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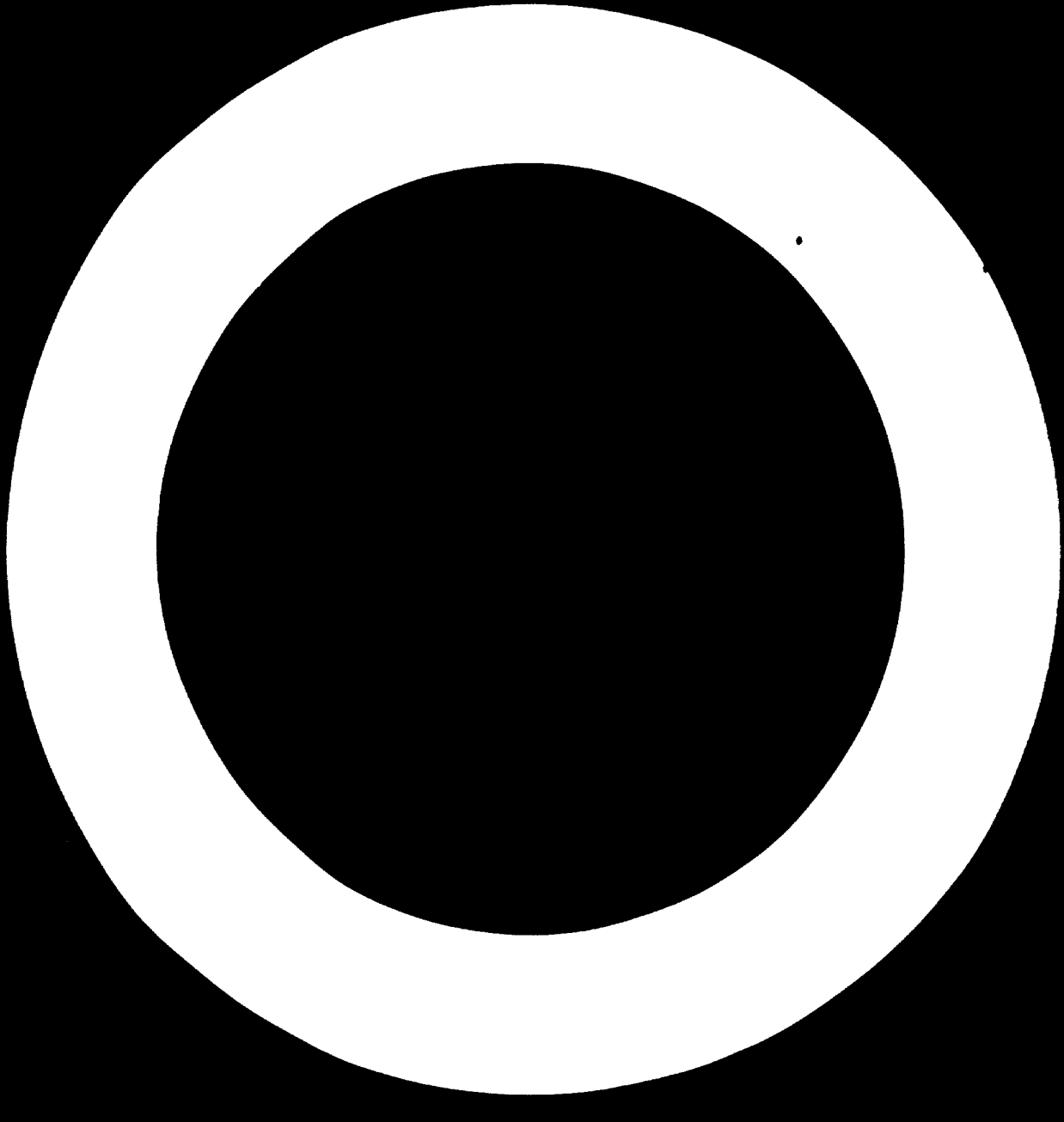
07087

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO/IOD. 23
11 November 1975
ENGLISH

DIRECTORY OF FERTILIZER PRODUCTION FACILITIES

PART IV LATIN AMERICA



PREFACE

This directory is one of a series designed to provide developing and developed countries with a concise and factual source of information on the fertilizer production facilities of the various regions of the world, which can be of value in long-range planning to develop fertilizer industries wherever appropriate.

The present directory, which deals with countries in the region of the Economic Commission for Latin America (ECLA),[1/] contains data concerning the present and projected fertilizer demand and production; existing fertilizer production facilities; and projects being implemented or in the planning stage. It also contains information on the availability and production of fertilizer raw materials and fuels and other relevant data. It illustrates briefly the state of development of the national economies and of the agricultural and manufacturing sectors.

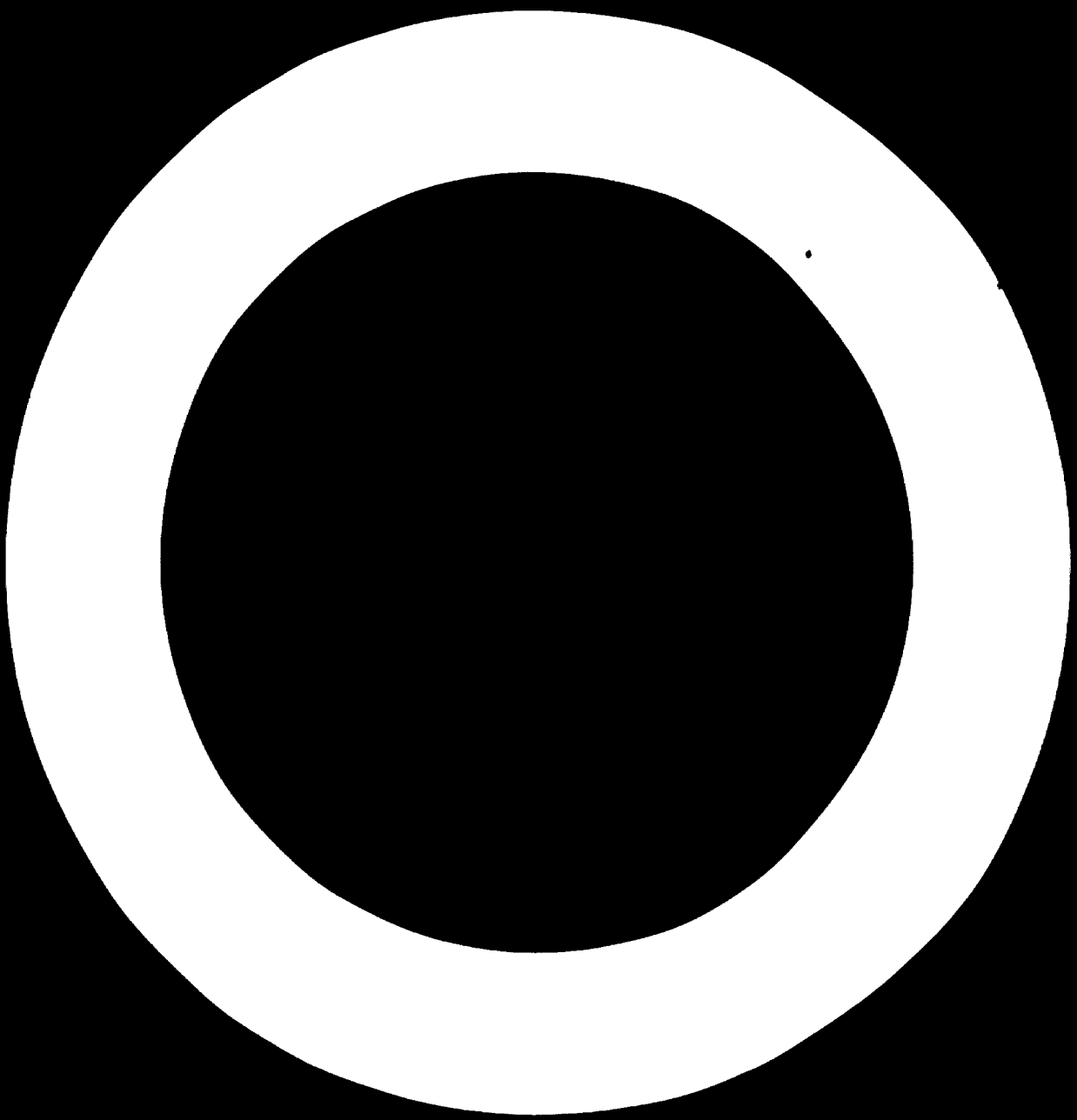
Information from a variety of sources has been used in the preparation of the directory, including data issued by the Food and Agriculture Organization of the United Nations (FAO); ECLA; and various national, international, governmental and private organizations, as well as information from United Nations experts in the field and information collected by staff members of the United Nations Industrial Development Organization while visiting Latin American countries. The data have been verified, as far as possible, with the valuable assistance of ECLA, FAO and a number of Governments.

For analysis and comparison, the countries considered in this volume are grouped into the two subregions of Central America and South America as follows:

Central America. Belize, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Netherlands Antilles, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago (15 countries)

South America. Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Surinam, Uruguay, Venezuela (12 countries)

1/ Directories dealing with Africa, Asia and ECE countries were issued in 1970 (Africa) and 1973 (Asia and ECE countries) respectively: Directory of Fertilizer Production Facilities: Part I - Africa (United Nations publication, Sales No. 70.II.B.28); UNIDO, "Directory of Fertilizer Production Facilities: Part II - Asia" (UNIDO/ITD.272); and UNIDO, "Directory of Fertilizer Production Facilities: Part III - ECE Countries" (UNIDO/ITD. 279).



