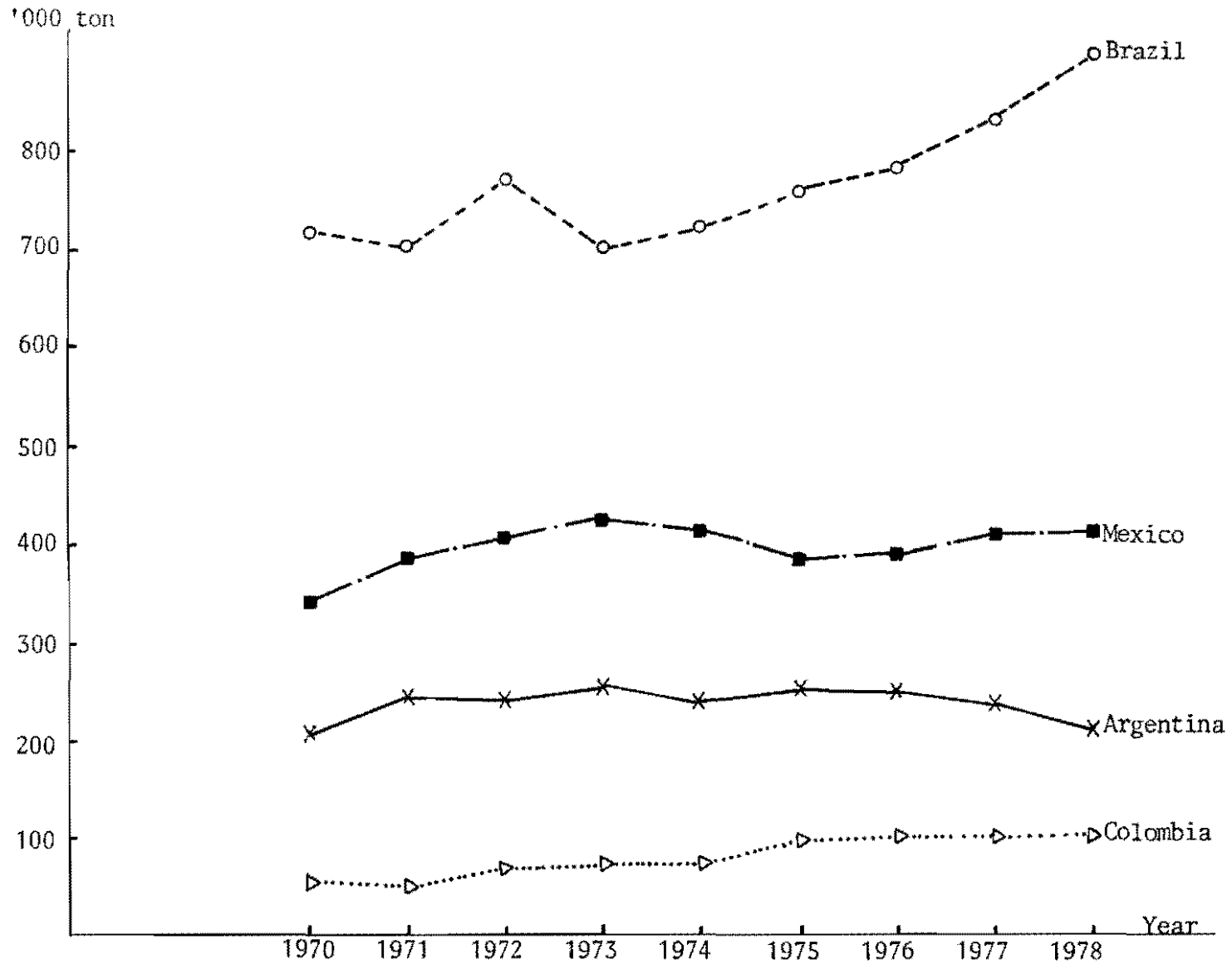
Source: Pork prices: Table 2.29
 Beef prices: F.G.V. (27), Empresas varias de Bogotá (14), Junta Nacional de Carnes (35), Ministerio de Industria, Comercio y Turismo de Bolivia (38), MAC (36), Universidad Católica de Chile (51), P.G.E.A. (41).

Figure 2.10 Pork: per capita consumption by country in Latin America. 1978



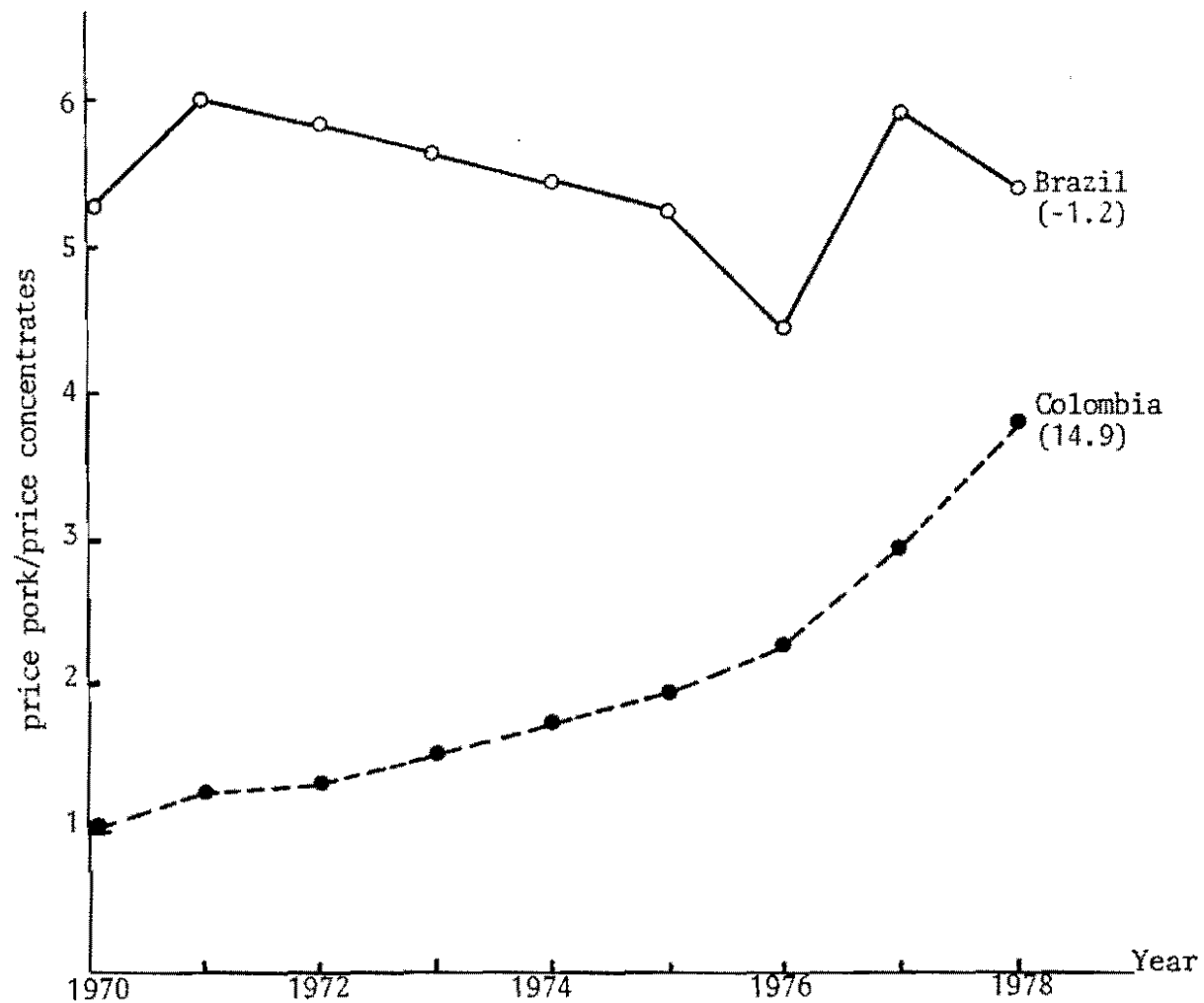
Source: Estimated from FAO (19)

Figure 2.11 Pork: production trends of the main producers in Latin America, 1970-1978



Source: FAO (19)

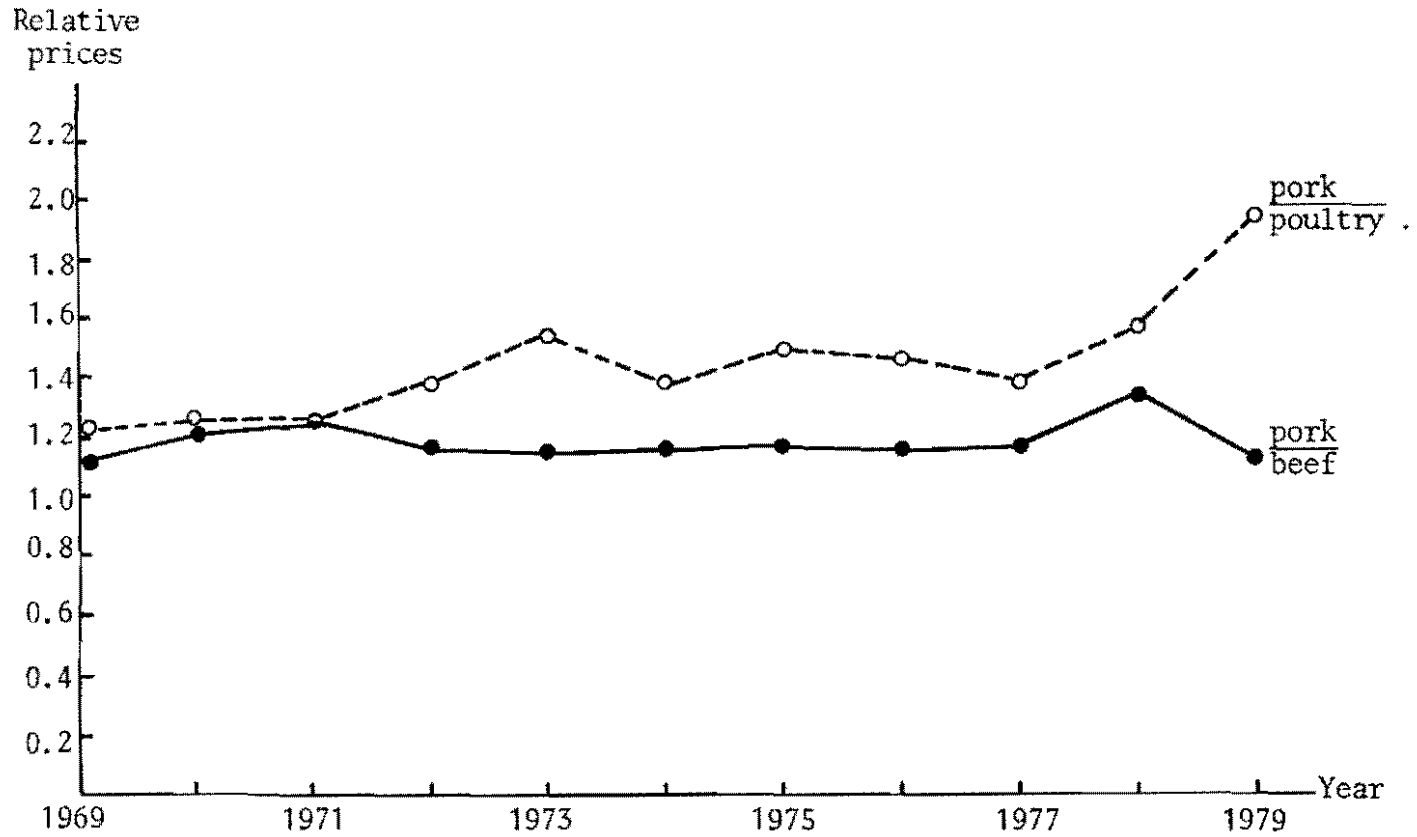
Figure 2.12 Relative pork/concentrate price ratios in Colombia and Brazil.
1970-1978



(growth rates shown in parentheses)

Source: FGV (27), DANE (6) and CORABASTOS (5)

Figure 2.13 Colombia: pork/poultry and pork/beef price ratios at consumer level. 1969-1979



Source: DANE (6) and (7) and Empresas Varias de Bogotá (14)

2e) POULTRY

Latin America has 12% of world poultry inventories, 785 million head, but produces only 8% of world poultry meat production. The United States possesses 6% of the world stock and supplies almost 30% of world poultry meat (Table 2.31).

Ninety two percent of the Latin American poultry stock is found in tropical Latin America which supplies 84% of Latin American production. Brazil and Mexico dominate production. In 1978 they supplied more than half of the region's poultry meat, followed in importance by Argentina and Venezuela. All of Central America produced less than Venezuela alone (Table 2.32).

Latin America is a net importer of poultry, although Brazil and Argentina export around 7% of their production. Venezuela imports 12% and Mexico 2% of their internal consumption. Uruguay is the only other exporting country in the region, trading 12% of its production in the world market.

Growth in poultry production has resulted both from growth in stocks and from the adoption of modern technology. During the period 1961/1971 to 1978, Latin American poultry stock increased at an annual average rate of 4.9%, and production grew at 9.5% annually (Table 2.33). Both stocks and production grew faster in the tropical region, particularly in Brazil, Mexico, Venezuela, Cuba and El Salvador (Figure 2.14). Chile is the only country where production declined during this period.

As a result of the high rates of growth in production, supply has increased faster than demand during the 1970-1978 period, with the exception of Ecuador, Bolivia, and some Central American countries (Table 2.34). If these growth rates are maintained in the future several countries would become self-sufficient or even net exporters of poultry

(Figure 2.15). As a result, the relative price of poultry has declined over time. In Brazil, the beef/poultry price ratio increased at a 1.3% annual rate over the 1970-1978 period [F.G.V. (27)].

Nevertheless, the efficiency of the poultry sector in Latin America is still very low, producing 2.3 kg and 5.5 kg per head in stock in the tropical and temperate regions respectively. The United States produces 20 kg per head in stock (Table 2.35). In Latin America, Argentina has the highest productivity (7.9 kg/head) followed by Venezuela (6.3 kg/head). Central America, Bolivia, Ecuador and Colombia are the most inefficient. But the high rates of growth observed in the last decade and the fact that no poultry data were published for Latin America prior to 1969 indicates that this is one of the most dynamic sectors of animal products in the region. Brazil, for example, was a net importer of poultry until 1974. It became an exporter in 1975, and by 1978 Brazil became the fifth exporter in the world, after Canada, United States, EEC and Hungary. The profitability of poultry production is expected to be higher in Brazil than in other countries of the region. In 1978 the Brazilian producer could buy 4 kg of concentrates with one kg of poultry meat, while the Colombian producer could only buy 3 kg of concentrates. The poultry/concentrate price ratio is even more favorable in Chile, where poultry production increased by more than 30% in 1978, after several years of low production (Figure 2.16).

Per capita poultry consumption in the tropical region is half that of Argentina, and only 14% of per capita consumption in the United States, with the exceptions of Venezuela, Guyana, Cuba and Peru (Table 2.36). The high and steadily rising levels of per capita consumption in Venezuela (17 kg in 1978) is due to increased imports, which were increased substantially in 1977 and further in 1978. This may be a consequence of the declining poultry/maize and poultry/sorghum prices which have taken place in Venezuela during the last years (Figure 2.17). Poultry production during 1978 did not exceed that of 1977, although it had been increasing in the previous years (Figure 2.14). In general, consumption is much lower in Central America, Bolivia and Ecuador, which as mentioned earlier, are also less efficient producers. Overall,

poultry consumption per capita in Latin America has increased over time (Table 2.36).

Table 2.31 Poultry: production and stock in selected regions.
1977

Region	Poultry stock ^a		Poultry meat production ^a	
	Total	Percentage	Total	Percentage
	'000 head		'000 ton	
World	6,386,470	100.0	24,646	100.0
United States	387,234	6.0	7,264	29.5
Europe	1,197,854	18.8	6,222	25.2
Latin America	784,813	12.3	2,013	8.2
Tropical Latin America	724,162	11.3	1,692	6.9
Brazil	307,100	4.8	680	2.8
Mexico	147,705	2.3	353	1.4
Colombia	54,200	0.8	79	0.3
Peru	38,000	0.6	130	0.5
Venezuela	30,251	0.5	194	0.8
Temperate Latin America	60,651	0.9	321	1.3
Argentina	33,400	0.5	260	1.1
Asia	2,561,692	40.1	5,713	23.2
Africa	526,363	8.2	884	3.6
Oceania	54,291	0.9	238	1.0

^{a/} Includes: chickens, ducks and turkeys

Source: FAO (19)

Table 2.32 Poultry: production, trade and consumption in Latin America, by country. 1978

Country	Production		+Imports -Exports	Per capita consumption
	'000 ton	%	ton	kg/year
Brazil	690	34.0	-51,500	5
Mexico	356	18.0	+ 7,500	6
Argentina	252	13.0	-15,000	9
Venezuela	194	10.0	+26,593	17
Peru	100	5.0	0	6
Colombia	80	4.0	+ 130	3
Cuba	78	4.0	+20,000	10
Chile	59	3.0	+ 200	5
Other Caribbean ^a	52	2.0	+18,589	9
Dominican Rep.	38	1.0	+ 46	7
Ecuador	18	1.0	0	2
Uruguay	17	1.0	- 2,180	5
Guyana	12	0.6	0	14
Guatemala	11	0.5	+ 466	2
Paraguay	11	0.5	0	4
El Salvador	11	0.5	- 219	2
Panama	10	0.5	+ 100	5
Nicaragua	7	0.3	+ 500	3
Honduras	6	0.3	+ 1	2
Bolivia	6	0.3	0	1
Costa Rica	5	0.2	0	2
Latin America	2,013	100.0	+ 5,226	6

a/ Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

Source: FAO (19) and (21)

Table 2.33 Poultry: annual growth rates of stock and production in Latin America, by country. 1969/71-1978

Region and Country	Stock	Production
	----- percentage -----	
United States	-1.9	3.0
Tropical Latin America	5.3	10.8
Brazil	5.5	11.8
Mexico	9.4	12.8
Colombia	9.5	7.9
Venezuela	7.7	12.0
Peru	10.3	9.6
Cuba	6.5	13.0
Ecuador	17.1	8.2
Paraguay	7.4	6.9
Dominican Rep.	1.5	5.5
Bolivia	10.3	4.8
Central America	4.5	6.1
Guatemala	3.5	3.8
Honduras	2.2	4.4
Costa Rica	4.5	1.8
El Salvador	11.7	13.0
Nicaragua	6.1	7.8
Panama	4.1	5.3
Caribbean	5.6	6.4
Guyana	7.1	5.3
Other Caribbean ^a	4.6	7.2
Temperate Latin America	0.9	3.9
Argentina	-0.3	5.6
Chile	1.9	-2.3
Uruguay	3.6	1.1
Latin America	4.9	9.5

^{a/} Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

Source: Estimated from FAO (19)

Table 2.34 Poultry: stock and production per capita in Latin America by country and region. 1978

Region and Country	Stock		Production	
	Total	Per capita	Per capita	Per head in stock
	'000 head	head	- kg/year -	
United States	386,531	1.8	35.3	20.0
Tropical Latin America	727,186	2.4	5.6	2.3
Brazil	310,000	2.6	5.8	2.2
Mexico	152,816	2.3	5.4	2.3
Colombia	61,800	2.4	3.1	1.3
Venezuela	31,000	2.3	14.6	6.3
Cuba	20,000	2.0	7.7	3.9
Paraguay	10,274	3.6	3.8	1.1
Peru	37,000	2.2	6.0	2.7
Ecuador	20,000	2.6	2.3	0.9
Bolivia	8,200	1.7	1.2	0.7
Dominican Rep.	7,800	1.4	6.7	4.9
Central America	41,286	2.1	2.5	1.2
Guatemala	13,545	2.2	1.8	0.8
Costa Rica	5,500	2.6	2.4	0.9
Nicaragua	4,500	1.8	2.7	1.6
Panama	4,400	2.4	5.5	2.3
Honduras	8,200	2.7	1.9	0.7
El Salvador	5,141	1.1	2.4	2.1
Caribbean	27,010	3.0	7.1	2.4
Guyana	11,500	13.3	13.9	1.0
Other Caribbean ^a	15,510	1.9	6.3	3.4
Temperate Latin America	59,537	1.5	8.2	5.5
Argentina	32,000	1.2	9.5	7.9
Uruguay	7,537	2.6	5.9	2.3
Chile	20,000	1.8	5.4	3.0
Latin America	786,723	2.3	5.9	2.6

a/ Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

Source: Estimated from FAO (19)

Table 2.35 Poultry: apparent consumption per capita.
Averages 1969/71, 1972/74 and 1975/78