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EXPLANATORY NOTES

The term "billion" signifies a thousand million.

Reference to dollars ($) is to United States dollars.

Ton refers to metric ton (1,000 kg) unless otherwise specified.

Bbl refers to a barrel of crude oil or of liquid petroleum products - (1 barrel = 42 US gallons = 0.15899 cubic metres).

Per cent P_2O_5 refers to the percentage of:

(a) The total phosphorus in phosphate rock;

(b) The available phosphorus in phosphate fertilizers, expressed as phosphorus pentoxide (P_2O_5).

Per cent K_2O refers to the percentage of water-soluble potassium, expressed as potassium oxide (K_2O) in potassium fertilizers.

In tables, three dots (...) indicate that data are not available or are not separately reported; a dash (-) indicates that the amount is nil or negligible; a blank indicates that the item is not applicable; figures do not necessarily add up to totals because of rounding.

Dates divided by a slash (e.g. 1972/73) indicate a crop or financial year.

Dates divided by a hyphen (e.g. 1970-1980) indicate the full period involved, including the beginning and end years.

An asterisk (*) indicates an unofficial figure quoted from FAO publications.

F = FAO estimate.

The following abbreviations are used in this publication:

AS	ammonium sulphate
AN	ammonium nitrate
bbl/d	barrels per day
CAN	calcium ammonium nitrate
DAP	diammonium phosphate
GDP	gross domestic product
GNP	gross national product
ha	hectare
kWh	kilowatt-hour
MAP	monoammonium phosphate
MW	megawatt
NPK	nitrogen-phosphate-potassium fertilizers
SSP	single superphosphate
TSP	triple superphosphate

United Nations bodies and specialized agencies

FAO	Food and Agriculture Organization of the United Nations
ECLA	Economic Commission for Latin America
UNDP	United Nations Development Programme

Other

LAFTA	Latin American Free Trade Association
TVA	Tennessee Valley Authority
API	American Petroleum Institute

FAO comments on "arable" and "agricultural" land as follows:

"The consumption per hectare of arable land and that of agricultural land are indicators of the intensity of fertilizer consumption. The term 'arable land' used in the tables includes land under temporary crops (double-cropped areas are counted once) temporary meadows for mowing or pastures, land under market and kitchen garden, land temporarily fallow or lying idle. It also includes land under permanent crops such as cocoa, coffee, rubber, fruit trees, nut trees, and vines.

Agricultural land includes, in addition to the above-mentioned categories, land under permanent meadows and pastures. Caution should be exercised when using these indicators since definitions may vary from one country to another." a/

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a/ Annual Fertilizer Review, 1974 (Rome, 1975), p. 8.

SUMMARY

The data presented in this directory, dealing with individual countries of Latin America, are summarized and presented on a subregional basis for Central America and for South America. Owing to the wide variations in development of the national economies, particularly in the agricultural and industrial sectors of the various parts of Latin America, and to the enormous distances involved and the attendant transport problems, it is considered that this approach is more meaningful and realistic than treating the region in its entirety.

Area, population and national income

Table 1 shows the area and population for each country and the average annual rate of growth of population over the period 1964-1974, which is 3.6 per cent for the Latin American countries of Central America and 3.1 per cent for those of South America. These figures illustrate the problems facing the developing countries of Latin America caused by the rapid increase in population and underline the need for modernization of the agricultural sector in these countries.

Table 2 illustrates the state of economic development of the two subregions. The data presented show the gross national product (GNP) for the individual countries as a total and *per capita* and the distribution of the gross domestic product (GDP) in the most relevant sectors according to the sources mentioned in the foot-notes. The lowest GNP *per capita* is in Haiti ($130) and Bolivia ($200); in four other countries it is between $300 and $400, and in the remaining it is $400 and more. In four countries the *per capita* GDP is over $1,200.

In most Latin American countries, the agricultural sector dominates the economy, although in several countries the manufacturing sector is also quite developed. Table 3 shows the production of some of the more important subsistence and cash crops.

Although this survey deals primarily with fertilizer production facilities, the above data have been included to illustrate the problems that most Latin American countries face in developing and modernising agriculture and in promoting the use and local manufacture of fertilizers. These factors are discussed later in more detail in the sections dealing with individual countries.

Table 1. Area and population of Latin American countries

Country	Area (thousand square kilometres)	Population in 1974 (million)	Average annual growth rate of population, 1964-1974 (percentage)
Central America			
Belize	23.0	0.14	3.9
Costa Rica	50.7	1.94	3.5
Cuba	114.5	9.00	2.0
Dominican Republic	48.7	4.94	4.1
El Salvador	21.4	3.96	3.9
Guatemala	108.9	5.73	3.3
Haiti	27.8	5.80	2.8
Honduras	112.1	3.10	4.0
Jamaica	11.0	2.16	2.4
Mexico	1 972.5	58.21	4.1
Netherlands Antilles	1.0	0.24	1.7
Nicaragua	130.0	2.30	3.6
Panama		1.68	3.9
Puerto Rico	8.9	2.99	1.7
Trinidad and Tobago	5.1	1.07	1.3
South America			
Argentina	2 776.9	25.71	1.6
Bolivia	1 098.6	5.14	2.7
Brazil	8 512.0	104.23	3.3
Chile	756.9	10.42	2.3
Colombia	1 138.9	24.58	4.1
Ecuador	283.6	6.96	4.0
Guyana	215.0	0.84	3.1
Paraguay	406.8	2.77	4.1
Peru	1 285.2	15.38	3.6
Surinam	263.3	0.45	3.6
Uruguay	177.5	3.03	1.3
Venezuela	912.1	12.32	4.0

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 4, 11-12.

Table 2. Economic status of Latin American countries, 1972

Country	GNP		Approximate distribution of GDP in relevant sectors (percentage)		
	Total (million dollars)	Per capita (dollars)	Agriculture	Manufacturing	Mining
Central America					
Belize	90	670	15	16	<0.5
Costa Rica	1 150	630	22	19[a]	
Cuba	3 970	450	...	...	
Dominican Republic	1 980	480	20	18	4
El Salvador	1 250	340	25	19	<0.5
Guatemala	2 340	420	28	16	<0.5
Haiti	560	130	49	10	2
Honduras	860	320	35	15	2
Jamaica	1 560	810	9	15	12
Mexico	40 340	750	10	26	1
Netherlands Antilles	350	1 500	...	...	
Nicaragua	1 020	470	26	19	<0.5
Panama	1 340	880	17	16	<0.5
Puerto Rico	5 860	2 050	4	24	<0.5
Trinidad and Tobago	1 020	970	5	12	15
South America					
Argentina	30 970	1 290	13	32	2
Bolivia	1 030	200	17	13	15
Brazil	52 010	530	18	24	<0.5
Chile	8 030	800	8	27	7
Colombia	9 270	400	27	20	1
Ecuador	2 370	360	26	17	4
Guyana	300	400	20	11	17
Paraguay	740	320	35	16	<0.5
Peru	7 380	520	16	21	8
Surinam	340	810	8	6	32
Uruguay	2 240	760	13	23[a]	
Venezuela	13 820	1 240	6	18	19

Sources: Quarterly Economic Review: Annual Supplement 1975, 1975 (London), p. 35; Statistical Yearbook 1973 (United Nations publication, Sales No. 74-XVII.1); and World Bank Atlas: Population, Per Capita Product and Growth Rates (Washington, D.C., IBRD, 1974).

a/ Including mining.

Consumption and production of fertilizers

The past and estimated consumption and production of the primary fertiliser nutrients (N, P_2O_5 and K_2O) from 1960 to 1980 for the Latin American countries of Central America and of South America are shown in tables 4 and 5, and for Latin America as a whole in table 6. These data are also illustrated graphically in figures I, II and III. The bases for the estimates are discussed later in the sections dealing with individual countries. However, because of the new situation on the raw materials market that has arisen since October 1973, the bases have changed considerably. Until the costs of the feedstocks, the manufactured fertilizers and the agricultural products have reached a reasonable equilibrium, satisfactory to all partners involved in this sector, it may not be possible to establish any reliable projection for the future. The data have, therefore, been presented without taking into account this evolution. The reported production capacities assume 100 per cent utilization. Since several of the sources consulted differ from each other, certain discrepancies in the statistics could not be avoided. These discrepancies, however, do not affect the size of the problem.

Table 3. Cultivated land area and main crops in Latin American countries, 1974

Country	Cultivated area as percentage of total area	Cereals (thousand tons)	Wheat (thousand tons)	Maize (thousand tons)	Paddy rice (thousand tons)	Cocoa (tons)	Coffee (tons)	Sugar-cane (thousand tons)	Tobacco (tons)	Potatoes (thousand tons)
Central America										
Belize	-	20F		16	4F			745F		
Costa Rica	61.5	178		55	107F	7 000	85 500	2 300F	2 600F	-
Cuba	...	540		125	400	1 300	27 000	60 000 F	4 650F	15F
Dominican Republic	53.2	270		35	215	35 000	49 000	5 481	37 500	75F
El Salvador	72.9	520		359	30	300	139 000	2 450	1 900	
Guatemala	31.3	723	36	613	32	800	138 000	3 950	5 530	
Haiti	...	669		250	200	3 500	33 000	3 580	2 500	2F
Honduras	...	319	1	260	19	300	44 040	1 300	4 300	
Jamaica	55.5	12		12	-	2 200	1 200	3 920	1 300	1F
Mexico	73.3	14 047	2 764	7 784	420	27 000	210 000	37 174	71 400	65F
Netherlands Antilles	...	6F								
Nicaragua	29.4	335		193	82	630	41 600	2 054	2 415	
Panama	...	231		60	171	500	4 800	1 433	1 013	
Puerto Rico	58.9	3			2		12 000	3 552	3 039	
Trinidad and Tobago	42.2	16		4	12	4 000	1 814	1 531	287	3F
South America										
Argentina	51.3	23 160	5 600	9 900	316			17 600	57 600	250
Bolivia	...	508	63	277	75	1 500	13 900	2 050	2 100	10
Brazil	34.4	26 404	2 750	16 065	6 817	196 000	1 620 000	95 000	234 564	475
Chile	40.5	1 706	950	367	40				4 770	
Colombia	24.0	2 676	86	775	1 449	23 000	522 000	18 315	48 960	1
Ecuador	...	614	57	255	241	60 000	61 500	8 800	1 710	11F
Guyana	...	229		3F	226	30	600	4 150	180F	
Paraguay	43.0	332	36	250	40		6 000	1 300	26 000	16F
Peru	13.8	1 139	117	472	361	2 000	42 609	9 215	5 200	
Surinam	0.6	150			150	100	400	190		
Uruguay	93.1	1 152	526	225	150			268	470	2
Venezuela	28.5	836	1	500	293	21 000	6 000	5 748	14 434	17

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 41-189.

Table 4. Consumption and production of fertilizer nutrients in Central America, for selected years, 1960-1980
(Tons)

Nutrient		Actual			Estimated	
		1960/61	1965/66	1970/71	1975/76	1980/81
N	Consumption	183 636	490 671	797 202	1 070 000	1 320 000
	Production	48 376	201 087	521 911	1 020 000	1 700 000
	Deficit	135 260	289 504	275 291	50 000	-
	Surplus	-	-	-	-	380 000
P_2O_5	Consumption	51 853	189 711	263 045	300 000	310 000
	Production	19 974	91 126	183 401	360 000	502 000
	Deficit	31 879	98 585	79 644	-	-
	Surplus	-	-	-	60 000	192 000
K_2O	Consumption	28 144	117 200	227 394	360 000	520 000
	Production	-	-	-	-	-
	Deficit	28 144	117 200	227 394	360 000	520 000
	Surplus	-	-	-	-	-

Table 5. Consumption and production of fertilizer nutrients in South America, for selected years, 1960-1980
(Tons)

Nutrient		Actual			Estimated	
		1960/61	1965/66	1970/71	1975/76	1980/81
N	Consumption	199 815	281 661	562 647	1 070 000	1 620 000
	Production	213 743	312 045	270 640	780 000	1 500 000
	Deficit	-	-	292 007	290 000	120 000
	Surplus	13 928	30 384	-	-	-
P_2O_5	Consumption	166 827	284 357	677 306	1 260 000	1 850 000
	Production	110 652	111 340	208 695	315 000	680 000
	Deficit	56 175	173 017	468 611	945 000	1 170 000
	Surplus	-	-	-	-	-
K_2O	Consumption	147 014	187 108	432 559	830 000	1 300 000
	Production	14 088	23 358	21 900	30 000	30 000
	Deficit	132 926	163 750	410 659	800 000	1 270 000
	Surplus	-	-	-	-	-

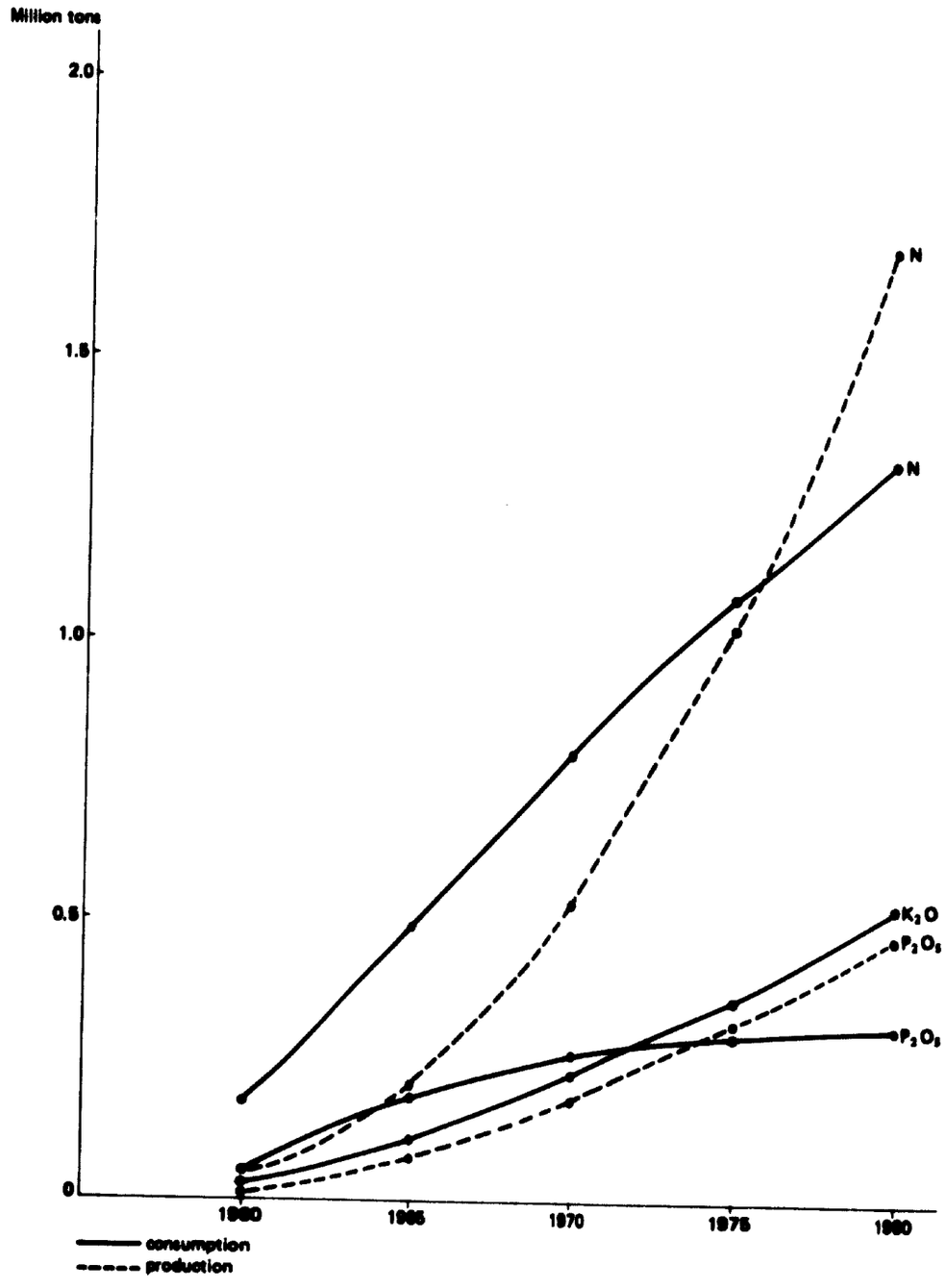


Figure I. Consumption and production of fertiliser nutrients in North and Central America, 1960-1980

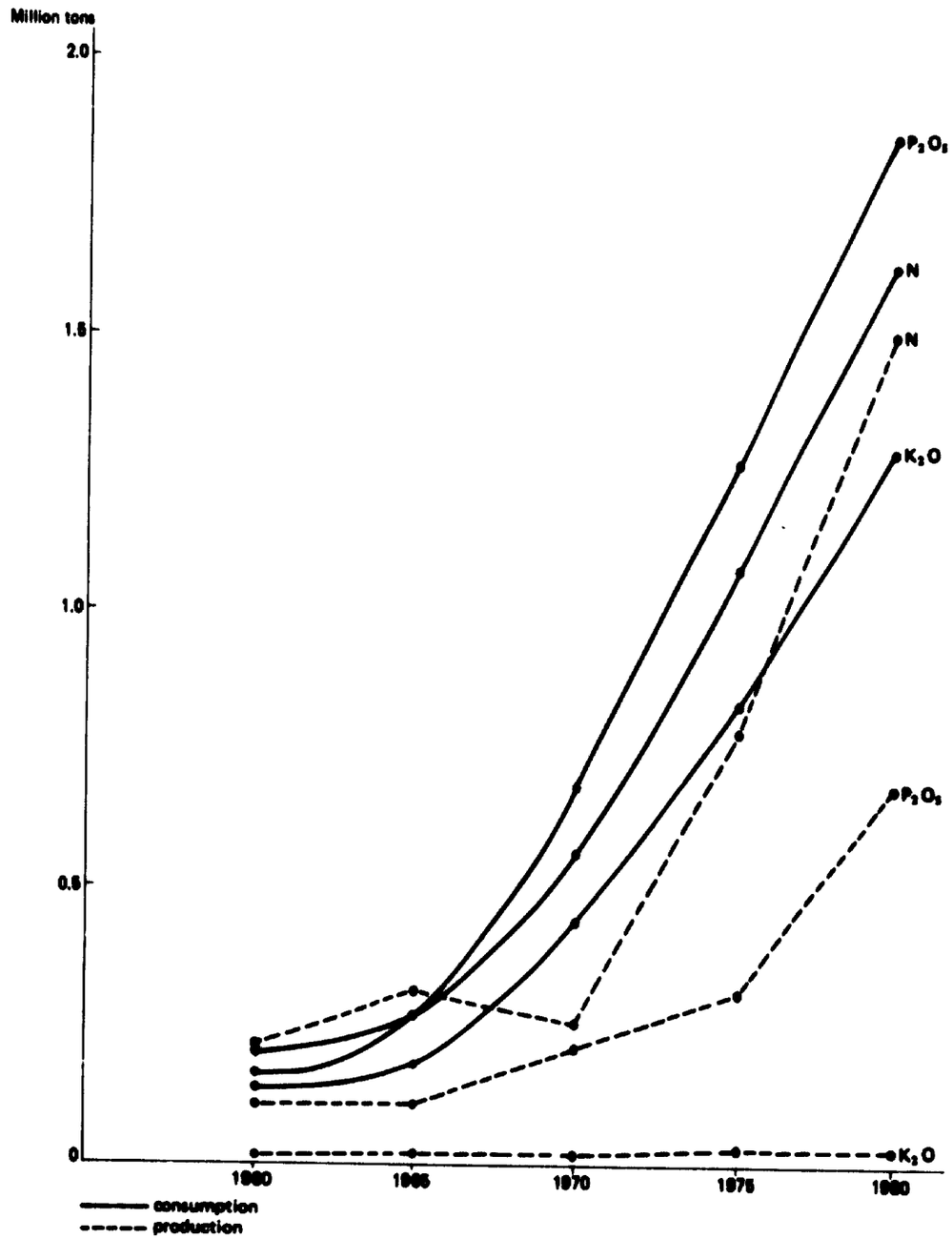


Figure II. Consumption and production of fertiliser nutrients in South America, 1960-1980