Region and Country	1969/71	1972/74	1975/78
	---- kg per capita/year ----		
United States	28.9	30.5	31.2
Tropical Latin America	4.0	3.8	4.5
Brazil	3.9	3.7	5.6
Mexico	4.4	3.4	5.3
Colombia	2.1	2.3	2.8
Venezuela	7.8	9.7	13.8
Paraguay	3.0	3.5	4.0
Peru	4.3	5.9	7.7
Ecuador	1.5	2.0	2.3
Bolivia	0.6	1.3	1.0
Dominican Rep.	6.7	6.0	7.2
Cuba	4.7	4.2	8.1
Central America	1.9	2.1	2.3
Nicaragua	2.7	2.5	3.0
Guatemala	1.5	1.5	1.6
Costa Rica	1.7	2.7	2.0
Honduras	1.5	1.7	1.6
El Salvador	1.1	1.5	2.1
Panama	4.8	5.3	5.7
Caribbean	6.3	4.7	5.6
Guyana	8.6	13.4	13.2
Other Caribbean ^a	5.8	6.5	8.2
Temperate Latin America	6.8	8.1	8.1
Argentina	7.7	8.9	9.9
Uruguay	4.8	6.8	5.7
Chile	5.4	6.2	4.3
Latin America	4.4	4.3	5.9

a/ Includes: Trinidad & Tobago, Haiti, Jamaica and Barbados

Source: Estimated from FAO (19) and (21)

Table 2.36 Poultry: growth rates of demand and production in Latin America, by country. 1970-1978

Region and Country	Growth rate		Income elasticity of demand for poultry ϵ_y	Growth rate of:	
	Per capita GNP \dot{Y}	Human population \dot{P}		Demand \dot{d}	Production \dot{a}
	percentage			percentage	
Tropical Latin America	-	-	-	6.7 ^b	10.8
Ecuador	4.8	3.5	1.2	9.5	8.2
Brazil	7.4	2.8	0.7	8.1	11.8
Bolivia	3.4	2.7	1.2	6.9	4.8
Colombia	3.3	2.8	1.0	6.2	7.9
Peru	2.7	3.0	1.0	5.8	9.6
Mexico	1.7	3.5	1.0	5.3	12.8
Paraguay	3.8	2.7	0.6	5.0	6.9
Venezuela	3.1	3.1	0.5	4.7	12.0
Dominican Rep.	5.7	2.9	1.0	8.9	5.5
Central America	-	-	-	5.2 ^b	6.1
Guatemala	3.0	2.9	1.0	6.0	3.8
Nicaragua	2.5	3.3	1.0	5.9	4.4
Costa Rica	3.0	2.5	1.0	5.6	1.8
El Salvador	2.1	3.1	1.0	5.3	13.0
Panama	1.3	3.1	1.0	4.4	7.8
Honduras	0.5	2.7	1.0	3.2	5.3
Caribbean	-	-	-	4.5 ^b	6.4
Guyana	1.9	1.8	1.5	4.7	5.3
Other Caribbean ^c	-	-	-	4.5	7.2
Temperate Latin America	-	-	-	2.4 ^b	3.9
Chile	1.1	1.8	1.0	2.9	-2.3
Argentina	1.8	1.3	0.6	2.4	5.6
Uruguay	0.5	0.7	0.8	1.1	1.1
Latin America	-	-	-	6.1 ^b	9.5

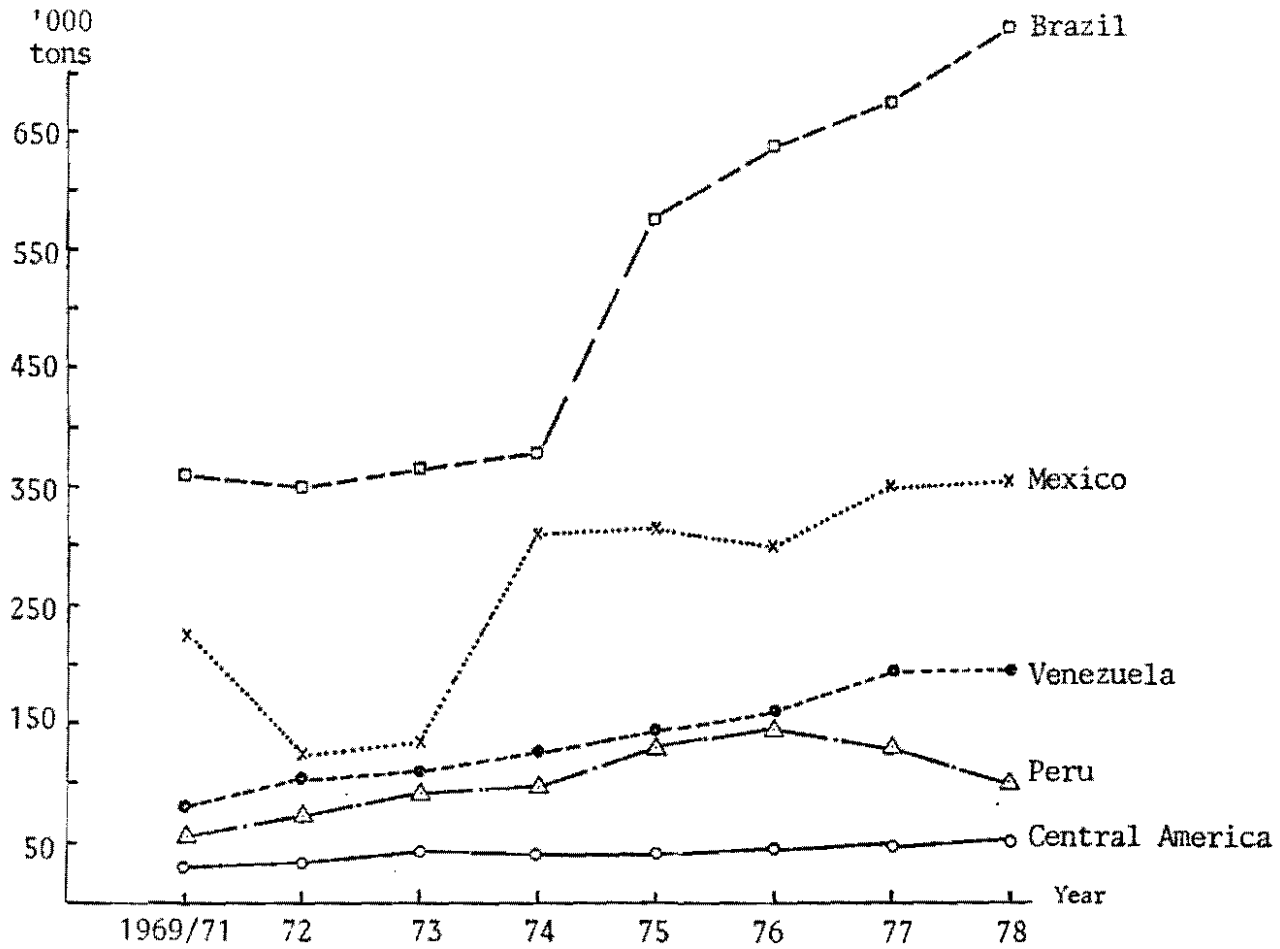
a/ $\dot{d} = \dot{P} + \epsilon_y \dot{Y} + \dot{P} \dot{Y} \epsilon_y$

b/ Average, weighted by population

c/ Includes: Trinidad & Tobago, Jamaica, Haiti and Barbados

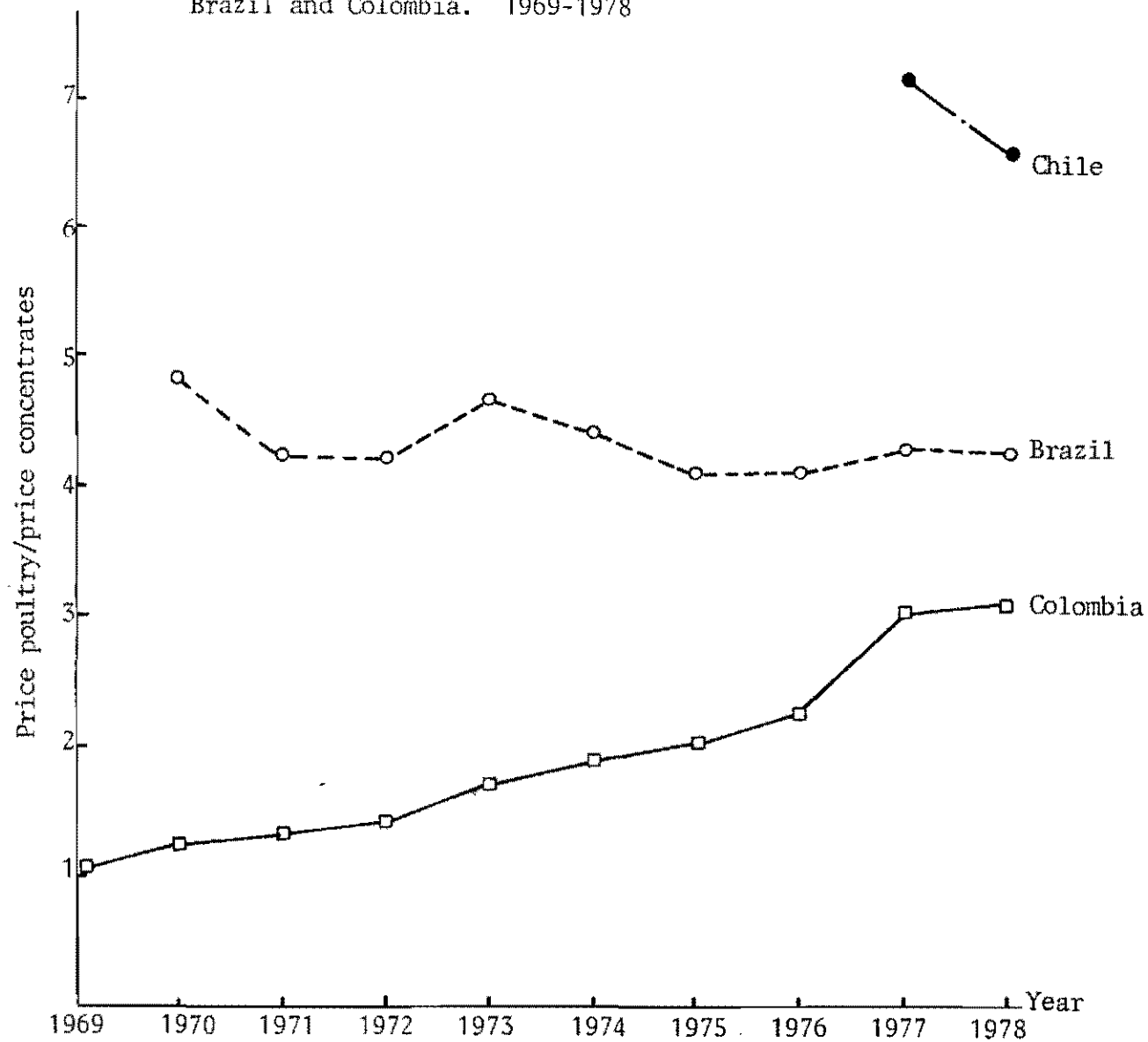
Source: Income and population data were from the World Bank (54). Income elasticities of demand and production data were from FAO (16) and (19).

Figure 2.14 Evolution of poultry production in selected countries of tropical Latin America. 1969/71 - 1978



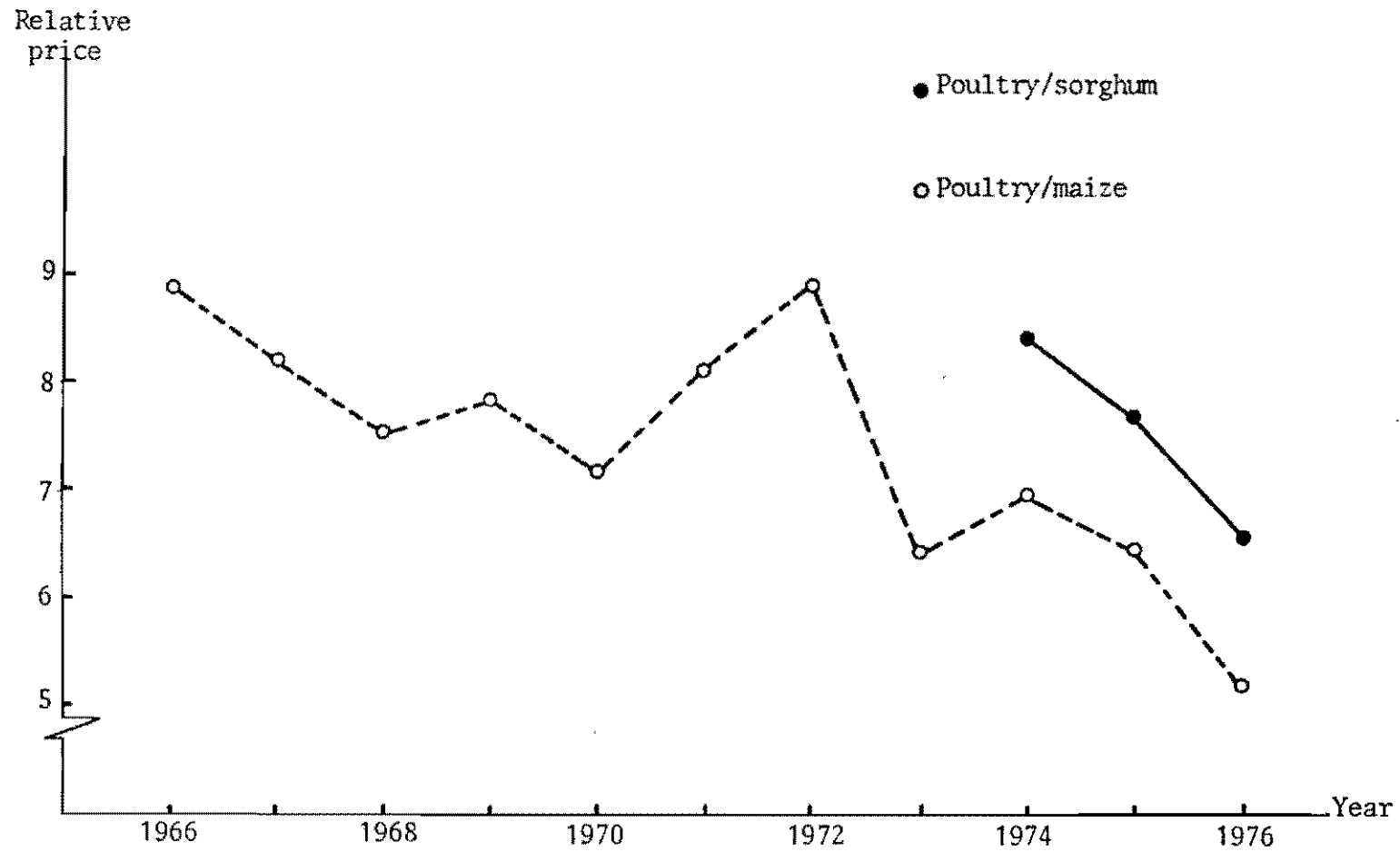
Source: FAO (19)

Figure 2.15 Relative poultry/feed prices at the producer level: Chile, Brazil and Colombia. 1969-1978



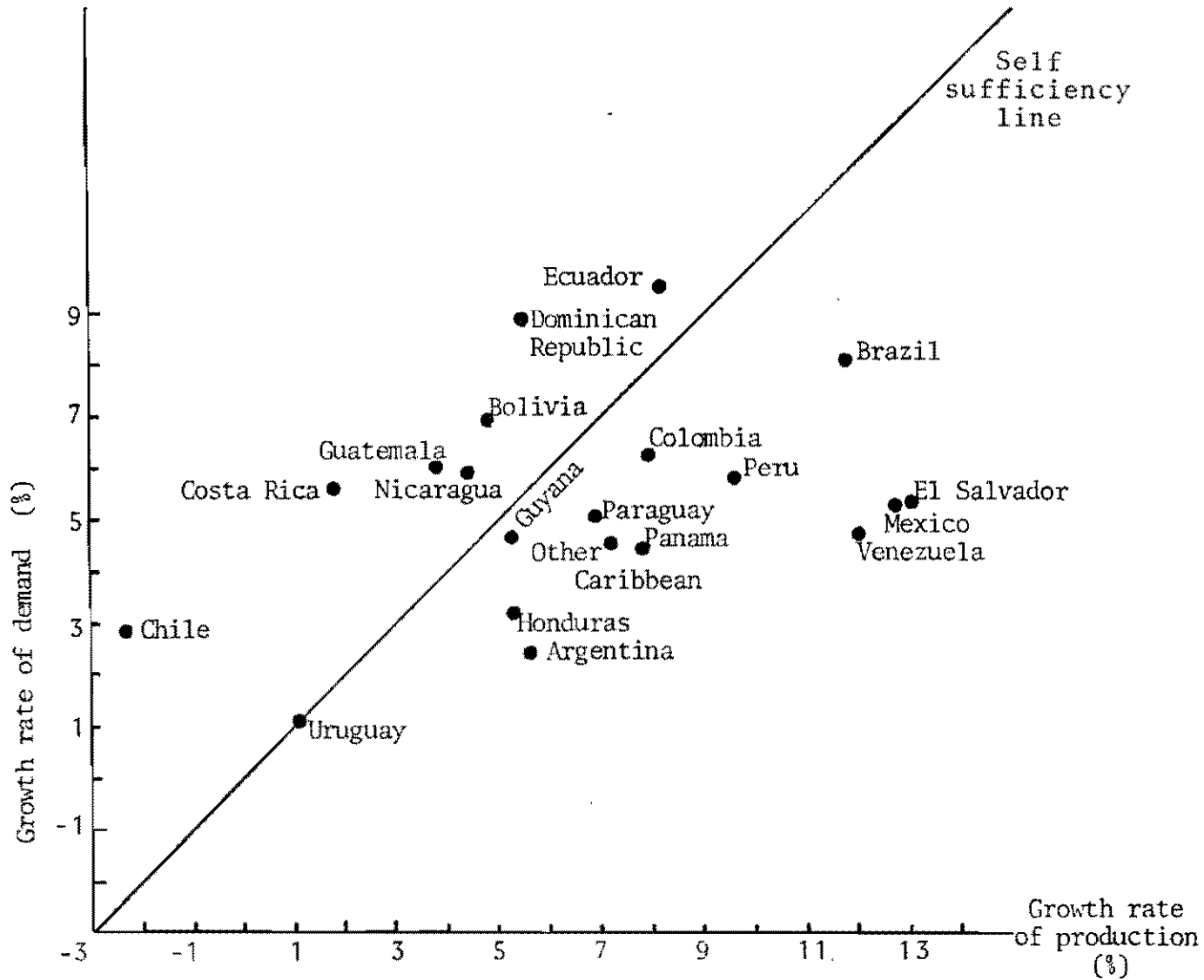
Source: Universidad Católica de Chile (51), F.G.V. (26), DANE (6) and (7), CORABASTOS (5)

Figure 2.16 Venezuela: relative poultry/maize and poultry/sorghum prices. 1966-1976



Source: MAC (36)

Figure 2.17 Poultry: growth rates of demand and production in Latin America, by country. 1970-1978



Source: Table 2.36

3. Beans

Brazil and Mexico dominate production with 75.5 percent of Latin American production. Two of the three principal bean exporters, Argentina and Chile, follow with 7.5 percent of production (Table 3.1). Latin America remains a small net exporter of edible legumes with substantial exports by Argentina, Mexico, and Chile and large imports by Cuba and Venezuela (Table 3.2).

Bean production has been stagnant with continuing yield declines in Latin America (-0.8%) and a rapid decline in Brazil (-3.0%) (Figures 3.1 and 3.2). Production has been maintained by area increase especially in Brazil (2.5%). Even in the principal agricultural states of Brazil, Parana and São Paulo, bean yields remain low (Table 3.3). Mexico has been able to increase yields but area has declined rapidly there.

In 1979 there has been a decline in both Brazilian and Mexican bean production. In Brazil the gradual production decline over the last two harvests continued with a slightly falling area in the Central South (Table 3.3). In the 1979 "safra da agua" production has again fallen (Veja⁵³, p.83). In Mexico the bean harvest of 1979 of 638,000 tons was 32 percent lower than in 1978 implying a need to import 250,000 tons to maintain 1978 levels. (The Economist Intelligence Unit¹², p.16).

Bean production has not been stagnant everywhere. Argentine and Colombian production has increased rapidly largely due to a strong export demand for European and Venezuelan markets respectively. El Salvador also has exported beans to Guatemala and has an impressive rate of production growth (Figure 3.4).

High population and per capita income growth kept demand growth above three percent in most Latin American countries. In few countries did production grow sufficiently rapidly to accompany demand so some combination of rising prices, increasing imports, and decreased per capita consumption especially among poorer consumers were experienced by most countries in Latin America (Table 3.4 and Figure 3.5).