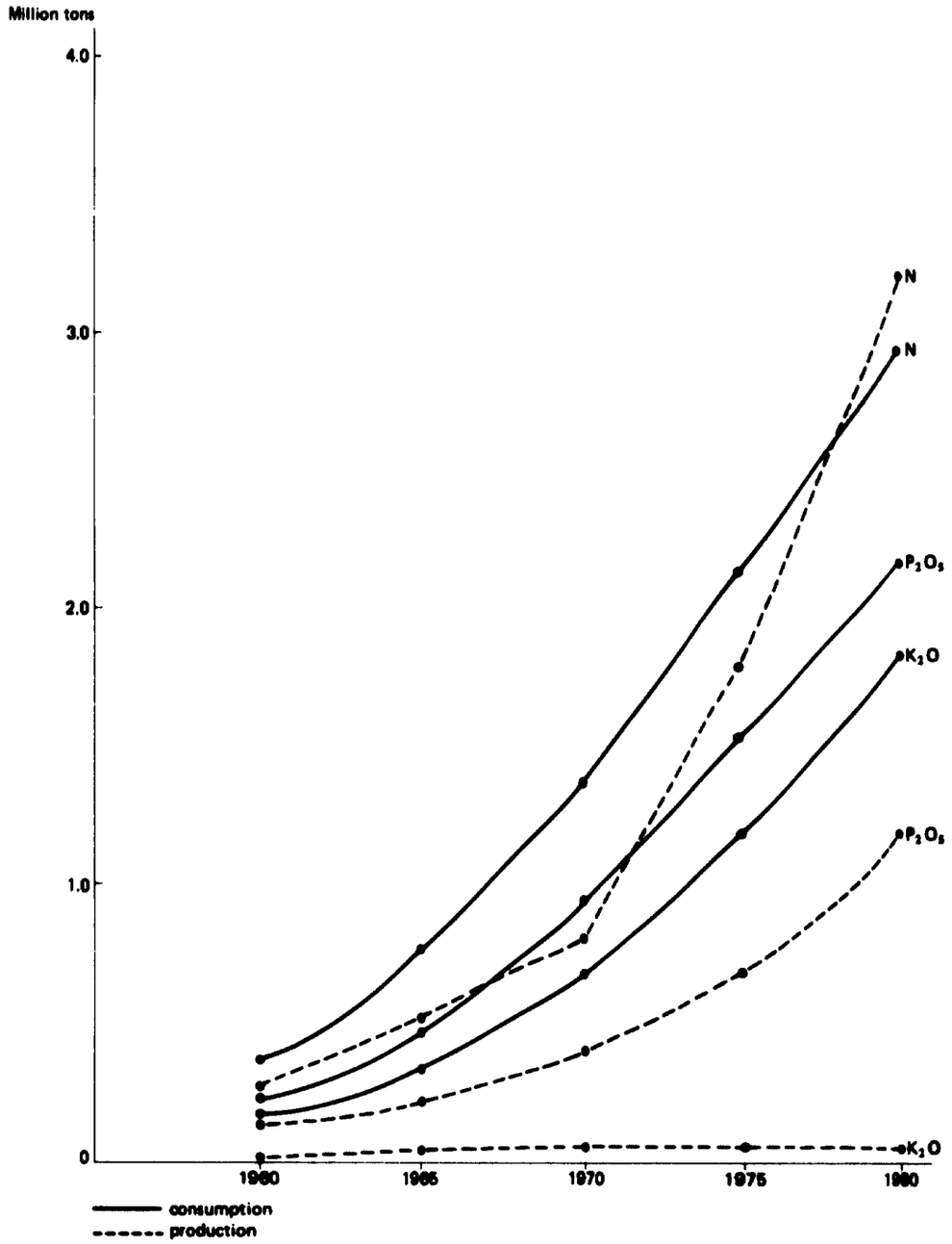


Figure III. Consumption and production of fertiliser nutrients in Latin America as a whole, 1960-1980

Table 6. Consumption and production of fertilizer nutrients in Latin America as a whole, for selected years, 1960-1980
(Tons)

Nutrient		Actual			Estimated	
		1960/61	1965/66	1970/71	1975/76	1980/81
N	Consumption	383 451	772 332	1 359 849	2 140 000	2 940 000
	Production	262 119	513 132	791 951	1 800 000	3 200 000
	Deficit	120 332	259 200	567 898	340 000	-
	Surplus	-	-	-	-	260 000
P_2O_5	Consumption	218 860	474 068	940 351	1 560 000	2 160 000
	Production	130 626	202 466	392 096	675 000	1 182 000
	Deficit	88 234	271 602	548 255	885 000	978 000
	Surplus	-	-	-	-	-
K_2O	Consumption	175 158	304 308	659 953	1 190 000	1 820 000
	Produotion	14 088	23 358	21 900	30 000	30 000
	Deficit	161 070	280 950	638 053	1 160 000	1 790 000
	Surplus	-	-	-	-	-

Considering the Latin American region as a whole, it appears that, according to the data shown in tables 4, 5 and 6, by 1980/81 only nitrogen production will meet the demand and that an excess of 260,000 tons may then be available for export. The production of P_2O_5 and of K_2O will each show a deficit of about one million tons. Owing to the higher prices of fertilizers, farmers will become more reluctant than ever to use them; but if these prices are brought into a sound relation to the profits expected, this reluctance may gradually vanish.

Nitrogen fertilizers

Out of about 1.4 million tons nitrogen consumed annually in Latin America, 59 per cent is used in the northern and 41 per cent in the southern area. Since production is 42 per cent lower than consumption, more ammonia plants need to be built, especially in South America, where the deficit is higher and where enough natural gas as feedstock is available. It may be recalled that fuel reserves exist not only in Mexico, but also in South America in quantities that outstrip the need of agriculture of the region for nitrogen so that exports may even be envisaged. Nevertheless, up to 1973, only Chile and Trinidad and Tobago exported nitrogen in modest quantities and, therefore, imports from outside Latin America were necessary.

The consumption pattern shows that more nitrogen is consumed than the other prime nutrients. The average ratio during 1970/71 of $N:P_2O_5:K_2O$ was 1:0.7:0.5.

Phosphate fertilizers

The production capacity in the phosphate industry in Latin America as a whole in 1970/71 covered about 42 per cent of the consumption. The only exporter was Mexico, which exported 64,000 tons P_2O_5 in 1973. All other Latin American countries imported P_2O_5.

Tns known phosphate rock reserves in Latin America are as follows:

Mexico - 46 million tons oontaining an average of 18% P_2O_5

Brazil - 120 million tons containing an average of 25% P_2O_5

Colombia - 15 million tons containing an average of 24-28% P_2O_5; probable reserves, 100 million tons

Peru - 514 million tons containing an average of 30.5% P_2O_5

Venezuela - a production of 25,000 tons phosphate rock in 1973 (size of the probable reserve is not known)

In addition to the manufactured phosphate fertilizers, 95,751 tons of P_2O_5 in the form of ground rock phosphate were used directly as fertilizer in 1971/72 (table 7).

Tabls 7. Ground-rock phosphate used for direct application in Latin Amerioan countries, 1971/72 (Tons of P_2O_5)

Country	Consumption
Brazil	61 651
Chile	5 000
Colombia	3 000
Guyana	1 500
Trinidad and Tobago	100
Uruguay	24 500
Other Latin American countries	-
Total	95 751

Potash fertilizers

Potash deposits havs bsen found in Brazil, Chile and Peru. In Brazil, a potassium magnesium sulphate estimated at 40 million tons has been discovered, and exploitation was to be startsd in 1975 with a plannsd production of 500,000 t/a. In Chile, potassium sodium nitrats is mined at a rats of 154,000 t/a, and in Peru a deposit estimated at 6.4 million tons containing 60-62 per cent K_2O is supposed to be exploited at a rate of 200,000 t/a.

Sulphur

Sulphur is not considered a primary nutrient, but it is usad for ths manufacture of sulphuric acid nssdsd for the digestion of phosphate rock, eithsr to maks the P_2O_5 containsd in ths phosphate rock soluble or to produce phosphoric acid. Sulphur is obtained either from voloanic deposits or from natural gas. Sulphur may also bs obtained from pyrites, from whioh it is recovered by roasting, while the ash is used in producing iron and steel.

Elemental sulphur deposits have been found in Costa Rica, Mexico and in the Andes (Argentina and Chile). The extraction of elemental sulphur is sometimes more costly than the sulphur obtainsd from natural gas or from refineries, as in Venezusla.

The consumption of sulphur will depend on the composition of the phosphate rock used in manufacturing fertilizers.

The availability of known fertilizer feedstocks in Latin America is shown in table 8.

Future trends

The only Latin American countries that export nitrogen fertilizers are Chile, Trinidad and Tobago and Venezuela. In Trinidad, a subsidiary of a United States company is producing ammonia, urea and ammonium sulphate from natural gas. Since the plant does not work at full capacity and the feedstock is available, the nitrogen production could easily be augmented. Chile has no industrial ammonia production, but reserves of mineral nitrates and guano are large enough to permit exports. Since feedstocks for ammonia production are also available, local manufacture of nitrogen fertilizers is envisaged from domestic or imported feedstocks.

As for phosphate feedstocks, Latin America has a deficit and will need further imports of phosphate rock or phosphoric acid. The same is true for potassium, unless additional deposits are found.

The need for fertilizers is increasing to satisfy the growing need for food. However, the inflationary prices in the fertilizer market have caused insecurity among the farmers, which is bound to disappear once a new equilibrium between costs and income in agriculture has been reached.

Factors limiting the extension of fertilizer use in Latin America

The factors limiting the extension of the use of fertilizers can be summarized as follows:

(a) In most Latin American countries, agriculture is practised on large surfaces of fertile soil, and many farmers prefer the system of rotation of crops, which, owing to the abundant good soil, gives them satisfactory results;

(b) Fertilizing large surfaces needs high investments;

(c) Adequate training and promotion is lacking;

(d) Farmers are unable to obtain adequate credit;

(e) Foreign exchange to import fertilizers is lacking;

(f) Latin American currencies fluctuate;

(g) Sometimes irrigation is inadequate;

(h) Inland transportation often presents difficulties;

(i) Political instability may make investors reluctant to invest capital in new fertilizer industries.

To promote the use of fertilizers, concerted action by Governments and industry will be necessary. This action should include promoting fertilizer industries and developing an effective pricing and distribution system for fertilizers and farm crops and a system of credits for farmers to enable them to purchase fertilizers and to store and market their crops.

Table 8. Availability of fertilizer feedstocks in Latin America

Country	Natural gas				Coal and lignite				Crude oil				
	Year	Total proved and probable reserves (billion ft^3)	Year	Annual production (million ft^3)	Year	Total proved and probable reserves (million tons)	Year	Annual production (thousand tons)	Year	Total proved and probable reserves (million tons)	Year	Annual production (thousand tons)	Capacity of refineries (bbl/d)
Central America													
Belize	...	...	...	...	...	...	...	...	...	...	...	...	...
Costa Rica	...	...	...	...	...	...	...	...	...	...	...	...	8 000
Cuba	...	...	...	...	...	...	...	...	1972	1.5	1971	100	113 800
Dominican Rep.	...	...	...	...	...	...	...	...	...	...	...	...	30 000
El Salvador	...	...	...	...	...	...	...	...	...	...	...	...	13 200
Guatemala	...	...	...	...	...	...	...	...	...	...	...	...	21 000
Haiti	...	...	...	...	...	5	...	-	...	...	...	...	-
Honduras	...	...	...	...	...	...	...	...	...	...	...	...	10 300
Jamaica	...	...	...	...	...	...	...	...	...	...	...	...	...
Mexico	1972	325 000[a]	1971	18 714[a]	1972	182	...	...	1972	770	1971	24 600	...
Netherlands Antilles	...	...	...	...	...	...	...	...	...	...	...	...	700 000
Nicaragua	...	...	...	...	...	...	...	...	...	...	...	...	12 000
Panama	...	...	...	...	...	...	...	...	...	...	...	...	75 000
Puerto Rico	...	...	...	...	...	...	...	...	...	...	...	...	221 000
Trinidad and Tobago	1972	5 000	1972	1 618[a]	...	...	...	...	1972	215	1972	7 248	430 000
South America													
Argentina	1972	7 600	1972	6 180[a]	...	...	1972	676	1972	349	1972	22 128	515 000
Bolivia	1972	142	1971	100 900	...	...	...	...	1972	27	1971	1 600	11 600
Brazil	1972	9 000	1972	43 000[a]	...	...	...	...	1972	137	1971	8 380	?
Chile	1972	2 200	1972	4 080[a]	...	...	...	...	1972	15	1972	1 608	80 000
Colombia	1972	2 500	1973	115 000	...	...	...	...	1972	236	1973	9 162	244 350
Ecuador	1972	6 000	1971	3 200	...	...	...	...	1972	758	1972	37 152	36 300
Guyana	...	...	...	...	...	...	...	...	...	...	...	...	...
Paraguay	...	...	...	...	...	...	...	...	...	...	...	...	5 000
Peru	1972	2 500	1971	600	...	...	1971	92.4	1972	53	1971	3.19	105 600
Surinam	...	...	...	...	...	...	...	...	...	...	...	...	...
Uruguay	...	...	...	...	...	...	...	...	...	...	...	...	45 000
Venezuela	1972	25 400	1971	52 030[a]	...	152	1971	41	1972	1 984	1973	165 000	1 565 400

Table 8. (continued)

Country	Phosphate rock			Potash			Elemental sulphur		
	Total proved and probable reserves (million tons)	Average grade (% P_2O_5)	Annual production (thousand tons)	Total proved and probable reserves (million tons)	Average grade or composition	Annual production (thousand tons)	Total proved and probable reserves (million tons)	Grade (% S)	Annual production (thousand tons)
Central America									
Belize	...	...	...	...	...	...	...	...	...
Costa Rica	...	...	...	...	...	...	200	...	...
Cuba	...	...	...	...	...	...	...	...	...
Dominican Republic	...	...	...	...	...	...	...	...	...
El Salvador	...	...	...	...	...	...	...	...	...
Guatemala	...	...	...	...	...	...	...	...	...
Haiti	...	...	...	...	...	...	...	...	...
Honduras	...	...	...	...	...	...	...	...	...
Jamaica	...	...	...	...	...	...	...	...	...
Mexico	46	18	...	...	...	...	84.6	...	...
Netherlands Antilles	...	...	143 (1970)	...	...	...	...	...	...
Nicaragua	...	...	...	...	...	...	...	...	...
Panama	...	...	...	...	...	...	...	...	...
Puerto Rico	...	...	...	...	...	...	...	...	...
Trinidad and Tobago	...	...	...	...	...	...	...	...	...
South America									
Argentina	...	...	...	...	...	...	...	...	242.4 (1972)
Bolivia	...	...	...	...	...	...	...	...	...
Brazil	120	25	233 (1973)	40	...	...	...	...	...
Chile	...	...	15 (1970)[b]	...	...	154 (1970)[d]	...	...	42 (1967)
Colombia	100	24-28[c]	10 (1973)	...	...	...	...	...	...
Ecuador	...	...	...	...	...	...	...	...	...
Guyana	...	...	...	...	...	...	...	...	...
Paraguay	...	...	...	...	...	...	...	...	...
Peru	2 762 (9.1% P_2O_5) 514 (30.5% P_2O_5)	...	...	6.41	60-62% K_2O	200[e]	...	...	...
Surinam	...	...	...	...	...	...	...	...	...
Uruguay	...	...	...	...	...	...	...	...	...
Venezuela	...	...	25 (1973)	...	...	...	...	...	...[f]

a/ Million m^3.

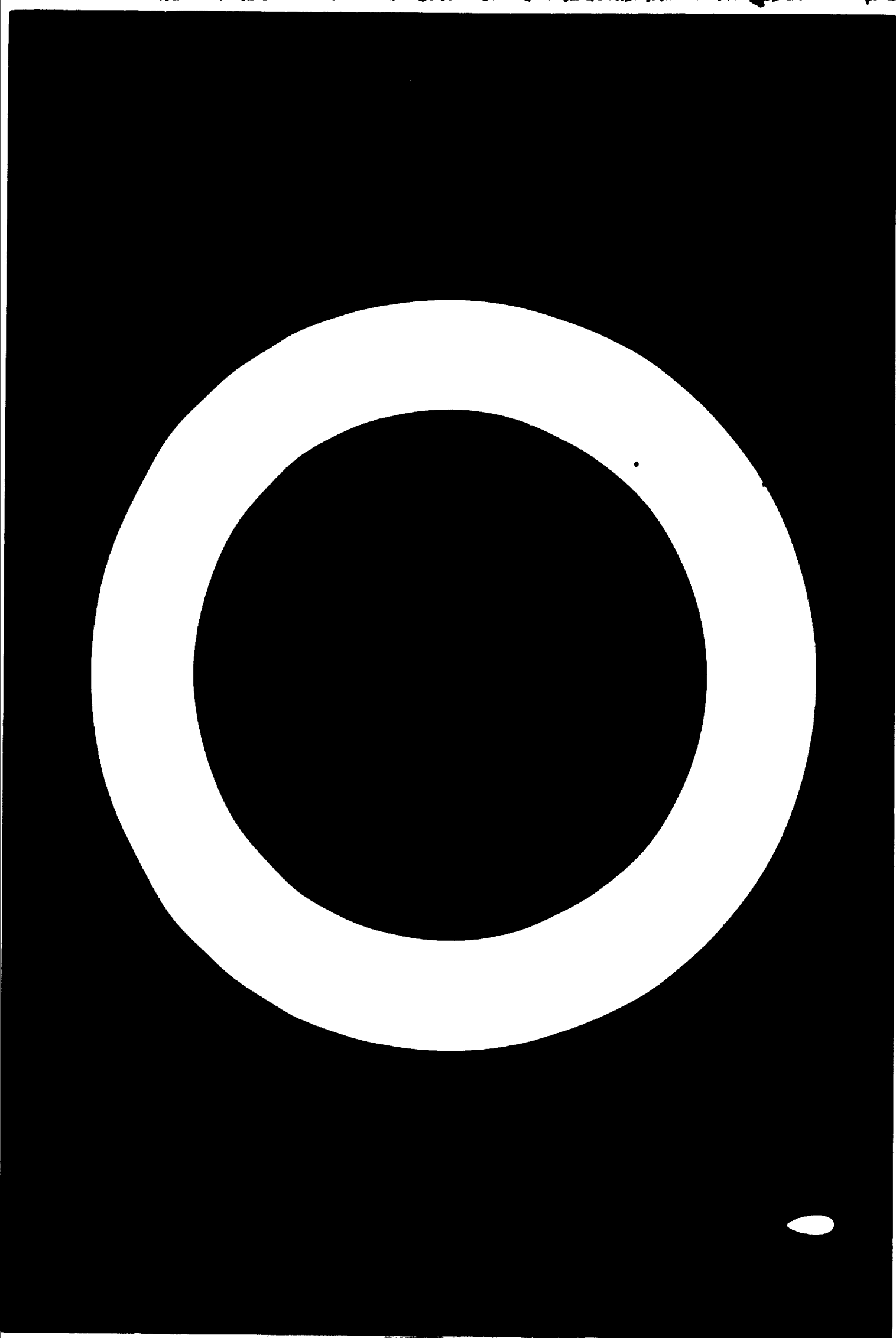
b/ Guano.