Only in Colombia and Mexico have bean yields been increasing significantly and absolute levels are still extremely low except in the temperate countries

(Table 3.5). Production increase or maintenance with falling yields have been achieved with rapid area expansion (Figure 3.6). As beans are pushed into more marginal areas further from the principal markets and prices go up the potential returns to yield increasing technology are also increasing. Production stagnation appears to be principally a supply problem. However, governments can help avoid price collapse in the limited domestic markets by price floors in good harvest years. More rapid income increase in the poorest sectors of the Latin American economies would also be expected to substantially increase demand growth.

Table 3.1

Dry Bean Production in Latin America, 1964-1966 to 1976-1978

Country	1964-1966		1976-1978	
	Average Production	%	Average Production	%
	1000 tons		1000 tons	
Brazil ^a	1881	53.6	1950	53.4
Mexico	922	27.3	807	22.1
Argentina	32	.9	174	4.8
Chile	77	2.3	98	2.7
Guatemala	56	1.7	75	2.1
Colombia	39	1.2	74	2.0
Peru	46	1.4	58	1.6
Paraguay	22	.7	56	1.5
Nicaragua	49	1.4	56	1.5
Venezuela	38	1.1	51	1.4
Haiti	41	1.2	47	1.3
Honduras	50	1.5	46	1.3
El Salvador	15	.4	39	1.1
Dominican Republic	25	.7	38	1.0
Ecuador	31	.9	29	0.8
Cuba	25	.7	25	0.6
Others ^b	30	.9	28	0.8
Latin America	3379		3651	

a/ Cowpeas were deleted from the Brazilian bean production estimates. Cowpeas were an estimated 22.5 percent of bean production in the Brazilian Northeast and 7.5 percent of total Brazilian bean production. These estimates were based upon beans and cowpeas maintaining the same production shares as in the 1966-1977 period according to unpublished CFP (the Brazilian Commission for Financing Production of agricultural commodities) data.

b/ Includes those countries producing less than 0.5 percent of Latin American production in 1976-1978.

Source: Updated from Sanders and Alvarez (45).

Table 3.2
Production, Trade, and Consumption of Edible Legumes^a in Latin America, 1963-65 and 1975-77

Country	Mean 1963-1965				Mean 1975-1977			
	Total Production	+Imports -Exports	Net Domestic Consumption ^b	Apparent Per Capita Consumption	Total Production	+Imports -Exports	Net Domestic Consumption ^b	Apparent Per Capita Consumption
	----- 1000 tons -----		----- kg/year -----		----- 1000 tons -----		----- kg/year -----	
<u>Exporters</u>								
Argentina	85	-18.2	66.8	3.0	213	-124.9	88.1	3.4
Mexico	969	-22.9	946.1	22.9	999	-59.1	939.9	15.1
Chile	88	-27.1	60.9	7.3	116	-35.7	80.3	7.7
Colombia	91	2.4	93.4	5.2	126	-5.6	120.4	4.9
Nicaragua	45	-2.0	43.0	20.8	53	-2.5	51.5	22.9
Honduras	50	-18.0	32.0	14.3	44	-2.1	41.9	14.8
Peru	105	1.8	106.8	9.4	105	-0.6	104.4	6.5
Bolivia	10	0.3	9.7	2.5	17	-0.1	16.9	2.9
<u>Importers</u>								
Cuba	27	61.5	88.5	11.8	25	97.9	122.9	13.0
Venezuela	43	32.4	75.4	8.4	50	45.4	95.4	7.7
Brazil	2123	7.9	2130.9	26.6	2220	12.3	2232.3	20.4
Guatemala	59	2.3	61.3	13.7	76	6.4	82.4	13.1
El Salvador	15	15.2	30.2	10.7	42	6.3	48.3	11.7
Dominican Republic	50	5.4	55.4	15.4	57	5.4	62.4	12.8
Panama	7	3.4	10.4	8.7	6	2.8	8.8	5.1
Uruguay	7	1.5	8.5	3.6	5	1.2	6.2	2.1
Costa Rica	15	1.0	16.0	11.2	15	0.8	15.8	7.9
Haiti	43	0.5	43.5	10.6	87	0.6	87.6	18.8
Ecuador	65	0.1	65.1	13.3	50	0.6	50.6	7.0
Paraguay	26	-1.0	25.0	12.9	66	0.0	66.0	23.7
Others ^d	19	23.2	43.2	5.2	17	47.3	64.3	9.6
Latin America	3942	69.7	4012	16.8	4390	-3.6	4386	13.7

a/ Includes all edible legumes as defined by FAO. See the Appendix of Sanders and Alvarez.

b/ Sum of the two previous columns, i.e. production plus imports minus exports. No adjustments for losses, seed use or animal feed utilization were made.

c/ The previous column, Net Domestic Consumption, divided by the population with the qualification on utilization in b/.

d/ Includes Guyana, Jamaica, Surinam, Trinidad and Tobago, Puerto Rico, Belize and other Caribbean islands which either produce or import legumes.

Table 3.3

Area, Production and Yields of Beans in the Brazilian States and Regions, 1976/77 to 1978/79

Regions	1976-1977			1977-1978			1978-1979 ^a		
	Area (1000ha)	Production (1000t)	Yields (kg/ha)	Area (1000ha)	Production (1000t)	Yields (kg/ha)	Area (1000ha)	Production (1000t)	Yields (kg/ha)
Paraná	809.6	576.9	713	744.0	507.0	681	746.5	503.5	674
São Paulo	349.5	201.6	577	485.6	230.3	474	351.5	231.1	657
Minas Gerais	598.5	283.4	474	559.4	277.5	496	449.9	210.8	469
Santa Catarina	188.9	134.5	712	195.1	123.1	631	232.4	191.5	824
Rio Grande do Sul	175.0	109.5	626	203.7	132.3	650	178.3	136.7	167
Goiás	212.2	86.8	409	207.6	78.4	378	199.4	72.3	362
Mato Grosso	115.5	88.6	767	113.0	60.5	535	6.12	42.5	694
Espírito Santo	86.8	41.1	474	86.7	41.6	480	75.8	27.7	365
Rio de Janeiro	12.0	7.2	600	12.0	7.2	600	12.8	9.0	703
Center-South	2,548	1,530	600	2,607	1,458	559	2,308	1,425	618
North-Northeast ^b	...	582	...	...	567	...	...	557	...
Brazil	...	2,112	...	...	2,025	...	...	1,982	...

a/ Preliminary estimates.

b/ Adjusted from the IEA data with the assumption that the same percentage of Brazilian bean are cowpeas, 7.5 per cent of the Brazilian total or 22.5 percent of North-Northeast bean production as during the period 1966-77.

See. J. H. Sanders and G. H. Nicoletti. (46).

Source: Instituto de Economia Agrícola (IEA), p.135. (30).

Table 3.4

Demand Components and Trends and Production Trends of Beans in Latin America, 1965-1978

Country	Growth Rates			Income Elasticity of Demand for Pulses	Growth Rates	
	Per Capita GNP	Human Population ^a			Demand ^b	Production
	(\dot{y})	%	(\dot{p})		(\dot{d})	%
Brazil	4.2		2.70	0.03	2.83	-0.59
Mexico	2.8		3.76	-0.16	3.31	-0.40
Argentina	2.8		1.35	0.12	1.69	16.46
Chile	0.6		1.64	0.30	1.82	1.88
Guatemala	2.8		3.13	0.40	4.22	2.83
Colombia	2.7		2.68	0.50	4.03	6.39
Honduras	1.8		2.19	0.40	2.91	-1.38
Nicaragua	3.5		2.99	0.20	3.69	0.49
Haiti	0.2		1.61	0.44	1.70	1.41
El Salvador	1.8		2.91	0.40	3.63	7.53
Peru	2.5		2.92	0.60	4.42	0.88
Venezuela	2.2		3.13	0.30	3.79	1.73
Dominican Republic	3.4		2.91	0.40	4.27	4.20
Ecuador	3.8		3.20	0.50	5.10	-2.26
Costa Rica	2.9		2.67	0.30	3.54	-0.04
Panama	3.8		2.95	0.25	3.90	-4.68
Uruguay	0.4		0.15	0.10	0.55	2.14
Latin America	3.0		2.72	0.08	2.96	0.55

a/ Population growth estimates are for the period 1960-1976.

b/ Demand growth is the sum of population growth plus the income elasticity of demand for pulses from FAO times the per capital GDP growth. The third interaction term was considered to be trivial due to the generally low income elasticities of demand.

Source: Updated from Sanders and Alvarez (45).

Table 3.5

Bean Yields in Latin American Countries and North America,
1964-66 and 1976-78

Country	Mean 1964-66	Mean 1976-78
	----- kg/ha -----	
Brazil	655	592
Mexico	431	492
Argentina	1019	1018
Chile	1241	1010
Colombia	542	680
Guatemala	651	563
Nicaragua	942	779
Honduras	676	533
El Salvador	576	736
Peru	920	793
Venezuela	427	502
Dominican Republic	658	864
Ecuador	477	473
United States	1370	1404
Canada	1630	1484

Source: Updated from Sanders and Alvarez (45).

Table 3.6

Growth Rates^a of Population, Bean Production, Area, and Yields, 1965-1978

Country	Population	Production	Area	Yield
Brazil	2.70	-0.59	2.46	-3.05
Mexico	3.76	-0.40	-2.52	2.12
Argentina	1.35	16.46	15.40	1.06
Colombia	2.68	6.39	3.16	3.23
Cuba	1.82	0.61	0.00	0.61
Chile	1.64	1.88	4.32	-2.44
Ecuador	3.20	-2.25	-1.04	-1.22
El Salvador	2.91	7.53	6.40	1.13
Guatemala	3.13	2.83	3.53	-0.70
Haiti	1.61	1.41	0.37	1.04
Honduras	2.19	-1.38	1.48	-2.86
Nicaragua	2.99	0.49	2.27	-1.78
Panama	2.95	-4.68	-2.60	-2.08
Peru	2.92	0.88	1.38	-0.50
Dominican Republic	2.91	4.20	2.65	1.55
Uruguay	0.15	2.14	0.06	2.08
Venezuela	3.13	1.73	0.27	1.46
Latin America	2.72	0.32	1.12	-0.80

a/ Estimated with the semi-log model $LY = A + bX$

where:

LY is the log to the base e

"A" and "b" are the parameters of the regression and

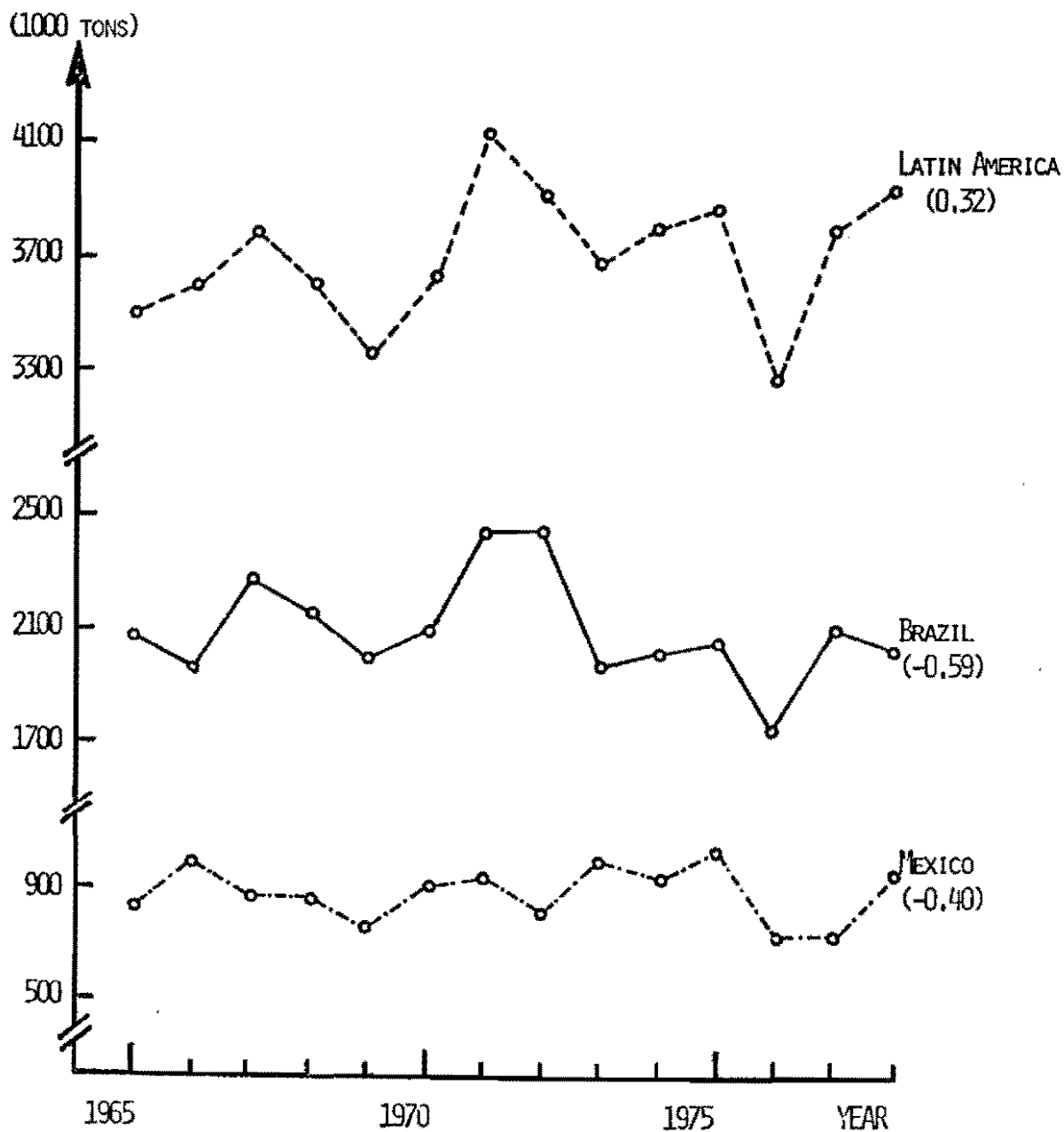
"X" is the trend term.

Deriving LP with respect to the trend terms gives b, or the geometric growth rate multiplied by 100.

Source: Updated from Sanders and Alvarez (45).

FIGURE 3.1

BEAN PRODUCTION IN LATIN AMERICA, BRAZIL AND MEXICO, 1965-1978

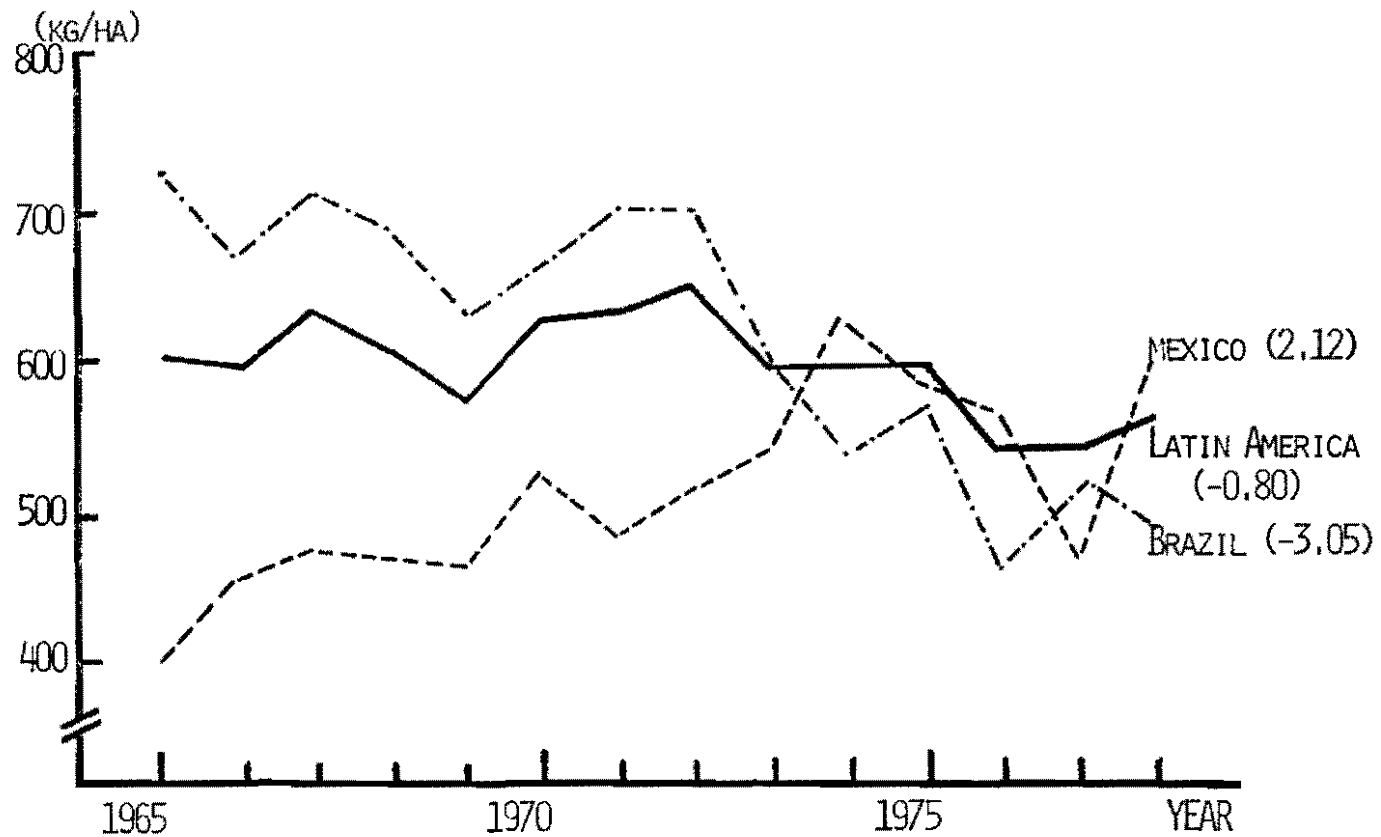


(GEOMETRIC GROWTH RATES ARE INCLUDED IN PARENTHESES)

SOURCE: UPDATED FROM SANDERS AND ALVAREZ (45).

FIGURE 3.2

DRY BEAN YIELDS OF LATIN AMERICA, BRAZIL AND MEXICO, 1965-1978

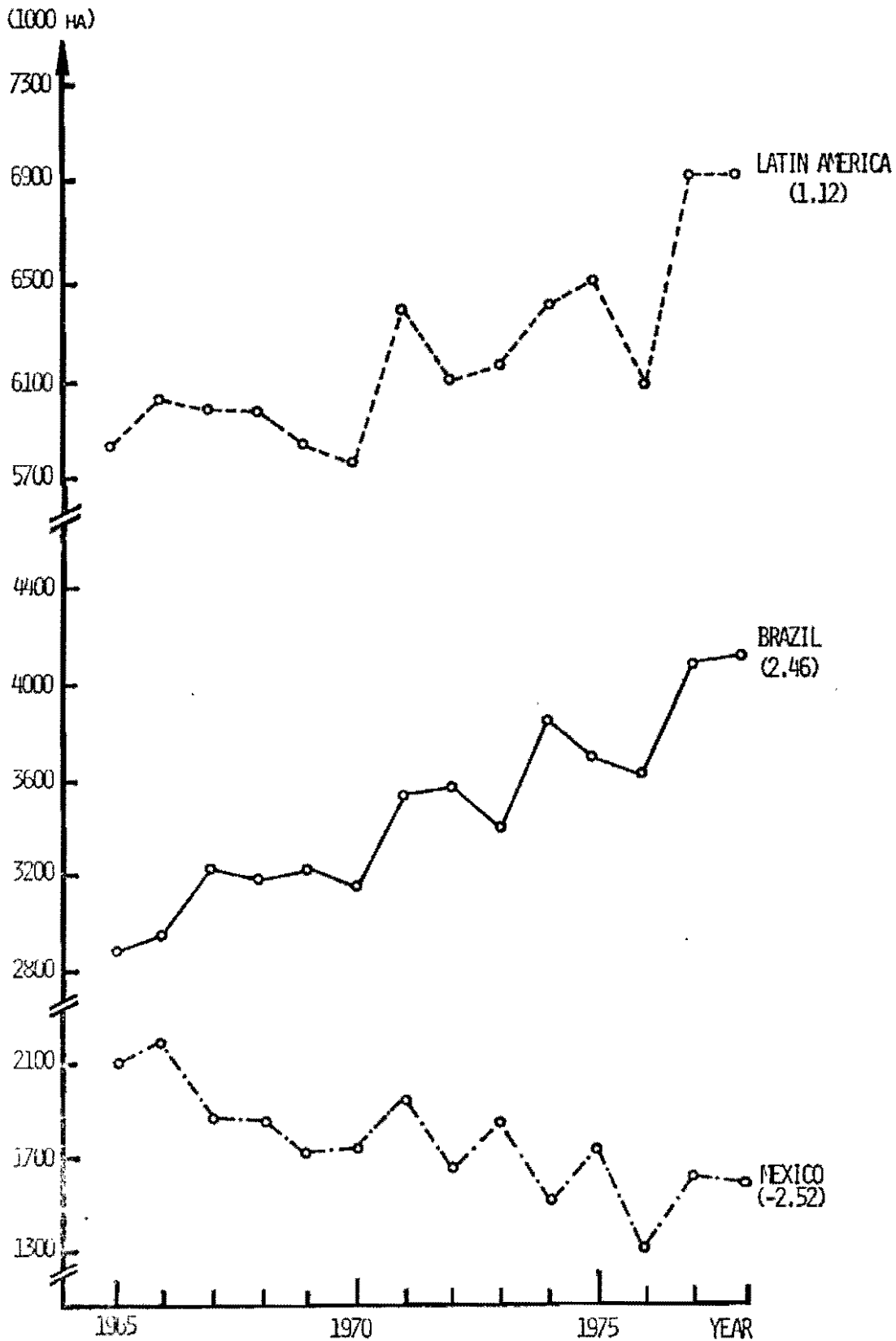


(GEOMETRIC GROWTH RATES ARE IN PARENTHESES)

SOURCE: UPDATED FROM SANDERS AND ALVAREZ (45).