c/ Source: "La situación de la industria de fertilizantes en la subregión Andina y sus perspectivas hasta 1980-1985" (E/CN.12/938), p. 42.

d/ Sodium potassium nitrate.

e/ Estimate for 1975.

f/ Recovered sulphur from refineries.



COUNTRY DATA

CENTRAL AND SOUTH AMERICA

CENTRAL AMERICA

BELIZE

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	140	2 000*	1 500*		
	Production	-	-	-		
	Deficit					
	Surplus					
P_2O_5	Consumption	199	668	1 300*		
	Production	-	-	-		
	Deficit					
	Surplus					
K_2O	Consumption	7	93	500*		
	Production	-	-	-		
	Deficit					
	Surplus					

Sources:
1960/61: FAO, Fertilizers: An Annual Review of Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 149 and 150;
1965/66: FAO, Fertilizers: An Annual Review of Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151;
1970/71: FAO, Production Yearbook, 1972 (Rome, 1973), p. 233.

General

Belize (or British Honduras) is a fully self-governing territory of the United Kingdom of Great Britain and Northern Ireland, on the east coast of Central America. It is bounded on the east by the Caribbean Sea, on the north by Mexico and on the south and west by Guatemala. Following large-scale destruction of the original capital, Belize City, in 1961 by a hurricane, the new capital city, Belmopan, was constructed 80 km inland. The total area of Belize is 22,960 km^2.

The population is small; in 1972, it was 126,000, with an average annual growth rate of 2.9 per cent.

In the north, the land is flat and low. A further narrow strip of lowland extends along the coast to the south. In the south lie the Maya Mountains, whose highest point is 1,200 m above sea level. Much of the country is covered by thick tropical forest.

The climate is hot and humid during most of the year, with considerable local variation in temperature, rainfall and humidity. The hurricane season is from August to November.

Mean annual temperature in Belize City is 26°C. Temperatures south of the city on the coast average slightly higher (29°C in Punta Gorda), but in the west the temperature range is 8°-40°C. Average humidity is greatest on the coastal plain south of Belize City (83-90 per cent), while in the west and north it is 75 per cent.

Mean annual rainfall risss from 50-130 cm in the north and west to 460 cm in the mountains in the south; in Belize City rainfall ranges from 147-223 cm. The dry season in the northern half of the country extends from February to mid-May, but is shorter farther south.

The climate, together with a varisty of excellent soils, makes possible ths production of a wide range of agricultural products.

Forest products were formerly the mainstay of the economy, but ovsr-sxploitation has considerably reduced their contribution to the national economy. By 1972, forsstry accounted for only 5.3 per csnt of the total value of exports.

The major export earners are now sugar, citrus fruits and fish products. In 1972, sugar accounted for 53 per cent of total exports; citrus fruits, the sscond most important export earnsr, accounted for 13.5 per cent. Rice and bsef production is promising. The economy is vulnerable to extsrnal influences, owing to its dspendencs on exports of sugar and citrus products.

In 1971, GNP amounted to $80 million; *per capita* income was $640. During the period 1965-1971, *per capita* GNP grew at an average annual rate of 1.9 per cent.

In 1971, agriculture accounted for 20.9 per cent of GDP; mining and quarrying, 0.2 per cent; and manufacturing, 11.6 per cent.

Belize is recsiving a large amount of forsign aid, both for capital projscts and technical assistance.

The National Dsvelopment Plan (1973-1976) has the following objectives:

(a) Expansion of farm and industrial output for export and for import substitution;

(b) Diversification of industry and agriculture with a view to diminishing the dependenos of the eoonomy on sugar and citrus production and processing;

(c) Expansion of the tourist sector.

Belize is a member of the Caribbean Development Bank.

Agriculture

The distribution of land according to use in 1968 was as follows (thousand hectares):

Total area	2 296
Arable land	26
Land under permanent crops	21
Permanent meadows and pastures	17
Forest and woodlands	1 048
Othsr land	1 184

Sources: FAO, *Produotion Ysarbook, 1974*, vol. 28-1 (Rome, 1975), p. 4.

Although the potential for agricultural developmsnt is considerable, littls land is ourrently under cultivation because of inadequate communications, lack of trained manpower and research facilities, and insufficient credit to farmers.. Howevsr, efforts are being made to oombat these problsms, including crop research carried out by the Department of Agriculture, assistance to planters by a Marketing Board, advice to farmers by trained personnsl, and the provision of the servicss of a qualified veterinary officer to livsstock ownsrs.

At present, about 75 per cent of the agricultural labour force is engaged in subsistence farming, and the remainder in production of sugar and citrus fruits.

Production figures for 1974 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Rice, paddy	2F	1 750	4F
Sugar-cane	13F	57 308	745F
Citrus fruits	...	...	...
Coconut	...	...	17F
Grapefruit	...	...	14F
Cereals, total	12F	166.9	20F
Bananas	1F	5 600	3F
Tobacco leaves	0.1F	...	...

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 41, 46, 126, 157, 166, 170 and 181.

Natural resources and industry

Licences have been granted to explore for oil in the entire north and south on-shore areas. Oil prospecting is also being conducted in the north and south off-shore areas. A recent geological survey showed no commercially exploitable solid mineral resources.

Belize's energy needs are supplied by diesel generating stations. The Belize Electricity Board's 5.4-MW capacity in Belize City more than doubled in 1971 with the completion of a new generating station. The country's reserves of water power have not yet been utilized.

Industrial activity, excluding the processing of sugar and citrus fruits, is on a very small scale. Most of the industries, with the exception of an export-oriented clothing factory, are concerned with substitution of imports on the local market. The tourist industry is still at an early stage of development.

Fertiliser production

Only a blending plant using imported ingredients has been operating since 1972. It meets over 50 per cent of the country's needs.

Fertiliser consumption

In 1973/74, fertiliser consumption was as follows (tons): N, 647; P_2O_5, 1,580; and K_2O, 382.[1/]

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

Imports of fertilizers in 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	395	727	647
P_2O_5	460	687	1 580
K_2O	381	19	382

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 113, 145 and 169.

In 1973/74, fertilizer use on arable and agricultural land was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	13.8	10.1
P_2O_5	33.6	24.7
K_2O	8.1	6.0
Total	55.5	40.8

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 48.

Per capita fertilizer consumption in 1973/74 was 18.8 kg of nutrients.2/

2/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 48.

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COSTA RICA

Consumption and production of fertilisers
(Tons)

Nutrient		Actual			Estimated	
		1960/61	1965/66	1970/71	1975/76	1980/81
N	Consumption	8 098	15 500	31 600 1/ 37 365 2/	51 000	70 000
	Production	...	...	12 047 2/	...	...
	Deficit	...	...	19 553 1/ 25 318 2/	...	...
	Surplus	...	...	-	...	...
P_2O_5	Consumption	5 098	5 000	12 100 1/ 6 000 2/	22 000	...
	Production	...	...	...	...	...
	Deficit	...	...	...	...	...
	Surplus	...	...	...	...	...
K_2O	Consumption	4 621	7 000	11 300 1/ 6 000*2/	18 000	...
	Production	-	-		...	...
	Deficit	4 621	7 000	11 300 1/ 6 000*2/	18 000	...
	Surplus	-	-	-	...	...

Sources:
1960/61 and
1975/76: UNIDO, "Report and proceedings", paper prepared for the Meeting on the Development of Fertiliser and Pesticide Industries in Latin America (in collaboration with ECLA and the Government of Brasil), Rio de Janeiro, Brasil, 15-19 September 1970 (ID/WG.80/9), p. 171;

1965/66: Ministry of Agriculture and Livestock, National Council for Agriculture and Livestock, San José, September 1974;

1970/71: 1/ UNIDO, "Report and proceedings", paper prepared for the meeting on the Development of Fertiliser and Pesticide Industries in Latin America (in collaboration with ECLA and the Government of Brasil), Rio de Janeiro, Brasil, 15-19 September 1970 (ID/WG.80/9), p. 171;

2/ FAO, Production Yearbook 1973 (Rome, 1974), pp. 257 and 259;

1980/81: Estimates of Raymond Ewell, UNIDO consultant.

General

Located in Central America, Costa Rica borders on Nicaragua to the north, the Caribbean Sea to the east, Panama to the south-west, and the Pacific Ocean to the west. The country falls naturally into three regions - the Atlantic coastal plain, the central mountain range, and the Pacific slope. It is the second smallest of the Central American republics, with an area of 50,700 km^2.

Three climatic zones exist: the damp, tropical area along the Atlantic; the central plateau with its mild climate; and the Pacific coast with its well-defined wet and dry seasons.

In San José (altitude, 1,160 m) the dry season laste from December to May and the wet season from June to the end of November. The average annual rainfall amounts to 2,000 mm; average temperature is 21°C and relative humidity 82 per cent. Temperatures in the Central Plateau are fairly uniform throughout the year, with a range of 12°-28°C. In the coastal plains, the temperature range is 21°-33°C; temperaturee are partially moderated by sea winds. The north of the Pacific coastal area is dry with an average rainfall of 1,477 mm, while the south is wet with over 3,000 mm. The Caribbean coast enjoys a tropical climate with rainfall averaging 3,350 mm.

Population in 1972 totalled 1.9 million, with an average annual growth rate of 2.9 per cent. Population pressure is heavieet in the Central Plateau area, where San José, the capital, is situated. Some 44.6 per cent of the working population was engaged in agriculture in 1970.

Costa Rica ie a predominantly agricultural and livestook-producing country, although the importance of the manufacturing industries and the tourist industry is increasing.

In 1971, GNP amounted to $1 billion; per capita GNP was $590. The latter increaeed between 1965 and 1971 at an average annual rate of 4.5 per cent.

In 1972, agriculture alone accounted for 22 per cent of GDP; mining, quarrying and manufacturing industries together accounted for 20 per cent.

Costa Rica hae been a member of the Central American Common Market eince 1963.

The National Economic and Social Development Plan elaborated by the Ministry of Planning for the period 1972-1975 had the following aime: promotion of new industriee and a search for new markets for the country's traditional produots; and development of the renewable and non-renewable reeources through programmes of agrioultural diversification.

Agriculture

The distribution of land in 1973 according to use was as follows (thouaand heotaree):

Total area	5 070
Arable land	283.3
Land under permanent crops	207.2
Permanent meadows and pastures	1 558.1
Forests and woodlands	716.5
Other land	2 304.9

Source: Ministry of Agriculture and Livestook, San José, September 1974.

In 1973, some 66,360 ha were irrigated.[1/] Various areas in Costa Rica appear suitable for large-scale irrigation schemes, especially in the north of the Pacific coastal area, in the Arenal region and the Tempisque Valley.

Coffee, the principal export crop, accounte for about 30 per cent of foreign exchange earnings. The second most important export crop is bananas. Cocoa ie also a major export.

1/ Data supplied by the Ministry of Agriculture and Livestock, San José, September 1974.

Maize, sugar, tobacco, rice and potatoes are also widely grown. Rice, corn and beans are the most important items in the national diet and are grown throughout the country. When harvests are good, small quantities are exported.

The dependence of the economy on coffee, banana, and sugar production underlines the need for agricultural diversification.

Medium- and large-scale operators are adopting modern farming methods, with increasing use of fertilizers.

Production figures for 1972 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Coffee	83.4	835	69.70
Cocoa beans	20.3	223	4.5
Maize	51.9	1 010	52.4
Sugar-cane	38.8	57 945	2 246.1
Tobacco	1.5	1 066	1.6
Rice, paddy	65.5	1 589 a/	104.0
Potatoes	2.0	10 308	20.6
Bananas	36.2	33 138	1 198.1

Source: Ministry of Agriculture and Livestock, San José, September 1974.

a/ The yield was particularly low because of drought.

The beef-cattle industry has gained importance as a source of foreign exchange, providing 10 per cent of Costa Rica's export earnings, and is now one of the fastest growing agricultural sectors. The major dairy farms are to be found in the highlands of the Central Plateau, where climatic conditions are excellent for raising both beef and dairy cattle.

Natural resources and industry

Minerals found in the country include gold, silver, copper, diatomite, laterite, lead, lime, limestone, manganese calcium carbonate, magnetite, bauxite and zinc. Exploration of Costa Rica's mineral resources is continuing.

There are no known reserves of coal. Oil companies from the United States of America have been exploring for petroleum since 1965, but none has yet been found in commercial quantities.

Sulphur was recently discovered; estimated reserves total 200 million tons. Costa Rica has no significant deposits of phosphates or potash.

Timber resources are still plentiful. However, forest conservation is becoming urgent because of the practice of clearing land through burning, which depletes forests and leads to soil erosion.

Since the country has no fossil fuel, the hydroelectric power resources assume importance. Electrical power generation in 1965, largely from hydroelectric stations in the interior, was 529.9 million kWh.

Industrial development is still at a relatively low level and is mainly associated with food processing. In addition, the nitrogen fertilizer plant described in the next section, a cement plant and an oil refinery, the Refinadora Costarrincense de Petróleo SA, are in operation. The refinery, located at Moin in the District of Limón, has a capacity of 8,000 bbl/d and uses imported crude. It was built by the Government, together with local interests and the Allied Chemical Co.

Fertilizer production

In 1963, Fertilizantes de Centro America SA (FERTICA) started up a nitrogen fertilizer plant at Puntarenas, which marked the beginnings of heavy industry in Costa Rica. In 1967, production was as follows (thousand tons): nitric acid, 41; AN, 25; and nitrophosphates, 60.[2/] This plant exports AN to other Central American countries. It uses ammonia and rock phosphate and imported potash as feedstock.

The growth in production of nitrogen fertilizers can be seen from the following (tons of N): 1961-1965, 11,600; 1971/72, 17,391; and, 1973/74, 27,000*.[3/]

Fertilizer mixing plants exist in the country, which are based on locally mined diatomite. All other products used are imported. In 1973/74, about 16,000 tons of nitrogen fertilizers were exported.[4/]

Fertilizer consumption

In 1973/74, fertilizer consumption was as follows (tons): N, 31,400; P_2O_5, 8,300; and K_2O, 25,200.[5/]

Fertilizer use on arable and on agricultural land in 1973/74 was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	69.4	16.6
P_2O_5	20.4	4.9
K_2O	40.8	9.8
Total	130.6	31.3

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 48.

In the same year, 33.9 kg of nutrients per capita were consumed.[6/]

2/ UNIDO, "Report and proceedings", paper prepared for the Meeting on the Development of Fertilizer and Pesticide Industries in Latin America (in collaboration with ECLA and the Government of Brazil), Rio de Janeiro, Brazil, 15-19 September 1970 (ID/WG.80/9), p. 168.

3/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 251.

4/ FAO, Annual Fertilizer Review, 1974, (Rome, 1975), p. 106.

5/ Ministry of Agriculture and Livestook, Consejo Agropecuario Nacional (San José, September 1974).

6/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 48.

In 1972/73, some 166,433 ha were fertilized (35 per cent of this area under coffee, 17 per cent under bananas, 15 per cent under sugar-cane and 25 per cent pastures) with total consumption of 107,700 tons of chemical fertilizers (35 per cent for coffee, 34 per cent for bananas, 10 per cent for sugar-cane and 8 per cent for rice).

Imports of fertilizers in 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	26 000*	26 000*	23 000*
P_2O_5	33 923	17 800*	18 200*
K_2O	19 700	21 000*	28 300*

Source: FAO, Annual Fertiliser Review, 1974 (Rome, 1975), pp. 113, 145 and 169.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Capacity				Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
			Product	Thousand tons per annum	Nutrient	Thousand tons per annum		
Puntarenas	1963	Fertilizantes de Centro America SA (FERTICA)	AN	50	N	17.5	...	...
			Nitric acid	75				
			NP fertilizers	...	N	...		
			Mixed fertilizers	182	NPK	...		
Puntarenas	Not producing at present	J. H. Baker and Bro. Inc.	Mixed fertilizers	29.2	NPK	...	...	...
Linda and Puntarenas	...	Abonos Superior	Mixed fertilizers	43.8	NPK	...	...	...
San José	...	Abonos Agro	Mixed fertilizers	7.5	NPK	...	...	...

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CUBA

Consumption and production of fertilizers
(Tons)

Nutrient		Actual			Estimated	
		1960/61	1965/66	1970/71	1975/76	1980/81
N	Consumption	...	100 000*	158 800		
	Production	-	-	4 537		
	Deficit	...	100 000*	154 263		
	Surplus	...	-	-		
P_2O_5	Consumption	...	80 000*	92 100		
	Production	...	15 000*	...		
	Deficit	...	65 000*	...		
	Surplus	...	-	...		
K_2O	Consumption	...	60 000*	145 400		
	Production	-	-	-		
	Deficit	...	60 000*	145 400		
	Surplus	...	-	-		

Sources:
1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150;
1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151;
1970/71: FAO, Production Yearbook, 1972 (Rome, 1973), pp. 233 and 231.

General

Cuba is the largest island in the West Indies, with an area of 114,000 km^2, and lies on the northern boundary of the Caribbean Sea. It extends approximately 1,340 km from west to east and ranges from 40 to 225 km in width. While about three fifths of Cuba is flat or gently rolling with many wide and fertile valleys and plains, the remainder of the country is mountainous or hilly. Three main groups of mountains lie in the eastern, central and western sections of the island. The Sierra Maestra Range in the east contains peaks that rise to almost 2,000 m above sea level.