FIGURE 3.3

AREA IN BEANS IN LATIN AMERICA, BRAZIL AND MEXICO

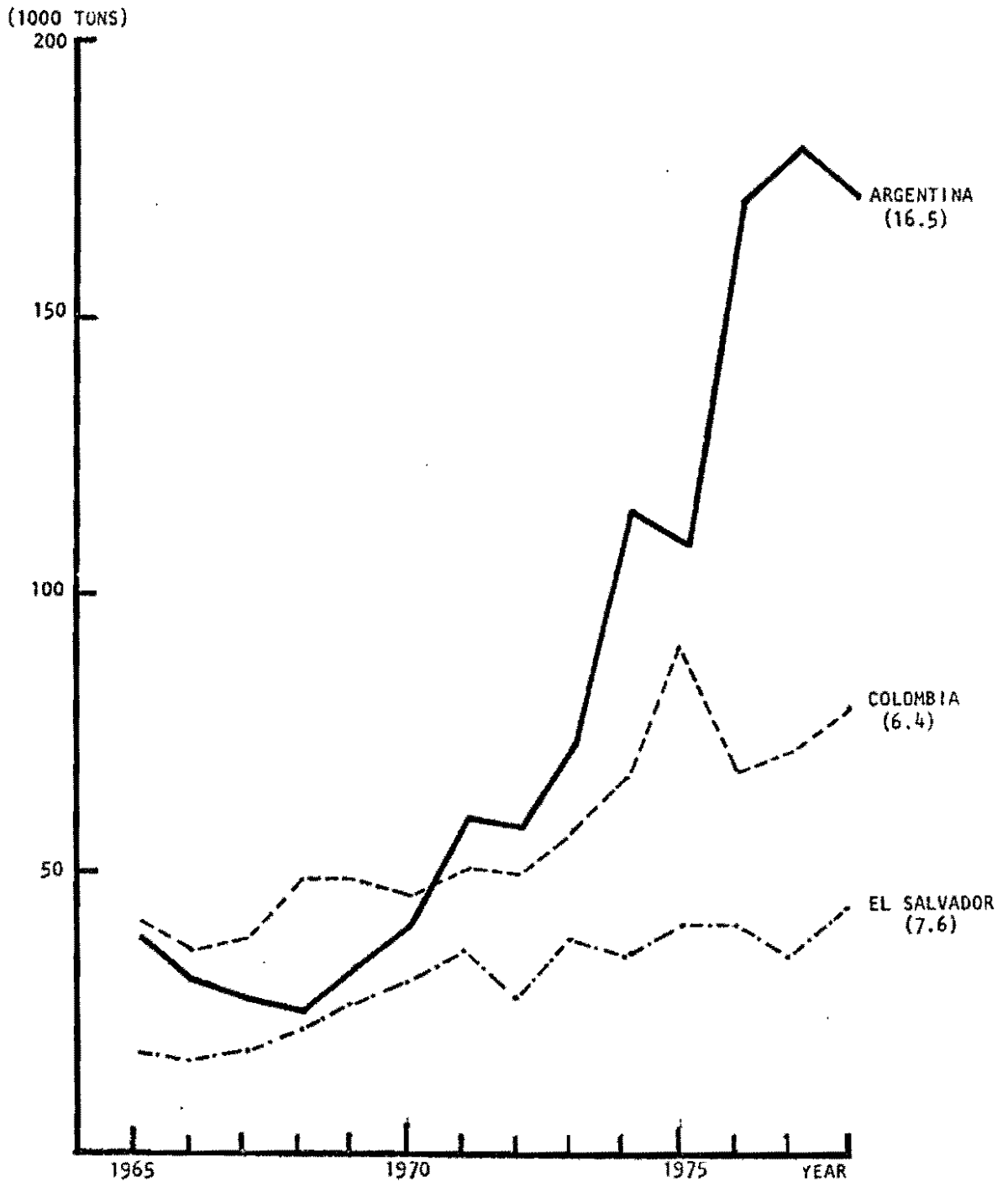


(GEOMETRIC GROWTH RATES ARE INCLUDED IN PARENTHESES)

SOURCE: UPDATED FROM SANDERS AND ALVAREZ (49).

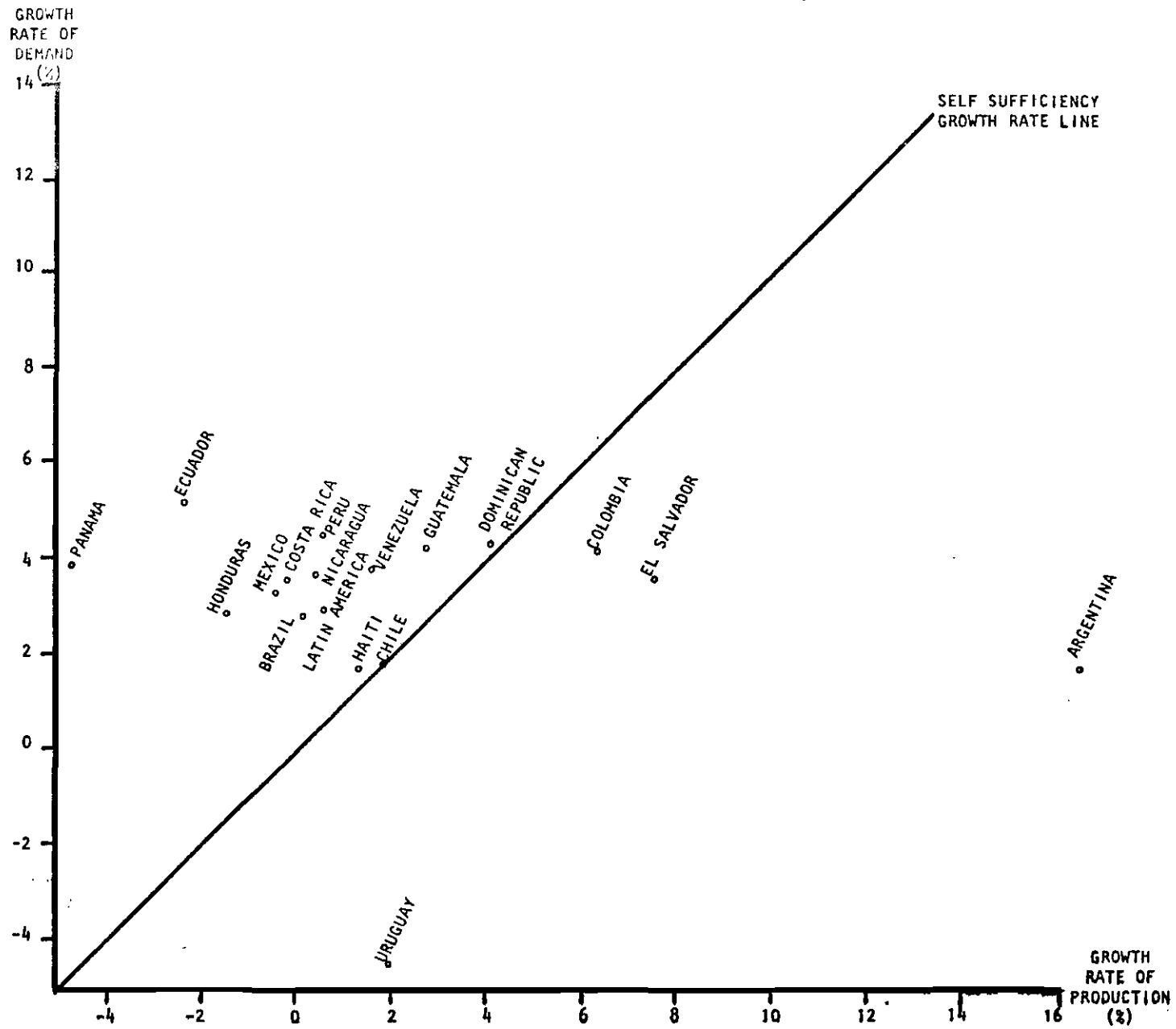
FIGURE 3.4

BEAN PRODUCTION IN LATIN AMERICAN COUNTRIES WITH RAPIDLY INCREASING PRODUCTION, 1965-78



(THE GEOMETRIC GROWTH RATES ARE INCLUDED IN PARENTHESES)

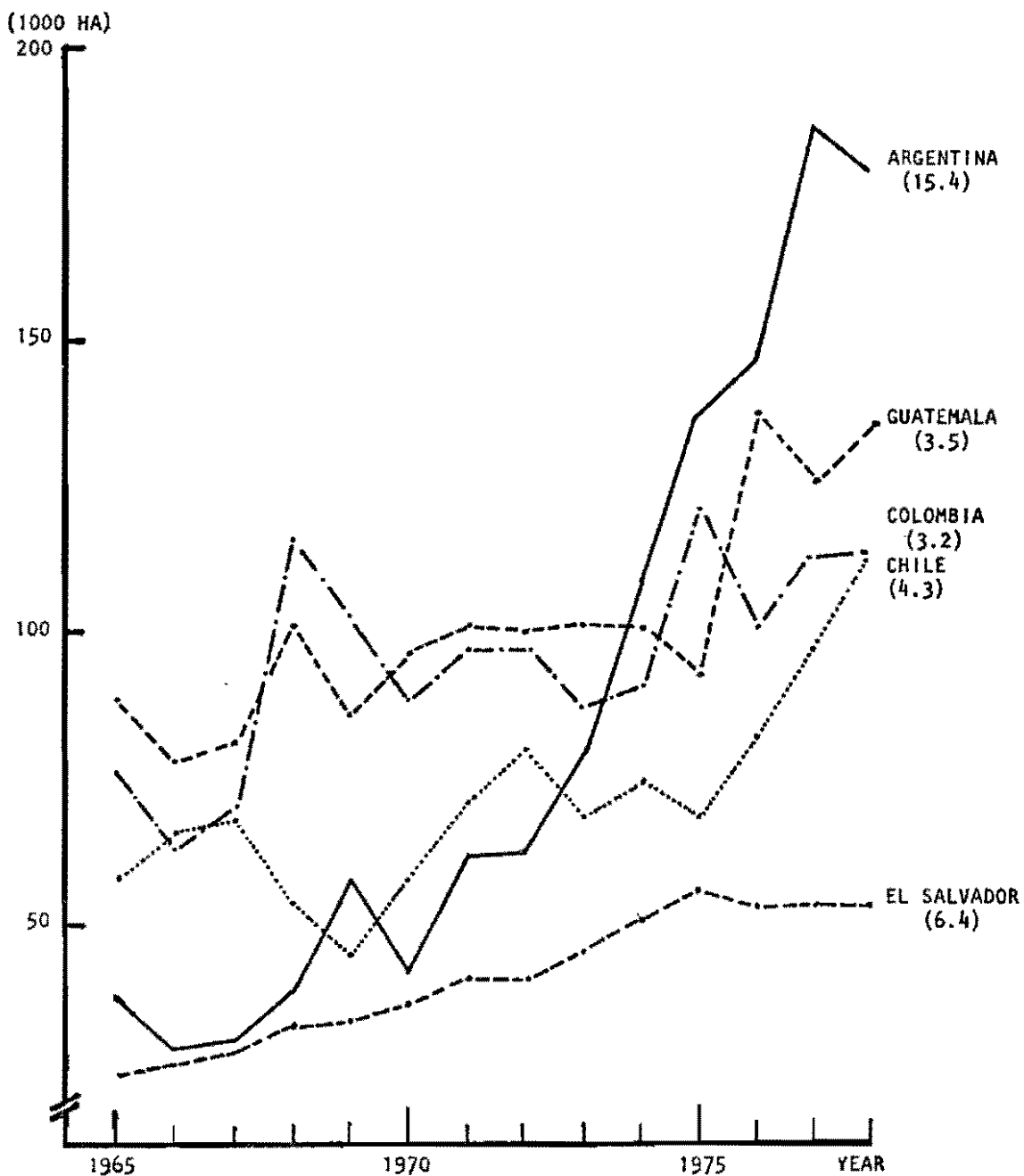
SOURCE: UPDATED FROM SANDERS AND ALVAREZ (45).



SOURCE: SAME AS TABLE 3.4

FIGURE 3.6

BEAN AREA IN LATIN AMERICAN COUNTRIES WITH RAPIDLY INCREASING AREA (EXCLUDING BRAZIL),
1965 - 1978



(GEOMETRIC GROWTH RATES ARE INCLUDED IN PARENTHESES)

SOURCE: UPDATED FROM SANDERS AND ALVAREZ (45).

4. Cassava

Since cassava is a root crop, it is a very efficient producer of carbohydrates. Moreover, it is particularly well adapted to marginal agricultural conditions, producing relatively good yields under stress due to soil and climatic factors. However, upon harvest it is highly perishable, contains 60% water or more, and is extremely bulky with minimal storage potential. Thus, quite favorable production characteristics contrast very sharply with very unfavorable market characteristics. Quite simply, cassava is an ideal rural subsistence crop but is a high priced vegetable crop in urban markets due to marketing problems. With the high cassava price in urban markets cassava loses its comparative advantage to grains, due to their lower marketing margins. Food uses, predominantly in rural areas, determine the demand for cassava in Latin America.

The growth in cassava production has not kept pace with the rates of growth in the production of grains. Cassava production in Latin America in the 1960-78 period increased at only 1.9% per annum, well below the population growth rate of 2.8% (see Table 4.2). This large implicit gap between supply and demand raises two hypotheses. The first assumes constraint on the production side and asserts that the lag in production growth generates rising prices and that the lack of supply response is due to constraints on area expansion or lack of yield increasing technologies. The second hypothesis assumes that the principal constraint is on the demand side and suggests that demand is growing at less than the population growth rate. The potential impact of new technology on traditional cassava food markets obviously depends on which hypothesis is operative.

No reliable conclusions can be drawn from the aggregate data other than that production has been growing very slowly or even declining in the 1960-78 period, with this trend being especially dramatic in the 1970-78 period. Table 4.2 suggests a virtual stagnation in the cassava economies of the major producing countries in the 1970-78 period, with area remaining relatively static and yield actually on a declining trend. Colombia would appear to be an exception, but continued high prices in Colombian cities and no apparent market outlet for the growth in production raises doubts about the reliability of an estimated 6% rate of growth in the 1960/78 period.

Brazil, which produces 80% of Latin American production, offers some independent data sources that allow perspective on the demand side. Table 4.4 presents the results of two consumer food budget surveys conducted in 1960 and 1975. Three principal points are highlighted by this particular table: (1) a large difference in consumption patterns of cassava between rural and urban areas, (2) a marked tendency to consume cassava in principally flour form, and (3) a significant decline in per capita consumption levels between the two periods in almost all categories.

Demand factors appear to be limiting expected price rises in cassava. One factor is the shifting population distribution to urban areas, where grains have the comparative advantage as the carbohydrate staple. A second factor is the substitution possibilities as prices rise. Table 4.5 demonstrates that cassava prices, especially for flour, did start to rise quite sharply in 1975, continuing though to 1976. In 1969 and 1970 the farinha to wheat flour price ratio hovered around .5. In 1975 it was a little over 1.0 in most Brazilian cities and by 1976 over 2.0. While cassava flour

consumption was declining, wheat flour consumption increased 23% between 1975 and 1976. Thus, the decline in cassava consumption in 1975 is at least partially due to an own price rise and a substitution effect. The third demand factor could be a low income elasticity, at least for flour. A low income elasticity may not apply to fresh cassava as there were increases in per capita consumption levels in the urban areas in the North-east and South.

Rising prices together with declining production are reducing the role of Brazil in cassava export markets (see Table 4.6). Moreover, growth in export markets have seen a relative shift away from starch toward pellets as an animal feed component, almost wholly as a result of price policy in the EC market. This market has been captured almost entirely by the Far East, principally Thailand.

Thus, cassava in Latin America is following much the same pattern as maize where it goes principally into food uses (see section 6). That is production appears to be stagnating due to lack of demand growth. A significant growth market for cassava products is needed. This may be provided in Brazil by the alcohol program. As well, within Brazil the economic rationality of a policy that subsidizes wheat both on the production side and on the consumption side, therefore effectively discriminating against the consumption of a domestically produced alternative, is not clear. Outside of Brazil market growth will probably come in the animal feed sector, as has happened in maize. However, to competitively exploit these markets, yield increasing technology and processing technology will be required.

Table 4.1. CASSAVA: Production, Relative Importance in the Region, and Per Capita Consumption levels, 1976/78.

Country	Production			Percentage of total 1976/78	Per Capita Production 1976/78
	1961/63	1971/73	1976/78		
	----- 1000 Mt -----			%	Kg
Cuba	166	220	262	0.8	27
Dominican Rep.	145	193	173	0.5	35
Guyana	10	9	0	0	0
Haiti	110	137	147	0.5	31
Jamaica	10	18	28	0.09	14
Trinidad	4	4	5	0.01	5
Caribbean	445	581	615	2.0	45
Costa Rica	9	9	14	0.04	7
El Salvador	9	14	13	0.04	3
Guatemala	5	7	8	0.02	1
Honduras	20	40	12	0.04	4
Nicaragua	12	17	25	0.08	11
Panama	18	38	40	0.1	23
Central America	73	125	112	0.4	6
Venezuela	322	304	368	1.2	30
Bolivia	138	240	302	0.9	53
Colombia	777	1438	2002	6.4	83
Ecuador	214	387	284	0.9	41
Peru	398	481	402	1.3	25
Andean	1527	2546	2990	9.5	47
Brazil	20050	29272	25347	80.8	230
Argentina	233	239	212	0.7	8
Paraguay	997	1332	1688	5.4	616
River Plate	1230	1571	1900	6.1	61
Latin America	23689	34418	31353	100.0	98

Source: FAO, Production Yearbook (19).

Table 4.2. CASSAVA: Annual Growth Rates in Production, Area and Yield, 1960/78

	Production			Area			Yield		
	1960/70	1970/78	1960/78	1960/70	1970-78	1960/78	1960/70	1970/78	1960/78
Cuba	4.1*	3.1*	2.8*	4.2*	2.3*	2.9*	-0.1	0.9*	0.0
Dominican Rep.	1.3*	-0.8	1.5*	-1.1	1.3	1.4*	2.4*	- 2.0	0.2
Guyana	2.1*	7.7	3.6*	0.0	4.8	1.7	2.1*	2.9	2.9*
Haiti	1.2*	1.6*	2.2*	0.8*	0.9*	1.1*	0.4	0.7*	1.2*
Jamaica	-0.1	9.8*	6.2*	2.8	-6.2*	-1.6	-3.0	16.0*	7.8*
Costa Rica	4.1*	3.6	1.1	2.7	-6.0*	-2.5*	1.4	9.6*	3.6*
El Salvador	3.6*	1.0	3.3*	3.5	-4.6	1.2	0.1	3.5	2.1*
Guatemala	3.0*	3.0*	3.2*	0.0	6.8*	2.9*	3.0	- 3.8	0.3
Honduras	8.6*	-18.2*	-0.7	2.4*	3.0*	2.8*	6.2	-21.2*	-3.5
Nicaragua	5.0*	6.1*	-4.5*	4.8*	6.5*	4.2*	0.2	- 0.5	0.2
Panama	13.0*	0.0	8.1*	4.6	3.3*	7.9*	8.4	- 3.3	0.3
Venezuela	-0.2	2.5	0.4	0.5	0.4	1.5	-0.6	2.0*	-1.2
Bolivia	8.8*	4.3*	6.5*	6.6*	4.3*	5.0*	2.2	0.1	1.5
Colombia	3.9*	6.7*	6.6*	1.7*	6.2*	3.6*	4.2	0.4	3.0*
Ecuador	5.4*	-5.1	3.0*	4.9*	-2.8	2.8*	0.6	-2.4	0.2
Peru	2.7*	-2.9*	0.5*	3.3	0.1	0.7	-0.6	-2.9*	-0.2
Brazil	5.6*	-2.6*	1.7*	4.4*	0.8*	2.5*	1.2*	-3.4*	-0.8*
Argentina	2.1*	-3.7	-0.5	3.3*	-2.4*	0.5	-1.2*	-1.3	-1.0*
Paraguay	6.1*	1.5	2.3	3.4	0.2	2.2*	2.7*	1.3	0.1
Latin America	5.4*	-1.8*	1.9*	4.0*	1.1*	2.4*	1.4*	-2.9*	-0.5

Significance Levels: (*) = .05

Source: FAO, Production Yearbook (19).

Table 4.3. CASSAVA: Trends in Yield Levels by Country 1961/78

Country	Annual Growth	Average Yield	Average Yield	Average Yield
	Rate in Yields 1961/78	1961/63	1971/73	1976/78
	%	----- Kg/Ha -----		
Cuba	-0.03	6775	6599	6970
Dominican Rep.	0.2	9833	11361	10063
Guyana	2.9***	10000	8604	-
Haiti	1.2***	3673	4152	4282
Jamaica	7.3***	3099	4993	8913
Trinidad	1.8***	9876	10126	12267
Costa Rica	3.6***	3877	3830	6743
El Salvador	2.1***	7954	9882	9863
Guatemala	-0.6***	3000	2929	2750
Honduras	-3.2	4862	7775	2107
Nicaragua	0.06	4017	4203	4058
Panama	-1.2***	10000	8641	8778
Venezuela	-1.2	11769	7969	9120
Bolivia	0.4	13133	13111	13050
Colombia	3.7***	5643	9000	8992
Ecuador	0.2	8640	8998	8877
Peru	-0.2	11539	13060	10802
Brazil	-0.8**	13432	14049	11750
Argentina	-1.0**	12258	10120	9809
Paraguay	0.09	14095	13438	14744
Latin America	-0.5	12344	13161	11330

Significance levels: (*) = .10 , (**) = .05 , (***) = .01

Source: FAO, Production Yearbook (19).

Table 4.4. Cassava Per Capita Consumption in Brazil in Fresh and
Flour Forms, 1960 and 1975

Country	1 9 6 0			Kilograms	1 9 7 5		
	Fresh Cassava	Cassava Flour	Total		Fresh Cassava	Cassava Flour	Total
Northeast	7.1	55.2	172.6		4.3	43.7	135.4
Urban	.9	26.8	81.3		3.2	20.4	64.4
Rural	10.3	69.7	219.4		5.2	55.0	170.2
Southeast	11.8	17.0	62.8		4.5	5.9	22.2
Urban	4.4	6.4	23.6		2.0	2.7	10.1
Rural	20.2	29.0	107.2		5.0	14.1	47.3
Sao Paulo	5.7	3.7	16.8		2.4	1.1	5.7
Urban	2.5	2.4	9.7		1.3	1.0	4.3
Rural	11.1	5.8	20.5		4.3	1.7	9.4
South	44.6	12.1	80.9		15.8	3.5	26.3
Urban	3.7	5.2	19.3		7.6	2.5	15.1
Rural	68.7	16.2	117.3		23.2	4.4	36.4
North and West	-	-	-		5.0	23.6	75.8
Urban	-	-	-		0.4	45.5	136.9
Brazil	14.9	26.3	93.8		6.1	17.6	58.9
Urban	3.0	11.6	37.8		2.7	9.7	31.8
Rural	24.7	38.3	139.8		11.2	29.4	99.4

Source: Getulio Vargas Foundation (28) and IBGE (29).

Table 4.5 . CASSAVA: Retail Prices for Fresh Cassava and Farinha in Various Brazilian Cities, 1966/77

Year	Belem		Recife		Salvador		Belo Horizonte		Rio de Janeiro		Sao Paulo	
	Fresh	Flour	Fresh	Flour	Fresh	Flour	Fresh	Flour	Fresh	Flour	Fresh	Flour
	----- Cruzeiros (constant 1975 prices)/Kg -----											
1966	1.24	3.35	1.24	2.73	1.55	2.42	0.81	1.18	1.80	1.30	1.18	1.18
1967	1.05	1.19	1.19	2.19	1.19	1.71	0.90	1.47	1.81	1.33	1.33	1.57
1968	0.78	1.17	1.44	1.56	1.13	1.56	1.01	1.29	1.64	1.21	1.52	1.68
1969	0.67	1.18	2.00	1.75	1.49	1.94	0.92	0.95	1.46	1.91	1.72	1.59
1970	0.78	2.54	1.27	2.31	0.88	2.29	0.80	1.06	1.45	1.14	-	1.58
1971	0.76	1.36	1.40	2.64	2.10	2.94	0.95	1.43	1.77	1.56	1.75	2.14
1972	1.46	1.32	1.45	1.50	1.46	2.65	1.39	1.48	1.97	1.63	1.85	2.21
1973	2.07	1.99	1.55	1.48	1.74	2.14	1.38	1.33	1.79	1.32	2.42	1.94
1974	2.55	2.95	1.28	1.99	2.17	2.05	1.20	1.41	2.02	2.58	2.88	2.28
1975	1.27	3.55	1.63	3.05	2.20	2.99	1.72	2.37	2.22	2.29	2.56	2.80
1976	1.52	2.28	1.77	3.38	2.69	4.49	2.55	3.41	1.99	3.42	2.73	3.90
1977	1.84	2.02	1.62	2.21	1.97	3.06	2.60	2.62	1.87	2.62	2.18	3.29

Note: Exchange Rate in 1975: 8.13 \$CR/\$US

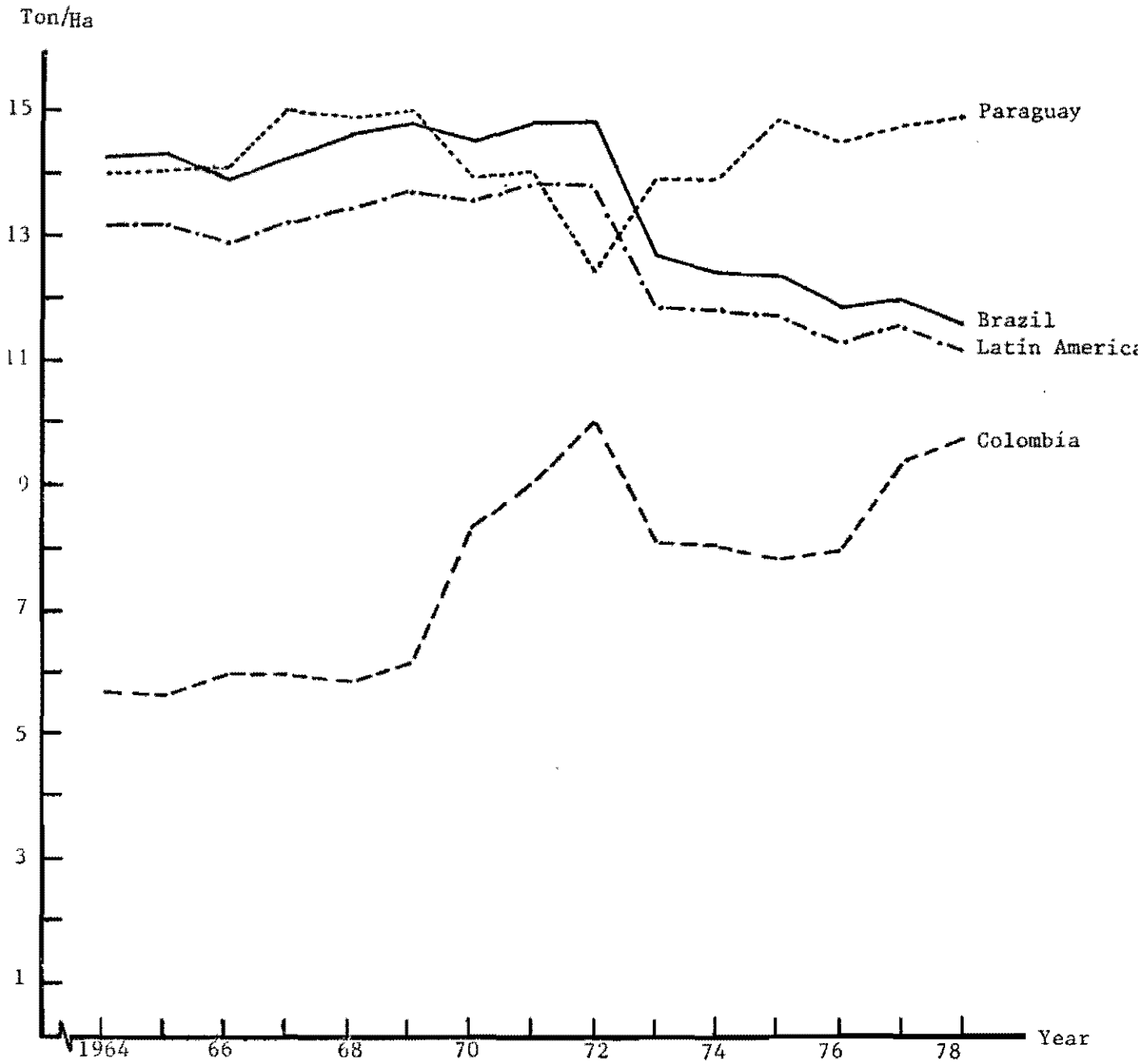
Source: EMBRATER (13) and Anuario Estadística (24).

Table 4.6. Summary of World Trade in Cassava Products, 1962-1976

Region	Net Exports			Net Imports		
	1962-64	1972-74	1976-78	1962-64	1972-74	1976-78
	THOUSAND TONS - FRESH ROOT EQUIVALENT					
<u>LATIN AMERICA</u>	210	157	94	-	-	-
BRAZIL	200	151	81	-	-	-
<u>AFRICA</u>	140	206	102	-	1	-
<u>ASIA</u>	2170	5870	10,367	150	517	523
INDONESIA	280	818	777	-	-	-
MALAYASIA	80	94	100	-	2	-
THAILAND	1710	4958	9400	-	-	-
JAPAN	-	-	-	110	305	307
<u>NORTH AMERICA</u>	-	-	-	824	820	547
U.S.A	-	-	-	812	800	527
<u>EUROPE</u>	-	-	-	1520	4935	9483
EEC	-	-	-	1504	4928	9453
WORLD TOTAL	2520	6261	10,572	2496	6273	10,559

Source: FAO, "Cassava: Supply, Demand and Trade Projections, 1985", (17).

Figure 4.1. CASSAVA: Yield Trends in Latin America and the Three Major Producing Countries, 1964/78



Source: FAO, Production Yearbook (19).

5. Rice

Rice is rapidly becoming the principal carbohydrate staple in much of Latin America. It is effectively displacing maize in many countries in Central America and the Andean region and root crops in the Caribbean and the Andean zone. This fact is reflected in the relatively high income elasticities for rice, as shown in Table 5.5. As the Latin American economies progressively urbanize, this tendency will continue as urban consumers turn to rice as a primary staple and away from the dominant rural staples, maize and cassava.

Latin American rice production has been increasing at an annual growth rate of 3.3% in the 1961/78 period (see Table 5.2). Production growth rates have far exceeded population growth rates in all regions except Brazil, which, however, accounts for almost 60% of total Latin American production. Latin American has in the process shifted from being a net importer of rice to a net exporter, while at the same time increasing per capita consumption levels from 41 to 44 Kg per person from 1971/73 to 1976/78 (see Table 5.4). The only region that remains a net importer is the Caribbean, although even in this zone import levels have been falling.

As shown in Table 5.5, production growth in the major regions, except for Brazil, has been either in line with demand growth or well ahead. The production growth appears to be at least partially demand led and in areas where production has exceeded demand growth, new technology has allowed falling prices (to at least the world market level) while maintaining production incentives. The River Plate countries are an exception in that their agricultural economies are open and thus already operate at world market price levels. Only in Brazil do there appear to be obvious cons-

straints on production increases.

In Mexico, Central America, Venezuela, and the Andean Zone production growth has been due principally to rising yields. With the exception of Central America, these yield increases have come principally from irrigated land (see Table 5.6). Central America, on the other hand has achieved quite marked yield increases under primarily upland conditions, although obviously starting from a much lower average yield level than the other regions. Thus, yield increments are being achieved under both irrigated and favorable upland conditions. In The River Plate countries, on the other hand, production growth has resulted from area expansion principally on irrigated areas. Moreover, The River Plate countries have consistently maintained relatively high yield levels with little variation.

Brazil also has been dependent on area expansion to sustain its 2.2% growth rate in production. However, average yields are at very low levels and have declined slightly over the period. This appears to be due to the declining area planted to irrigated rice and the rapid expansion in upland rice (Figure 5.2). The principal area expansion has been in the interior states of Mato Grosso, Minas Gerais, and Goias (Anuario Estadístico do Brazil). Yields in these states are very low, principally because these areas are characterized by acid, infertile soils. In these states rice is used as a first crop to bring new land into pasture production and takes advantage of the higher initial soil fertility. Responsiveness of supply under these circumstances would be expected to be low as increments in rice production would be due to investment patterns in developing new pasture land.

Country	Production			Percentage of Total 1976/78	Apparent Per Capita Consumption 1976/78
	1961/63	1971/73	1976/78		
	-----1000 Mt-----			%	Kg
Mexico	306	402	468	3.2	7
Cuba	194	352	457	3.2	64
Dominican Rep.	114	207	297	2.0	69
Guyana	218	170	277	1.9	236
Jamaica	5	0	5	0.03	22
Haiti	60	137	109	0.7	29
Trinidad Tob.	10	11	22	0.1	49
Caribbean	601	877	1167	8.1	101
Costa Rica	61	94	171	1.2	72
El Salvador	22	43	43	0.3	10
Guatemala	16	32	29	0.2	7
Honduras	12	13	22	0.1	9
Nicaragua	41	77	70	0.5	31
Panama	110	141	180	1.2	102
Central America	262	400	515	3.6	26
Venezuela	105	207	462	3.2	36
Bolivia	39	74	105	0.7	18
Chile	87	69	108	0.7	11
Colombia	536	996	1527	10.6	60
Ecuador	180	189	327	2.3	47
Peru	325	493	519	3.6	36
Andean	1167	1821	2586	17.9	41
Brazil	5563	7013	8579	59.4	76
Argentina	170	281	313	2.3	7
Paraguay	17	43	67	0.5	24
Uruguay	66	129	222	1.5	40
River Plate	253	453	602	4.2	12
Latin America	8258	11174	14442	100.0	44

Source: FAO, Production Yearbook (19).

Table 5.2. RICE: Annual Growth Rates in Production, Area, and Yield, 1961-78

Country	Production	Area	Yield
		percent	
Mexico	3.3***	1.3*	2.0***
Cuba	9.6***	7.1***	2.5**
Dominican Rep.	5.8***	2.7***	3.1***
Guyana	0.5	0.7	-0.2
Haiti	4.6***	-1.6*	6.2***
Jamaica	-0.6	3.9	-4.5***
Trinidad	5.0***	3.1**	1.8***
Caribbean	6.1	3.4	2.7
Costa Rica	6.7***	2.6**	4.2***
El Salvador	3.1*	0.8	2.3***
Guatemala	4.7***	3.0**	1.8**
Honduras	5.8***	5.0***	0.7
Nicaragua	3.9	1.0	2.9***
Panama	2.8***	-0.4	3.2***
Central America	4.2	1.2	3.0
Venezuela	8.3***	3.5***	4.8***
Bolivia	6.6***	5.9***	0.6
Chile	-0.2	-1.5	1.3**
Colombia	7.4***	1.4*	6.0***
Ecuador	4.1***	-0.3	4.4***
Peru	3.0***	2.7***	0.3
Andean	5.5	1.6	3.9
Brazil	2.2***	3.0***	-0.8***
Argentina	4.3***	4.2***	0.1
Paraguay	9.5***	10.9***	-1.5***
Uruguay	8.3***	6.5***	1.8***
River Plate	5.9	5.5	0.4
Latin America	3.3***	2.8***	0.5**

Significance levels: (*) = .10 , (**) = .05 , (***) = .01

Table 5.3 . RICE: Trends in Yield Levels by Country 1961/78

Country	Annual Growth	Average Yield	Average Yield	Average Yield
	Rate in Yields 1961/78	1961/63	1971/73	1976/78
	%	----- Kg/Ha -----		
Mexico	2.0***	2211	2534	3112
Cuba	2.5**	1489	2337	2076
Dominican Rep.	3.1***	1943	3020	2610
Guyana	-0.2	2349	1868	2267
Haiti	6.2***	1140	2431	2404
Jamaica	-4.5***	1743	1710	897
Trinidad	1.8***	2237	2785	2802
Costa Rica	4.2***	1251	2316	2302
El Salvador	2.3***	2213	3634	2902
Guatemala	1.8**	1475	2099	2147
Honduras	0.7	1279	1099	1465
Nicaragua	2.9***	1809	2503	2849
Panama	3.2***	1087	1386	1698
Venezuela	4.8***	1551	2184	3283
Bolivia	0.6	1455	1645	1631
Chile	1.3**	2708	2927	3336
Colombia	6.0***	2043	3643	4257
Ecuador	4.4***	1694	2689	2963
Peru	0.3	4037	4089	4263
Brazil	-0.8***	1633	1465	1422
Argentina	0.1	3361	3555	3440
Paraguay	-1.5***	2295	1939	2013
Uruguay	1.8***	3541	3988	3983
Latin America	0.5**	1739	1773	1820

Significance levels: (*) = .10 , (**) = .05 , (***) = .01

Source: FAO, Production Yearbook. (19)

Table 5.4. RICE: Production, Trade and Apparent Consumption, 1971/73 and 1976/78

Country	1971/73				1976/78			
	Produc- tion	+Imports -Exports	Apparent consump- tion	Apparent per capita consumption	Produc- tion	+Imports -Exports	Apparent consump- tion	Apparent per capita consumption
	-----	1000 Mt	-----	Kg	-----	1000 Mt	-----	Kg
Mexico	402	5	407	8	468	- 19	449	7
Cuba	352	246	598	70	457	165	622	64
Dominican Rep.	207	12	219	52	297	43	340	69
Guyana	170	- 64	106	151	277	- 82	195	236
Jamaica	0	35	35	19	5	40	45	22
Haiti	137	0	137	30	109	28	137	29
Trinidad	11	25	36	35	22	33	55	49
Caribbean	877	254	1131	89	1167	227	1394	101
Costa Rica	94	6	100	58	171	- 27	144	72
El Salvador	43	- 1	42	12	43	0	43	10
Guatemala	32	2	34	6	29	11	40	7
Honduras	13	4	17	6	22	4	26	9
Nicaragua	77	7	84	44	70	- 2	68	31
Panama	141	9	150	103	180	- 4	176	102
Central America	400	27	427	26	515	- 18	497	26
Venezuela	207	0	207	19	462	- 19	443	36
Bolivia	74	- 0	74	15	105	- 0	105	18
Chile	69	37	106	11	108	5	113	11
Colombia	996	- 4	992	46	1527	- 73	1454	60
Ecuador	189	2	191	33	327	- 3	324	47
Peru	493	- 4	489	37	519	54	573	36
Andean	1821	31	1852	34	2586	- 17	2569	41
Brazil	7013	- 54	6959	75	8579	-197	8382	76
Argentina	218	- 50	231	10	313	-132	181	7
Paraguay	43	- 0	43	19	67	- 1	66	24
Uruguay	129	- 58	71	26	222	-110	112	40
River Plate	453	-108	345	12	602	-243	359	12
Latin America	11,174	148	11322	41	14442	-293	14149	44

Country	Growth Rate of		Income Elasticity of Demand For Rice Ey	Growth Rate of	
	Per Capita GNP \dot{y}	Human Population \dot{p}		Demand \dot{d}	Production
Mexico	3.3	2.9	0.3	3.9	3.3
Dominican Rep.	3.1	3.3	0.6	5.2	5.8
Guyana	1.5	2.3	0.2	2.6	0.5
Haiti	1.5	1.5	0.7	2.6	4.6
Jamaica	3.6	1.5	0.4	2.9	-0.6
Trinidad	4.0	1.2	0.1	1.6	5.0
Caribbean	2.5	2.1	0.5	3.4	3.8
Costa Rica	2.9	3.1	0.3	4.0	6.7
El Salvador	1.8	3.3	0.6	4.4	3.1
Guatemala	3.3	2.9	0.6	5.0	4.7
Honduras	1.6	3.3	0.6	4.3	5.8
Nicaragua	3.0	3.1	0.4	4.3	3.9
Panama	4.1	3.0	0.2	3.8	2.8
Central America	2.7	3.1	0.5	4.5	4.2
Venezuela	4.0	3.2	0.3	4.4	8.3
Bolivia	2.5	2.4	0.5	3.7	6.6
Chile	1.7	2.0	0.2	2.4	-0.2
Colombia	2.6	2.7	0.5	4.1	7.4
Ecuador	4.0	3.3	0.5	5.4	4.1
Peru	2.0	3.3	0.3	3.9	3.0
Andean	2.4	2.8	0.4	3.8	5.5
Brazil	4.0	2.9	0.2	3.7	2.2
Argentina	2.8	1.4	0.1	1.7	4.3
Paraguay	2.0	2.5	0.3	3.2	9.5
Uruguay	1.5	1.1	0.2	1.4	8.3
River Plate	2.6	1.5	0.1	1.8	5.9
Latin America	2.4	2.6	0.3	3.5	3.3

Demand growth is calculated as $\dot{d} = \dot{p} + \dot{y}E_y$

Source: World Bank (52); FAO, Commodity Projections (16); FAO, Production Yearbook (19).

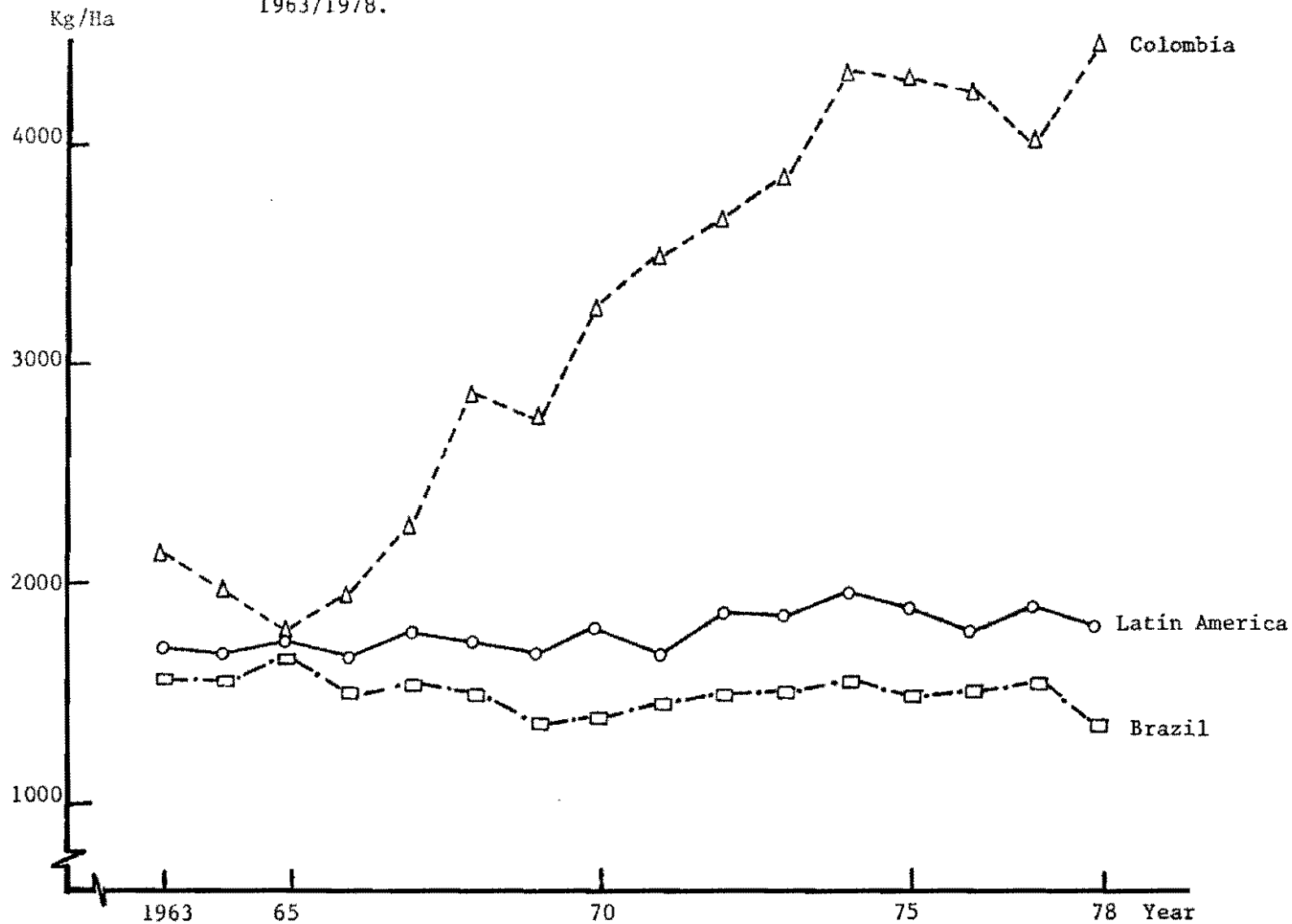
Table 5.6. RICE: Area, Production, and Yield under Irrigated and Upland Conditions, 1978.

Country	Area		Production		Yield	
	Irrigated	Upland	Irrigated	Upland	Irrigated	Upland
	----- 1000 ha -----		----- 1000 Mt -----		----- Ton/Ha -----	
Mexico	99.3	73.7	344	137	3.47	1.85
Cuba	200.0	0.0	420	0	2.10	-
Dominican Rep.	61.7	3.3	197	6	3.20	1.90
Guyana	95.8	39.2	249	51	2.60	1.29
Haiti	36.0	12.0	83	17	2.31	1.39
Carribbean	393.5	54.5	949	74	10.21	4.58
Costa Rica	3.3	59.7	11	119	3.24	2.00
El Salvador	4.5	8.5	n	n	n	n
Guatemala	0.0	11.5	0	26	-	2.26
Honduras	4.8	19.2	9	21	1.98	1.12
Nicaragua	11.6	3.4	41	4	3.56	1.09
Panama	3.4	111.6	4	186	3.64	1.63
Central America	27.6	213.9	65	356	12.42	8.10
Venezuela	111.3	36.7	442	65	3.97	1.78
Bolivia	0.0	83.0	0	101	-	1.22
Chile	35.0	0.0	n	0	n	-
Colombia	261.2	79.8	1219	110	4.66	1.38
Ecuador	56.1	58.9	167	148	2.98	2.56
Peru	93.5	28.5	454	49	4.85	1.71
Andean	445.8	250.2	1840	408	12.49	6.87
Brazil	756.0	4644.0	2995	5946	3.96	1.28
Argentina	91.0	0	320	0	3.50	-
Paraguay	19.5	10.5	56	19	2.87	1.81
Uruguay	58.3	0.0	228	0	3.91	-
River Plate	168.8	10.5	604	19	10.28	1.81
Latin America	2002.3	5283.5	7239	7005	3.53	1.32

n = not available

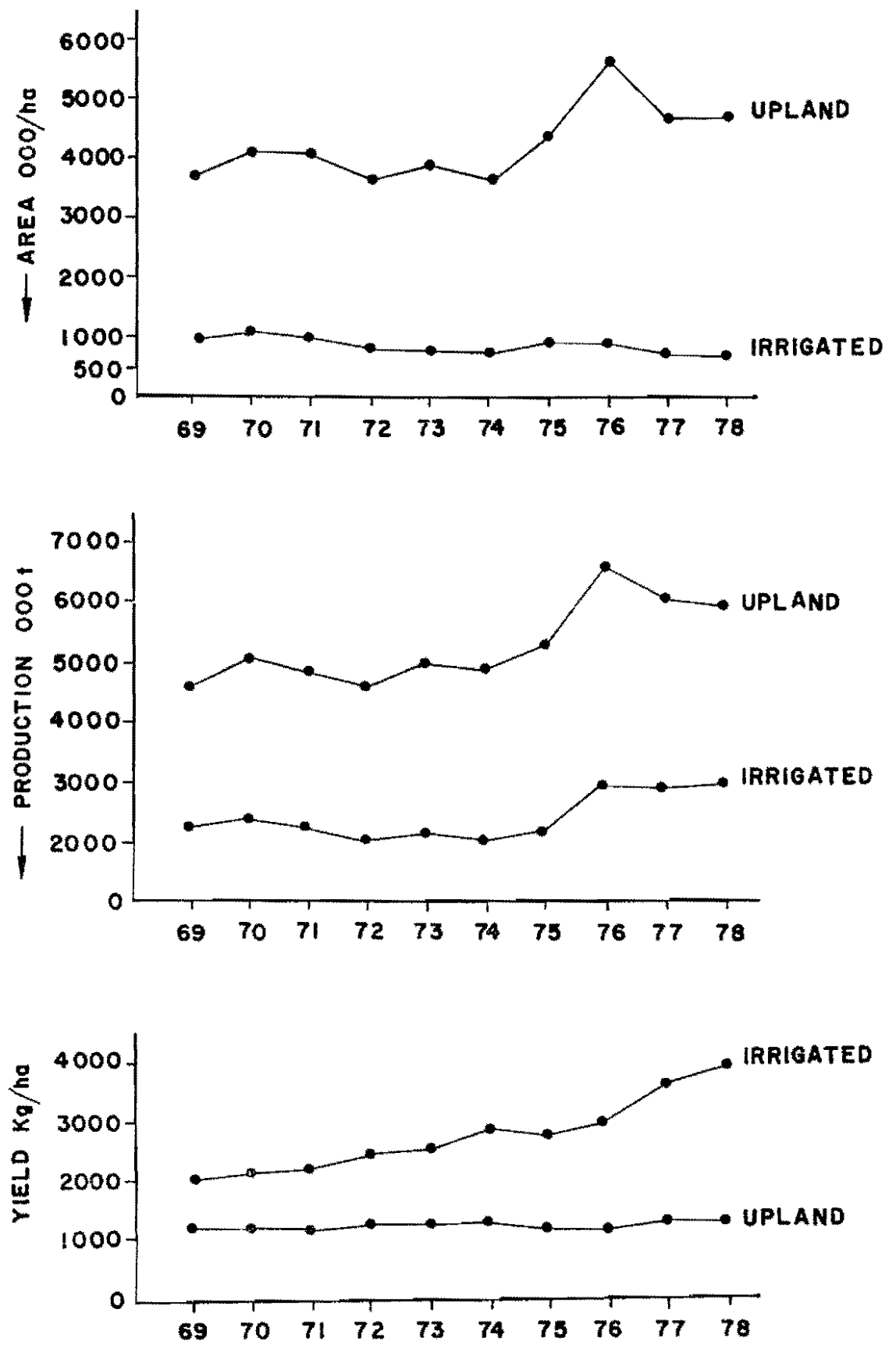
Source: CIAT, Upland Rice in Latin America (4)

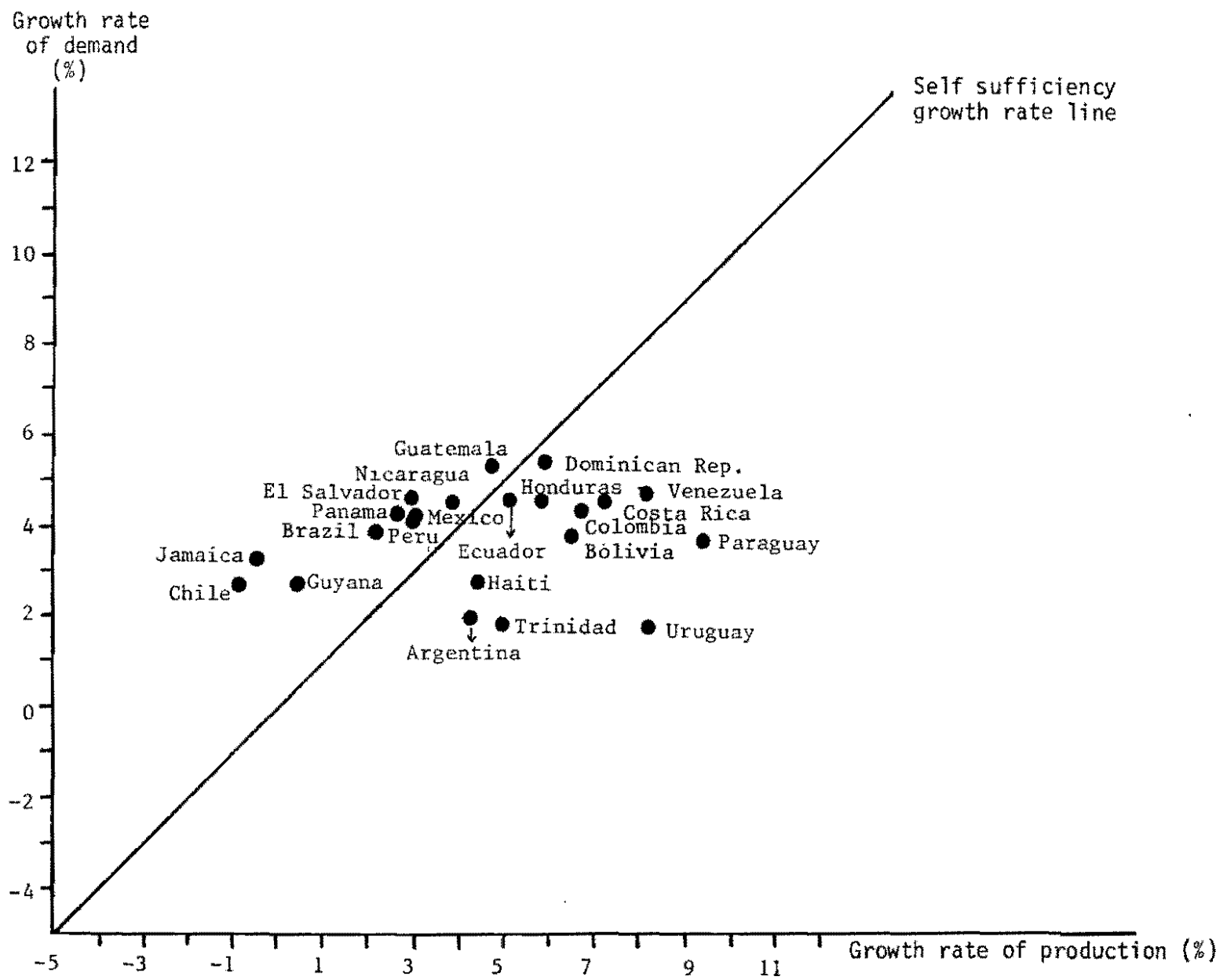
Figure 5.1 . RICE: average yields in Latin America and the two major producing countries
1963/1978.



Source: FAO, Production Yearbook. (19)

Figure 5.2 PRODUCTION STATISTICS FOR BRAZIL 1969-78





6. Maize

Maize is an important crop throughout much of Latin America and the Carribbean, being variously a major food staple, an animal feed, as earner of foreign exchange, or, frequently, the source of a substantial foreign exchange deficit.

The production of maize is concentrated in three countries (Table 6.1). Brazil produces about two-fifths of the total regional output, while Mexico and Argentina each produce about a fifth of the total. These same countries are also heavy consumers of maize. Mexico has the largest per capita annual consumption of maize, 164 Kgs., while Brazil is second at 149 Kgs. and Argentina is close behind at 123 Kgs. Venezuela and most Central American countries also consume on the average over 100 Kgs. per capita annually. Maize consumption is much lower in the Andean and Caribbean zones.

Trends in Production

Most Latin American countries have experienced significant growth in the production of maize between 1961-1978 (see Table 6.2). Of twenty four nations considered, 17 have had significant growth rates in this period. There are, though, some important contrasts in the patterns of growth. For example, although the output of the top three producers grew in this period, Brazil's grew steadily at a rate of 3.7% annually through the entire time-span, but Mexico and Argentina acheived growth only during the 1960's and have faced declining or stagnant production in the 1970's.

Paraguay and El Salvador, like Brazil, have enjoyed rapid growth over the last two decades. Production has increased less dramatically but nevertheless steadily in Bolivia, Chile and Peru. Joining Argentina and Mexico

in the ranks of those who have not sustained their growth in the 1970's are Venezuela, Colombia, Ecuador, and several of the Central American states.

For Latin America as a whole, there was an increase of 54% in total production of maize in the 1960's. However, through the 1970's, there was a growth in total output of only 7%. Thus, although there has been a widespread rise in maize production in Latin America from 1961-78, the record of recent growth has been relatively poor.

Sources of Trends in Production

Nearly three quarters of Latin American countries have achieved significant growth rates in yields over the last two decades (see Table 6.3). Of the major producers, Argentina has attained the most rapid rate of growth in yields and today has the highest yields in Latin America. Brazilian yields have grown comparatively slowly, but have continued to rise throughout the period 1961-1978. Mexico, like Chile, obtained substantial yield increases in the 1960's, but has made no gains in the last decade.

Areas planted to maize, have not, however, expanded steadily along with yield growth (see Table 6.2). During the 1960's, area planted to maize grew substantially in Latin America as a whole, and accounted for over half of the increased output that was achieved in the decade. In the 1970's, though, area expansion ceased in most countries, and the growth rate in production slowed as it became dependent on increased yields alone. Brazil is almost unique in maintaining growth in area as an important contributor to increasing production.

In many countries, among them Argentina, Venezuela, Colombia, Peru,

Ecuador, Guatemala and Uruguay, area planted to maize declined in the 1970's. Since the land that was taken out of production may have generally been of lower than average quality, improvements in technology, i.e. new varieties and more chemical fertilizers, may not be the sole cause of the yield increases observed in these countries.

Growth rates in production seem to be related to the end use of maize (see Table 6.5). Among the countries that consume maize primarily as a direct component of the human diet, growth rates in the production of maize are generally quite low as is the percent of total consumption that is imported. Among the nations where more than half of maize is used as an animal feed, both rates of growth and imports as a percent of total consumption are high.

Where maize is consumed as a carbohydrate staple, much production takes place in a subsistence agricultural sector of small farms and a large portion of output is consumed directly by producers without entering the market. In this setting of small farms, which are poorly integrated into markets and often located on the more marginal soils, production has not risen dramatically ^{1/}.

Where maize is used primarily as an animal feed, effective market demand for maize has been strong enough to attract supplies either through imports or through increased domestic production. Domestic production of maize as a feed grain has tended to rise among more commercialized larger

^{1/} Cutie, Jesus, "Diffusion of Hybrid Corn Technology: The Case of El Salvador", CIMMYT, Mexico 1975 and Colmenares, J. Humberto, "Adoption of Hybrid Seeds and Fertilizers Among Colombian Corn Growers", CIMMYT, Mexico, 1975.

farms, better served with infrastructure and cultivating fairly good soils. Such has been the case in Brazil, where the major part of the production increase has come in the Southeastern states, where mechanized production and hybrid utilization predominates.

In some countries where maize output has not been growing rapidly, sorghum has been a very successful alternative feed grain which has achieved some strikingly fast rates of growth in production (see next section, 7).

Trade Balances

Argentina, Brazil, Uruguay and Paraguay are the only Latin American exporters of maize (Table 6.4). For Argentina, maize is an export crop. About three-fifths of the Argentine maize crop is exported. The other exporting countries sell abroad no more than five per cent of their output. Argentina supplies over 90% of all maize exported from Latin America, and alone exports more maize than is imported by the 19 countries in the region, which are net importers. Hence, although Latin America as a whole is an exporter of maize, this export surplus originates almost entirely in Argentina while most Latin American countries are maize importers.

Mexico is by far the greatest importer of maize in Latin America even though it is one of the leading producers. Mexico's imports of maize declined in the late 1960's at the end of a decade of fairly rapid growth in production. However, during the 1970's production stagnated and imports grew tremendously, so that now Mexico must import approximately one sixth of its main dietary staple at a large cost in foreign exchange.

Like Mexico, Colombia, Peru and several of the Central American states improved their balance of trade in maize during the high growth of maize

production in the 1960's, only to see these gains erode during the slower growth of the 1970's.

The burden of maize imports fall relatively most heavy in the Caribbean zone. With the exception of Haiti, all the Caribbean countries import far more than their levels of domestic production of maize even though per capita consumption is comparatively low (Tables 6.5).

Table 6.1. MAIZE: Production, Relative Importance in the Region, and Per Capita Consumption levels, 1976/78.

Country	Production			Percentage of Total 1976/78	Apparent Per Capita Consumption 1976/78
	1961/63	1971/73	1976/78		
	1000 Mt			%	Kg
Mexico	6484	9019	8875	22.9	164
Cuba	151	122	95	0.2	49
Dominican Rep.	31	50	44	0.1	28
Guyana	1	3	2	-	11
Haiti	229	253	199	0.5	88
Jamaica	4	5	10	-	46
Trinidad	3	4	5	-	67
Caribbean	419	437	355	0.8	78
Costa Rica	58	50	88	0.2	46
El Salvador	199	340	421	1.1	113
Guatemala	555	701	748	1.9	129
Honduras	274	325	354	0.9	134
Nicaragua	144	190	197	0.5	95
Panama	74	51	76	0.2	47
Central America	1304	1657	1884	4.8	106
Venezuela	463	558	691	1.8	100
Bolivia	265	279	324	0.8	57
Chile	173	278	287	0.7	39
Colombia	765	870	833	2.1	37
Ecuador	161	255	231	0.6	36
Peru	464	607	675	1.7	55
Andean	1828	2287	2350	5.9	44
Brazil	9680	14,419	16,875	43.4	149
Argentina	4810	8497	7952	20.5	123
Paraguay	118	239	387	1.0	140
Uruguay	195	179	168	0.4	57
River Plate	5123	8915	8507	21.9	119
Latin America	25,302	37,295	39,539	100.0	114

Source: FAO, Production Yearbook. (19)

Table 6.2. MAIZE: Annual Growth Rates in Production, Area and Yield, 1961-78.

Country	Production	Area	Yield ^{1/}
	----- percent -----		
Mexico	1.4**	0.0	1.4**
Cuba	-2.1***	-3.1***	1.0***
Dominican Rep.	0.5	-0.8	1.3***
Guyana	9.7***	7.3***	2.4
Haiti	-0.4	-1.5	1.1
Jamaica	6.3***	6.8***	0.3
Trinidad	5.4***	4.1	1.3***
Caribbean	-0.4	-1.7	1.3
Costa Rica	0.8	-1.8	2.6***
El Salvador	5.5***	1.8***	3.7***
Guatemala	1.7***	-1.0	2.7***
Honduras	1.3***	1.9***	-0.4
Nicaragua	1.8***	1.9***	-0.1
Panama	-1.3	-2.3***	1.0***
Central America	2.3	0.4	1.9
Venezuela	2.1**	0.9	1.2**
Bolivia	1.4**	0.8***	0.6
Chile	2.8**	1.1	1.7*
Colombia	0.1	-1.2**	1.2***
Ecuador	3.3***	-0.1	3.4***
Peru	1.9***	0.5	1.4***
Andean	1.4	-0.1	1.5
Brazil	3.7***	2.7***	1.0**
Argentina	3.6***	0.1	3.4***
Paraguay	6.7***	6.0***	0.7
Uruguay	1.5	-2.6***	4.1***
River Plate	3.5	0.1	3.4
Latin America	2.8***	1.1***	1.7***

Significance levels: (*) = .10 , (**) = .05 , (***) = .01

Source: FAO, Production Yearbook. (19)

Table 6.3. MAIZE: Trends in Yield Levels by Country 1961/78

Country	Annual Growth	Average Yield	Average Yield	Average Yield
	Rate in Yields 1961/78	1961/63	1971/73	1976/78
	%	----- Kg/Ha -----		
Mexico	1.4**	992	1251	1246
Cuba	1.0***	995	961	1247
Dominican Rep.	1.3***	1011	1889	1727
Guyana	2.4	954	1736	785
Haiti	1.1	763	783	839
Jamaica	0.3	648	1131	779
Trinidad	1.3***	3196	4152	5000
Costa Rica	2.6***	1079	1117	1739
El Salvador	3.7***	1069	1603	1720
Guatemala	2.7***	853	889	1345
Honduras	-0.4	1053	1100	1024
Nicaragua	-0.2	867	819	886
Panama	1.0***	826	760	1017
Venezuela	1.2**	1068	1112	1314
Bolivia	0.6	1244	1280	1324
Chile	1.7*	1260	3369	2797
Colombia	1.2***	1094	1151	1339
Ecuador	3.4***	701	799	982
Peru	1.4***	1395	1679	1840
Brazil	1.0**	1309	1389	1480
Argentina	3.4***	1770	2318	3014
Paraguay	0.7	1250	1284	1400
Uruguay	4.1***	746	904	1050
Latin America	1.7***	1212	1434	1548

Source: FAO, Production Yearbook. (19).

Table 6.4 . MAIZE: Production, Trade and Apparent Consumption , 1971/73 and 1976/78

Country	1971/73				1976/78			
	Produc- tion	+Imports -Exports	Apparent consump- tion	Apparent per capita consumption	Produc- tion	+Imports -Exports	Apparent consump- tion	Apparent per capita consumption
	----- 1000 Mt -----		----- 1000 Mt -----	Kg	----- 100 Mt -----		----- 100 Mt -----	Kg
Mexico	9019	210	9229	182.1	8875	1340	102.15	163.9
Cuba	122	195	317	36.9	95	376	471	48.6
Dominican Rep.	50	29	79	18.7	44	94	138	27.8
Guyana	3	4	7	9.9	2	5	7	10.7
Jamaica	5	112	117	62.6	10	170	180	88.1
Haiti	253	0	253	5.5	199	8	207	44.5
Trinidad	4	43	47	45.7	5	69	74	66.9
Caribbean	437	383	820	64.9	355	722	1077	78.4
Costa Rica	50	29	79	45.7	88	5	93	46.4
El Salvador	340	- 1	339	96.8	421	57	478	113.0
Guatemala	701	20	721	136.8	748	26	774	128.6
Honduras	325	- 8	317	117.4	354	17	371	133.9
Nicaragua	190	26	216	112.5	197	14	211	95.1
Panama	51	18	69	47.3	76	4	80	46.5
Central America	1657	84	1741	105.0	1884	133	2007	105.8
Venezuela	558	140	698	64.2	691	543	1234	99.8
Bolivia	279	2	281	56.9	324	0	324	56.7
Chile	278	209	487	50.1	287	117	404	38.7
Colombia	870	69	939	43.9	833	66	899	37.3
Ecuador	255	- 1	254	43.7	231	13	244	35.5
Peru	607	107	714	53.6	675	212	887	55.1
Andean	2289	386	2675	48.5	2350	408	2758	43.6
Brazil	14419	- 495	13924	150.5	16,875	- 450	16,425	149.1
Argentina	8497	-4389	4108	172.9	7952	-4832	3120	122.9
Paraguay	239	- 6	233	101.3	387	- 4	383	139.8
Uruguay	179	3	181	66.5	168	- 9	159	57.2
River Plate	8915	-4392	4522	157.2	8507	-4845	3662	118.5
Latin America	37295	-3677	33618	121.9	38,809	-2121	36688	114.2

Source: FAO, Production Yearbook (19); FAO, Trade Yearbook (21).

Table 6.5 . MAIZE: Production and Utilization Indices Based on End Use

Country	Production Growth		Total Maize Per Capita consumption	Maize Imports as % of total consumption
	Rate 1961/78			
	Maize	Sorghum	Kg	%
More than 75% Food Use				
Haiti	-0.4	-	45	4
Guatemala	1.7	6.0	129	3
Nicaragua	1.8	0.8	95	7
Bolivia	1.4	-	57	0
Colombia	0.1	25.0	37	7
Between 50-75% Food Use				
Mexico	1.4	15.8	164	13
Costa Rica	0.8	8.6	46	5
El Salvador	5.5	4.3	113	12
Honduras	1.3	- 1.1	134	5
Panama	-1.3	-	47	5
Ecuador	3.3	-	36	5
Between 25-50% Food Use				
Venezuela	2.1	30.6	100	44
Peru	1.9	22.7	55	24
Paraguay	6.7	-	140	E
Less than 25% Food Use				
Cuba	-2.1	-20.8	49	80
Dominican Rep.	0.5	11.7	28	68
Guyana	9.7	-	11	71
Jamaica	6.3	-	88	94
Trinidad	5.4	-	67	93
Chile	2.8	-	39	29
Brazil	3.7	- 4.5	149	E
Argentina	3.6	11.1	123	E
Uruguay	1.5	17.3	57	E

E = Exporter

7. Sorghum

Sorghum is a feed grain which has become a major crop in Latin America only recently. Two decades ago sorghum production in Latin America was less than a tenth of maize production but today it is nearly a third. The growth in sorghum output has been extremely rapid. At the beginning of the sixties about two million tons of sorghum were produced in Latin America (Table 7.1). By the early seventies production has risen to 7.5 million tons, and Latin American sorghum production currently exceeds 12 million tons annually.

Argentina is the main producer of sorghum, contributing over half of the regional output while Mexico is second with about a third. Brazil, which is the top Latin American producer of rice, maize and cassava, is a very poor fourth in sorghum, with only three per cent of the regional output. Per capita consumption of sorghum is highest in Argentina and Mexico, the main producers, and also in Venezuela which can afford to import substantial quantities. For the entire region, however, per capita consumption of sorghum is considerably less than for cassava, maize or rice.

Trends in Production

Rates of annual growth in output of sorghum are very high and far greater than for the other products considered in this report. Production rose at an amazing 13.7% per year in Latin America from 1961 to 1978 (Table 7.2). The highest growth rate was achieved in Venezuela, 30.6% and Colombia was second at 25%. The largest producers, Argentina and Mexico, also attained very strong growth rates of 15.8 and 11.1 per cent respectively, from fairly substantial base year figures. Growth rates were higher in the sixties than in the seventies since many nations produced little or no sorghum at the beginning of the period. Nevertheless, the average annual

absolute increase in output for the entire region has remained nearly constant over the last two decades.

Increase in area cultivated has been the most important factor in growth of production. Over two third's of the gains in output have come from expansion of area. Although in Colombia and Venezuela area expansion is practically the sole factor in the rapid growth in production, Mexico and Argentina have coupled modest but steady growth in yields with strong increases in area.

Sorghum yields are considerably higher than maize yields for most countries in the region. Average yield of sorghum is 2.6 tons per hectare, compared with 1.5 tons for maize. Moreover, while sorghum yields have gone up about a ton in the last two decades, maize yields have risen by only about one third of a ton.

Trade Balances

Latin America was a net exporter of sorghum in 1976/78 (Table 7.4). However, as is the case with maize, Argentina alone accounts for more than 90% of Latin America exports. Moreover, Latin American sorghum importers outnumber exporters in the region by almost three to one. Mexico imports more sorghum than any other Latin American nation, purchasing 12% of its apparent consumption. Mexican imports have increased dramatically during the seventies despite significant gains in production. Venezuela is the second greatest importer, in absolute terms, and it buys 62% of its apparent consumption. Like Mexico, imports have continued to climb in Venezuela even though production has expanded substantially.

With the exception of Venezuela, sorghum imports are at a much lower

level than imports of maize and consequently are not a major balance of payments problem for most Latin American countries. Since imports have persisted in growing in many countries despite rapidly increasing domestic production, sorghum imports may develop into a more serious problem if recent trends are maintained.

Table 7.1 . SORGHUM: Production, Relative Importance in the Region, and Per Capita Consumption Levels, 1976/78.

Country	Production			Percentage of total 1976/78 %	Apparent Per Capita Consumption 1976/78 Kg
	1961/63 -----	1971/73 1000 Mt	1976/78 -----		
Mexico	330	2502	4094	33.0	74
Cuba	26	15	1	0.0	0
Dominican Rep.	0	8	21	0.2	4
Haiti	0	0	134	1.1	29
Caribbean	26	23	156	1.2	12
Costa Rica	8	11	42	0.3	28
El Salvador	88	153	161	1.3	41
Guatemala	19	46	43	0.3	10
Honduras	50	43	43	0.3	15
Nicaragua	47	50	52	0.4	26
Central America	212	303	341	2.7	20
Venezuela	0	6	317	2.5	67
Colombia	8	297	450	3.6	20
Ecuador	0	0	3	0.02	1
Peru	2	19	59	0.5	5
Andean	10	316	512	4.1	9
Brazil	0	83	384	3.1	3
Argentina	1417	4148	6419	51.8	85
Paraguay	4	6	9	0.07	3
Uruguay	15	118	155	1.2	30
River Plate	1436	4272	6583	53.1	72
Latin America	2012	7506	12389	100.0	28

Source: FAO, Production Yearbook. (19)

Table 7.2 . SORGHUM: Annual Growth Rates in Production, Area and Yield, 1961-78.

	Production	Area	Yield
	Percent		
Mexico	15.8***	14.1***	1.6***
Cuba	-20.8***	-19.7***	-0.5*
Dominican Rep.	11.7**	13.5***	-1.1
Costa Rica	8.6***	7.8**	1.0***
El Salvador	4.3***	2.3***	2.0***
Guatemala	6.0***	2.3**	3.7***
Honduras	- 1.1**	2.0**	-3.1**
Nicaragua	0.8	0.3	0.5
Venezuela	30.6***	32.0***	-1.8
Colombia	25.0***	24.9***	0.4
Peru	22.7***	19.3***	3.5***
Brazil	- 4.5	- 7.9	3.4
Argentina	11.1***	7.4***	3.7***
Paraguay	5.5***	5.3***	1.1
Uruguay	17.3***	6.8***	10.5***
Latin America	12.5***	9.2***	3.3***

Significance levels: (*) = .10 , (**) = .05 , (***) = .01

Source: FAO, Production Yearbook (19)

Table 7.3 . SORGHUM: Trend in Yield Levels by Country 1961/78

Country	Annual Growth Rate in Yields 1961/78	Average Yields 1961/63	Average Yields 1971/73	Average Yields 1976/78
	%	Kg/Ha		
Mexico	1.6***	2348	2427	3064
Cuba	- 0.4*	1182	1154	1100
Dominican Rep.	- 1.2	0	2248	3252
Haiti	- 8.1*	0	0	752
Costa Rica	0.9***	1611	1776	1798
El Salvador	2.0***	920	1195	1239
Guatemala	3.7***	595	708	1103
Honduras	- 3.1***	1196	1402	744
Nicaragua	0.5	933	1018	1006
Venezuela	- 1.8	0	1412	1935
Colombia	0.4	2209	2541	2305
Ecuador	-31.6	0	0	3401
Peru	3.5***	1994	2763	3063
Brazil	3.4	0	566	2391
Argentina	3.7***	1718	1960	2864
Paraguay	1.1	1021	1368	1298
Uruguay	10.5***	465	1560	1985
Latin America	3.3***	1606	2035	2615

Significance levels: (*) = .10 , (**) = .05 , (***) = .01

Source: FAO, Production Yearbook (19).

Table 7.4 . SORGHUM: Production Trade and Apparent Consumption 1971/73 and 1976/78

Country	1971/73				1976/78			
	Production	+Imports -Exports	Apparent Consumption	Apparent Per Capita Consumption	Production	+Imports -Exports	Apparent Consumption	Apparent Per Capita Consumption
	1000 Mt			Kg	1000 Mt			Kg.
Mexico	2502	73	2575	51	4094	540	4634	74
Cuba	15	0	15	2	1	0	1	0
Dominican Rep.	8	0	8	2	21	0	21	4
Jamaica	0	2	2	1	0	7	7	4
Haiti	0	0	0	0	134	0	134	29
Caribbean	23	2	25	2	156	7	163	12
Costa Rica	11	3	14	8	42	15	57	28
El Salvador	153	- 6	147	42	161	14	175	41
Guatemala	46	3	49	9	43	15	58	10
Honduras	43	0	43	16	43	- 1	42	15
Nicaragua	50	3	53	28	52	5	57	26
Central America	303	3	306	18	341	48	389	20
Venezuela	6	361	367	34	317	511	828	67
Chile	0	60	60	6	0	19	19	2
Colombia	297	24	321	15	450	43	493	20
Ecuador	0	0	0	0	3	6	9	1
Peru	19	27	46	3	59	18	77	5
Andean	316	111	427	8	512	86	598	9
Brazil	83	- 3	80	1	384	- 20	364	3
Argentina	4148	-1849	2299	97	6419	-4269	2150	85
Paraguay	6	0	6	3	9	0	9	3
Uruguay	118	0	118	43	155	- 71	84	30
River Plate	4272	-1849	2423	84	6583	-4340	2243	72
Latin America	7506	-1301	6205	22	12389	-3170	9219	28

Source: FAO, Production Yearbook (19); FAO, Trade Yearbook (21).

8. Fertilizers

The substitution of fertilizer for area expansion will depend upon the original soil fertility, the relative prices of land and fertilizer, and the profitability and fertilizer response of the crops planted. With abundant land and little production capacity of fertilizers utilization has been very low compared with the countries with scarce land resources such as Japan and West Germany. In many countries of Latin America rotation and area expansion have traditionally been relied upon rather than fertilization. In the last two decades there has been a rapid increase in Latin American fertilizer consumption principally in the countries producing part of their own fertilizer requirements. This increase has been especially rapid in Brazil and Mexico. El Salvador and Costa Rica, with their high man-land ratios have also attained high rates of fertilizer consumption per hectare (Table 8.1).

From 1965-66 to 1977-78 Latin American consumption of nitrogen fertilizers more than tripled; however, production increased faster than consumption so the dependence upon imports was reduced from 70 to 52 percent. During the same period Latin American consumption of phosphorus fertilizers increased by almost five times. Dependence upon imports increased from 52 to 68 percent (Table 8.2). Most countries in Latin America imported substantial quantities of fertilizer (Table 8.3); nevertheless, the Latin American fertilizer market share is still very small. In 1977-78 Latin America consumed 5.4 and 7.9 percent of nitrogen and phosphate fertilizers in the world (Table 8.2).

In Brazil fertilizer consumption has increased especially rapidly, over 18 percent for nitrogen and 24 percent growth rates for phosphorus. Mexican consumption has also increased rapidly but much less than that of Brazil, i.e. 10 percent growth rates for both nitrogen and phosphate fertilizers. Brazil and Mexico are responsible for 58 percent of Latin American nitrogen consumption and 78 percent of Latin American phosphate consumption (Figure 8.1 and 8.2 and Table 8.4).

The production increase of both major nutrients in Brazil has also been extremely rapid. Mexico, Argentina, Colombia, and Cuba demonstrated rapid production increases in at least one of the major nutrients during the last decade (Table 8.5).

Table 8.1

Nitrogen and Phosphorus Consumption per ha. of Arable Land and Land Under Permanent Crops in Latin America, 1961-65 to 1977-78

Country	Nitrogen Fertilizers		Phosphorus Fertilizers	
	1961-65	1977-78	1961-65	1977-78
	---- kg/ha ----		---- kg/ha ----	
<u>Fertilizer Producers</u>				
Brazil	1.9	16.9	2.8	37.7
Mexico	8.0	34.2	2.1	9.4
Chile	6.0	6.9	13.4	9.5
Trinidad and Tobago	22.1	22.1	3.9	1.9
Colombia	7.8	28.2	9.5	13.6
Venezuela	2.5	27.7	1.2	10.0
Argentina	.6	1.2	.2	0.9
Costa Rica	49.5	59.2	9.3	24.5
Peru	27.6	31.2	10.3	5.3
El Salvador	32.5	105.5	10.5	34.6
Cuba	28.4	70.8	28.0	17.5
Guatemala	6.4	34.1	3.5	14.9
Jamaica	32.5	17.0	8.3	16.2
Ecuador	2.2	11.4	1.8	4.5
Uruguay	4.4	9.3	10.9	22.1
<u>Countries Exclusively Importing Fertilizers</u>				
Honduras	8.1	16.6	.6	6.0
Nicaragua	9.5	23.9	2.5	10.1
Haiti	.1	1.8	-	0.8
Dominican Republic	9.9	31.3	1.2	12.8
Panama	15.7	15.9	-	11.0
Bolivia	.3	0.6	.3	0.5
Paraguay	.2	0.3	.9	0.6
Latin America	5.1	18.0	3.4	15.6
United States	8.9	48.2	6.8	24.6
Japan	122.3	138.2	82.2	149.8
West Germany	53.7	165.3	52.3	109.0

Source: Revision of C. Alvarez (1).

Table 8.2

Consumption and Production of Nitrogen and Phosphate Fertilizers in
Latin America, 1965/66 - 1977/78

	Nitrogen Fertilizers		Phosphate Fertilizers	
	1965-66	1977-78	1965-66	1977-78
Production (tons)	510,552	1,359,017	191,748	1,514,023
Consumption (tons)	727,879	2,576,294	456,560	2,231,533
Consumption from Domestic Production (%)	70.1	52.3	42.0	67.9
World Fertilizer Consumption (tons)	18,828,409	47,768,009	14,948,263	28,279,446
Latin American Share of World Consumption (%)	3.9	5.4	3.1	7.9

Source: Revision of C. Alvarez (1).

TABLE 8.3

Trade Balance of Fertilizers, Exports Minus Imports,
of Nitrogen and Phosphorus Fertilizers, 1977-78

Country	Nitrogen Fertilizers	Phosphate Fertilizers
	----- (Metric Tons) -----	
Brazil	-321460	-388835
Mexico	-219224	24303
Chile	11277	-51320
Trinidad and Tobago	-12173	288
Colombia	-46991	-11399
Venezuela	-25426	-37275
Argentina	-13016	-23036
Costa Rica	-1813	-18176
Peru	-35528	-15465
El Salvador	-63241	-16653
Cuba	-148666	-54060
Guatemala	-47124	-18140
Jamaica	-5933	-2500
Ecuador	-38800	-11576
Uruguay	-19372	-23826
Dominican Republic	-34800	-19900
Nicaragua	-21914	-10547
Panama	-11138	-5153
Honduras	-12533	-6066
Bolivia	-1600	-1600
Haiti	-966	466
Paraguay	-366	-512
Latin America	-998851	-703935

Source: Revision of C. Alvarez (1).

Table 8.4

Consumption of Nitrogen and Phosphorus Fertilizers in Latin America,
1965-66 to 1977-78

Country	Nitrogen Fertilizers			Phosphate Fertilizers		
	1965-66	1977-78	Geometric Growth Rate	1965-66	1977-78	Geometric Growth Rate
	(Tons N)		%	(Tons P ₂ O ₅)		%
<u>Fertilizer Producers</u>						
Brazil	70569	689200	18.3	86751	1533500	24.2
Mexico	263500	794200	10.2	67133	218032	9.9
Chile	31794	40000	2.8	63001	55200	-1.8
Trinidad and Tobago	3321	3467	0.9	907	300	-7.9
Colombia	45000	155200	11.8	55800	75100	3.2
Venezuela	17000	147700	16.3	8000	53628	16.3
Argentina	25000	41700	3.1	10000	31200	4.7
Costa Rica	10000	29000	6.4	4500	12000	9.5
Peru	64157	107116	6.4	14091	18233	2.3
El Salvador	19608	77118	11.2	8279	22400	7.7
Cuba	90000	223000	2.6	80000	55000	-6.0
Guatemala	7301	61346	12.9	4864	26800	8.9
Jamaica	7510	4500	-2.1	2115	4300	2.3
Ecuador	4894	58259	11.7	7095	23097	4.3
<u>Countries Exclusively Depending Upon Fertilizer Imports</u>						
Uruguay	8310	17800	5.9	21480	42300	4.8
Honduras	8000	15200	3.1	1000	5500	12.9
Nicaragua	15014	36000	6.0	10387	15242	1.5
Haiti	100	1400	17.3	-	700	33.2
Paraguay	267	300	3.3	1152	700	-11.7
Dominican Republic	10000	38500	12.2	1000	15700	32.6
Bolivia	500	1900	10.6	500 ^b	1800	11.3
Panama	8000	9000	1.7	2000 ^b	6200	11.8
Others ^a	18034	24388	2.2	8505	14601	4.6
Latin America	727879	2576294	9.7	456560	2231533	12.7

a/ Includes Surinam and the other Caribbean countries not explicitly mentioned above.

b/ Fertilizer consumption for 1968.

Source: Revised from C. Alvarez (1).

Table 8.5
Production of Nitrogen and Phosphate Fertilizers in Latin America,
1965-66 - 1977-78

Country	Nitrogen Fertilizers			Phosphate Fertilizers		
	1965-66	1977-78	Geometric Growth Rate	1965-66	1977-78	Geometric Growth Rate
	Tons	Tons	%	Tons	Tons	%
Brazil	14.445	232.157	33.7	61.056	1122.400	24.0
Mexico	134.000	611.200	12.3	67.478	282.013	12.0
Chile	178.844	96.000	-3.5	4.773	9.550	7.0
Colombia	39.000	71.600	6.8	8.033	33.000	20.3
Cuba	5.000 ^a	47.000	27.5	15.000	3.000	-0.04
Trinidad and Tobago	37.847	42.990	-0.35	n.a.	n.a.	-
Venezuela	17.000	103.700	13.5	8.000	18.000	7.5
Peru	43.416	71.534	4.4	19.408	4.257	13.1
Costa Rica	10.000	32.355	10.1	n.a.	n.a.	-
Argentina	4.000	30.100	13.9	1.000	4.000	32.5
Dutch Antilles	28.000	2.500	-19.5	n.a.	n.a.	-
El Salvador	4.000	12.400	1.6	1.500 ^a	4.200	9.7
Guatemala	n.a.	6.400	-	n.a.	5.400	-
Ecuador	2.000 ^a	1.581	-2.8	2.000 ^a	4.263	5.5
Latin America	510.552	1359.017	8.8	191.748	1514.023	17.4

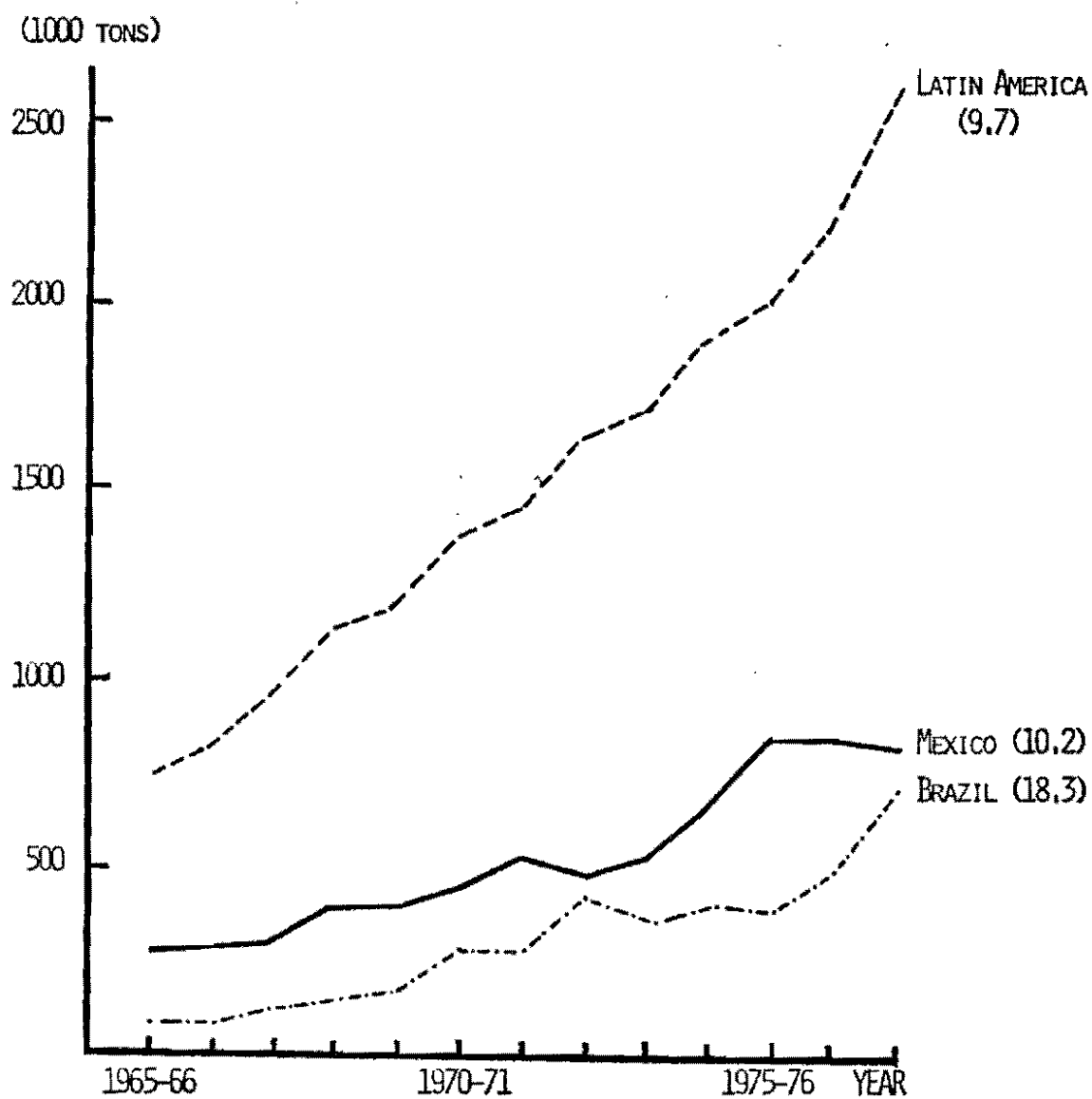
n.a. = Information not available.

a/ The production data indicated are for 1968.

Source: Revision of C. Alvarez (1).

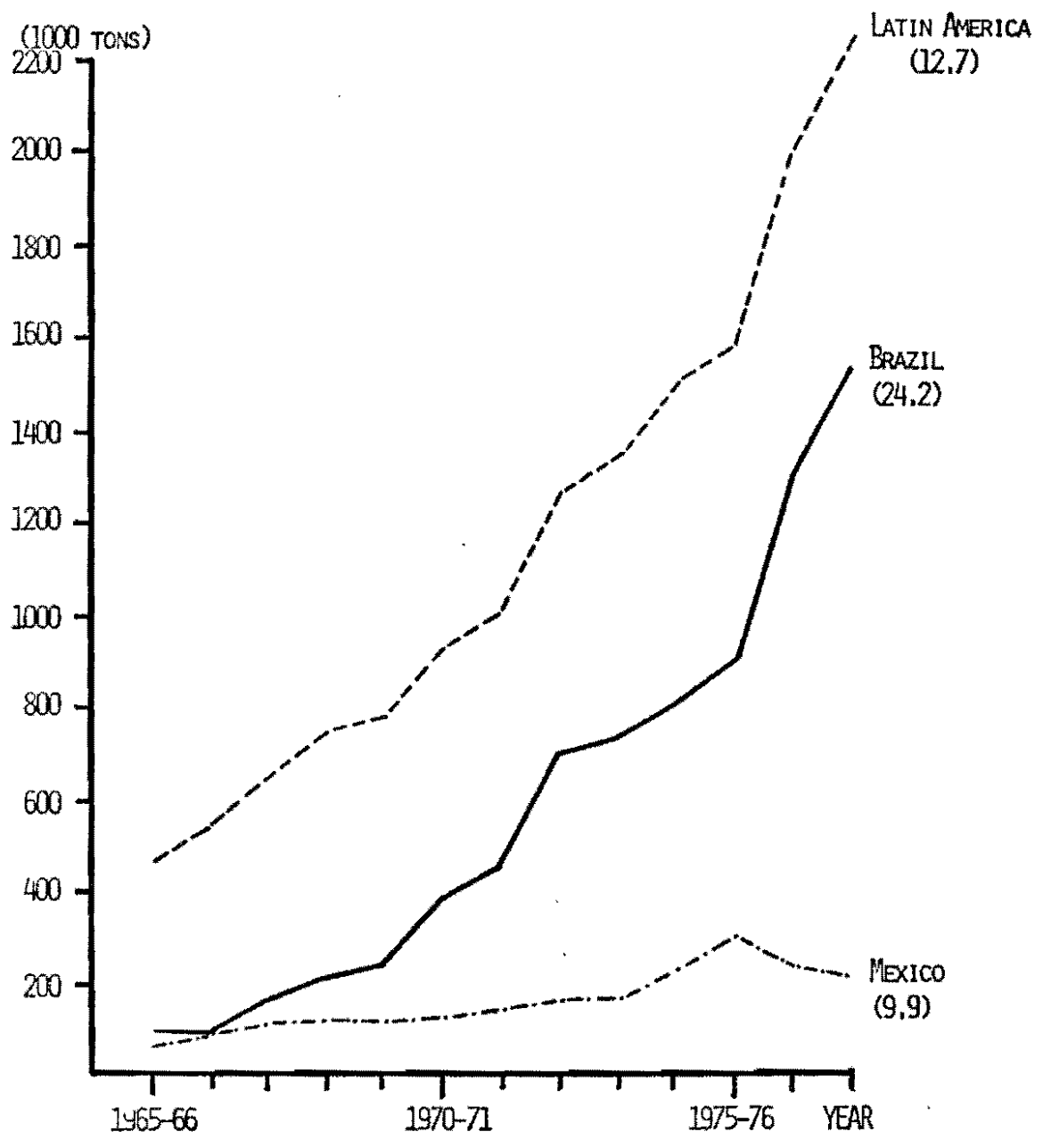
FIGURE 8.1

NITROGEN FERTILIZER CONSUMPTION IN LATIN AMERICA, BRAZIL AND MEXICO,
1965-66 - 1977-78



SOURCE: REVISION OF C. ALVAREZ (1).

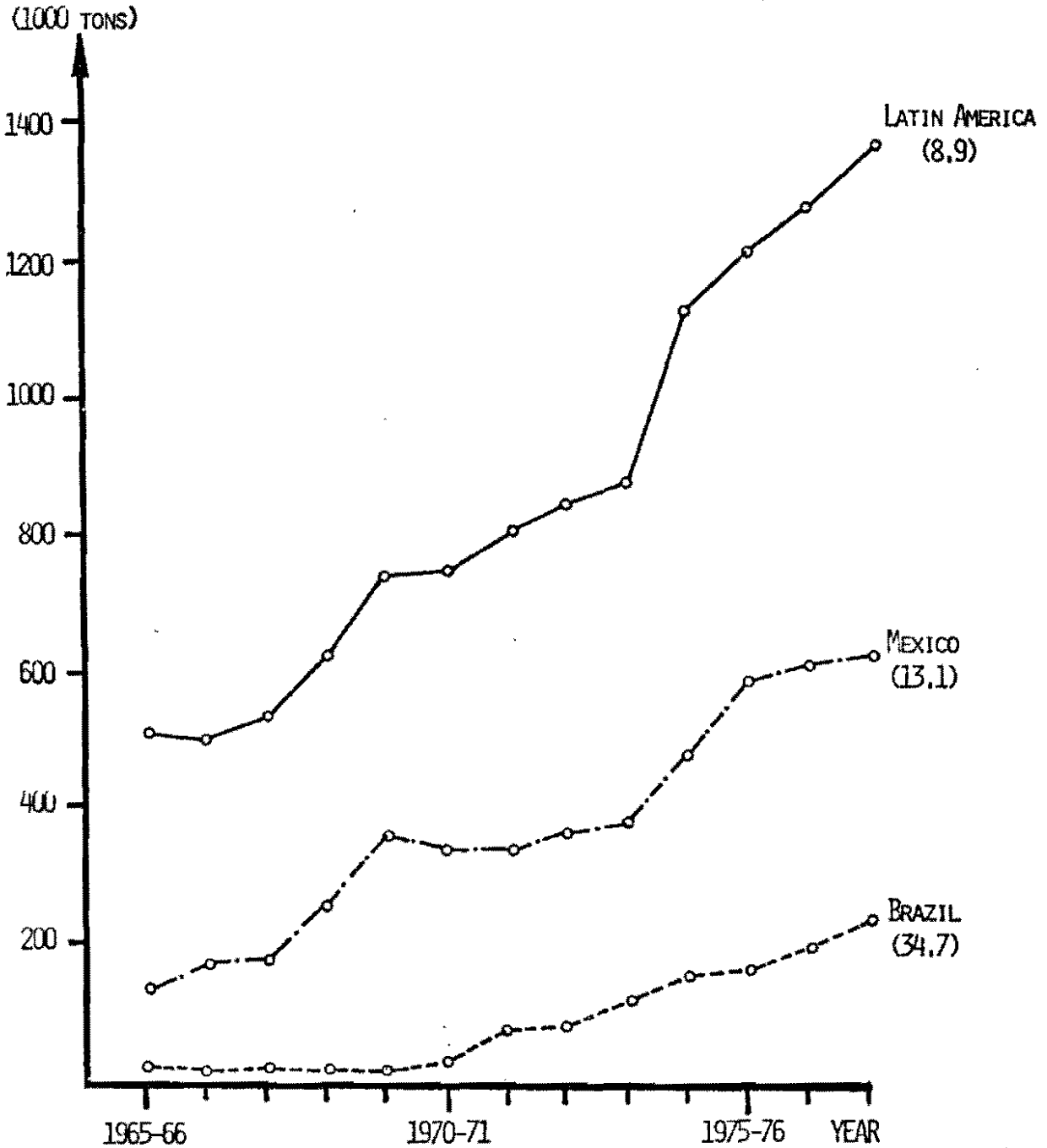
FIGURE 8.2
PHOSPHATE FERTILIZER CONSUMPTION IN LATIN AMERICA, BRAZIL AND MEXICO,
1965-66 - 1977-78



SOURCE: REVISION OF C. ALVAREZ (1).

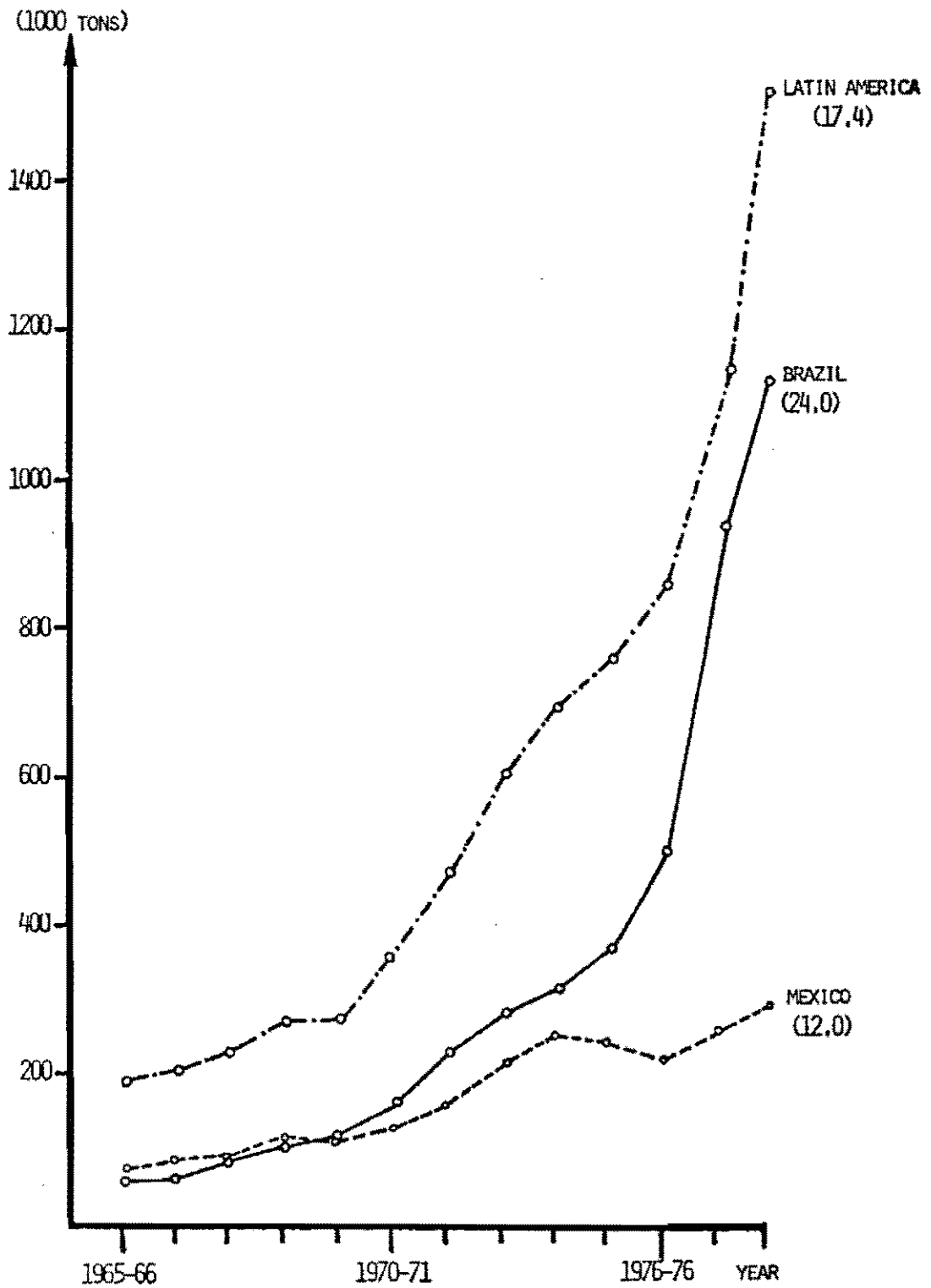
FIGURE 8.3

PRODUCTION OF NITROGEN FERTILIZER IN LATIN AMERICA, BRAZIL AND MEXICO,
1965-66 - 1977-78



SOURCE: REVISION OF C. ALVAREZ (1).

FIGURE 8.4
 PRODUCTION OF PHOSPHORUS FERTILIZERS IN LATIN AMERICA, BRAZIL AND MEXICO,
 1965-66 - 1977-78



SOURCE: REVISION OF C. ALVAREZ (1).

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