Abundant rainfall (averaging 137 cm per annum) and a frost-free climate give all-year-round vegetation. Although situated entirely in the tropics, Cuba lies also in the trade-wind belt, which renders its climate subtropical. Average temperature is about 24°C (21°C in winter and 27°C in summer). The dry season lasts from November through April, and the wet season from May through October.

Population in 1972 amounted to some 8.9 million, with an average annual growth of 1.9 per cent. Some 32.8 per cent of the working population was engaged in agriculture in 1970.

The soils in Cuba are among the most fertile in the world, and conditions are ideal for growing sugar-cane.

The economy is highly oriented towards agriculture. Overriding priority is given to agriculture, particularly to sugar production. The Government's Central Planning Board (JUCEPLAN) has declared that Cuba cannot, owing to its size, location and natural resources, become a fully industrialized country, and, accordingly, its present goal is to attain an agro-industrial economy. The result is that industrial growth is at present being less emphasized than agricultural development. Nevertheless, new plants are being built, in particular, for the production of import substitutes such as cement and fertilizers.

Cuba is a full member of the Council for Mutual Economic Assistance (CMEA). The Union of Soviet Socialist Republics is Cuba's principal trading partner.

Sugar accounts for 20-25 per cent of GNP. Non-sugar manufacturing, including primarily heavy industry (nickel processing, oil refining, cement and fertilizer production) but also food processing and light consumer and industrial production, accounts for 15 per cent. In 1971, GNP at market prices was $4,390 million; per capita GNP was $510. During the period 1965-1971, per capita GNP declined at an average annual rate of 1.6 per cent.

Lately, more emphasis has been placed on the development of food industries for local distribution, in particular, rice, meat and dairy produce. The fishing industry is becoming more important to the economy.

Agriculture

The distribution of land in 1972 according to use was follows (thousand hectares):

Total area	11 452
Arable land and land under permanent crops	3 590
Permanent meadows and pastures	2 439
Forest and woodlands	3 100
Other land	2 318

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

A major dam programme has been inaugurated to compensate for the absence of river systems. In 1972, 493,000 hectares were irrigated.[1/]

A massive fertilizer programme has been undertaken, initially based on imports but now increasingly on locally manufactured fertilizers.

The country is the world's largest producer and exporter of sugar, which accounts for 80 per cent of export earnings. Tobacco is the second most important export. Coffee has become an important crop. Intensive coffee planting is being undertaken in Havana Province. Cocoa is also produced. In 1968, a large-scale rice programme was launched, and results have been promising.

The Cuban economy is State-controlled, but about 30 per cent of the cultivable land is still worked by private farmers.

Diversification and expansion of agricultural production are planned. Sugar, however, will still remain the chief crop. At present, apart from sugar-cane, the chief agricultural crops are sweet potatoes, bananas, maize and cotton.

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Production figures for 1974 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Maize	130F	962	125*
Cottonseed	...	...	2.3F
Seed cotton	3F	1 094	4F
Cotton (lint)	...	...	1.2F
Sugar-cane	1 600F	37 500	60 000F
Sweet potatoes	63F	3 889	245F
Groundnuts in shell	15F	1 000	15F
Bananas	3F	25 067	75F
Coffee, green	50F	540	27*
Tobacco leaves	57.5F	809	46.5*
Cocoa beans	2.6F	500	1.3
Rice, paddy	195*	2 051	400*
Cereals, total	338	1 598	540

Source: FAO, Production Yearbook, 1974 (Rome, 1975), pp. 41, 46, 50, 65, 89, 117, 122, 157, 170, 176, 178, 182 and 189.

Natural resources and industry

Oil has been found in several areas, but production is insignificant. A search is being conducted for oil off the north coast of Cuba. In 1972, total estimated crude oil reserves were 10 million bbl (or 1.5 million tons); in 1971, the rate of production was 2,500 bbl/d (or 100,000 t/a).

The principal mining product is nickel. Most of Cuba's mineral wealth is located in the Province of Oriente, where reserves include nickel, chrome, manganese (estimated reserves, 7 million tons), iron ore (estimated reserves of laterite, 7 billion tons, and of magnetite, 110 million tons), copper and cobalt and a variety of other minerals that are not exploited commercially. Dolomite and gypsum are extracted and silica sand, sodium potash and calcium carbonate exploited.

There are four refineries, now operated by the Empresa Consolidada de Petróleo SA, a State-owned concern. The largest are the following:

Havana Refinery 1 (formerly owned by Cía. Petrolera Shell de Cuba), with a capacity of 27,000 bbl/d

Havana Refinery 2 (formerly owned by Esso Standard Oil Co.) with a capacity of 60,600 bbl/d

Santiago de Cuba Refinery (formerly owned by the Texas Co., West Indies, Ltd.), with a capacity of 23,500 bbl/d

Total refining capacity in Cuba is estimated at 113,800 bbl/d. Existing refinery capacity is to be expanded with Soviet aid, with an atmospheric distillation unit designed to add 18,000 bbl/d to present capacity.

In 1968, total installed electric capacity was 1,400 MW. Total electricity produced in 1969 was 4,700 million kWh. Cuba's dependence on thermally generated electricity is due to the absence of large rivers.

Industry is completsly State-controlled. It is basically divided into the sugar and the non-sugar sectors. The non-sugar sector includes fertilizers (fertilizer-mixing plants and production of N fertilizers); chemicals, including detergents; iron and steel; cement (five plants); nickel; oil refineries (based on orude oil imported formerly from Venezuela, but now from the USSR); paper; textiles and lsather goods. The traditional tobacco industry has grown steadily. A small shipbuilding industry exists. Both heavy and light industries have been recording increased output and produotivity recently. The Government has plans to intensify applied industrial research.

Fertilizer production

In 1973/74, fertilizer production was as follows (tons): N, 20,000*; and P_2O_5, 10,500*.[2/]

Fertilizer production is undergoing intensive modernization and expansion. Under an aid agreement with the USSR signed in 1962, a nitrogen fertilizer complex was installed at Nuevitas, with a capacity of 94,000 t/a of N. The fertilizer plants at Santa Lucia and Felton have also been constructed with financial aid from ths USSR. The Matanzas works has been modernized to produce mixed and granulated fertilizers (145,000 t/a).

Cuba's first nitric acid unit is located in a new plant at Cienfuegos and produces (at total capacity) 675 t/d of nitric acid. There are four main process plants - ammonia, AN, urea and nitric acid.

Cuba is expected to produce 1.5 million tons of fertilizers once current plants under construction are commissioned.

To meet agricultural requirements, the Government is rapidly expanding its fertilizer production capacity and is interested in developing new methods of fertilizer application, especially along with water used for irrigation. The use of liquid fertilizers would reduce manpower requirements in fertilizer application and improve the efficiency of supplying nutrients to agricultural crops.

Fertilizer consumption

In 1973/74, fertilizer consumption was as follows (tons): N, 130,400; P_2O_5, 50,300; and K_2O, 96,600.[3/]

Imports of fertilizers in 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	96 788	85 396	114 000*
P_2O_5	56 373	38 504	45 000*
K_2O	105 800	78 000	96 600

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 114, 145 and 169.

2/ FAO, Production Yearbook, 1974 (Rome, 1975), p. 251.

3/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

Fertilizer use in 1973/74 on arable and agrioultural land was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	36.3	21.6
P_2O_5	14.0	8.3
K_2O	26.9	16.0
Total	77.1	46.0

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 48.

In 1973/74 per capita consumption was 31.3 kg of nutrients.4/

Cuban requiremente for N are very high because it is needed for growing sugar-cane. Fertilizers are used to a lesser degree also for growing rice, coffee and citrus fruits. AS is traditionally used rather than urea and is imported largely from the USSR.

The Cuban authorities are embarking on an ambitious programme of sugar-cane production and replanting that will involve the replanting of almost 16 per cent of the total area under cane every year. This programme should result in an increased demand for fertilizers, particularly straight N and complex fertilizers.

4/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 48.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Capacity			Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
			Product	Thousand tons per annum	Nutrient	Thousand tons per annum	
Matanzas	1957/58	Government	Ammonia	36	N	30	30	...
			AN	29	N	10		
			Ammonium phosphate	...	N	...		
Matanzas	1973/74	Government	Mixed and granulated fertilizers	145	NPK	...	...	...
Matanzas	...	Government	SSP	...	P	...	-	...
Cienfuegos	1973	Government	Ammonia	252	N	207	207	...
			Urea	216	N	99		
			Nitric acid	866				
			AN	338	N	118		
			TSP	...	P	...		
Nuevitas	1962	Government						
			AN	200	N	70	94	...
			Urea	35	N	16		
Nuevitas	1972/73	Government	Ammonia	115	N	94		
			AN	...	N	...		
			Urea	...	N	...		
			Complex fertilizers	...	NPK	...		
Santa Lucia	...	Government	fertilizers	320	...			
Felton	...	Government	fertilizers	350	...			

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DOMINICAN REPUBLIC

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	...	10 000*	15 676		
	Production	-	-	-		
	Deficit	...	10 000*	15 676		
	Surplus	...	-	-		
P_2O_5	Consumption	...	1 000*	9 341		
	Production	-	-	-		
	Deficit	...	1 000*	9 341		
	Surplus	...	-	-		
K_2O	Consumption	...	1 000*	12 864		
	Production	-	-	-		
	Deficit	...	1 000*	12 864		
	Surplus	...	-	-		

Sources:

1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150;

1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151;

1970/71: FAO, Production Yearbook, 1972 (Rome, 1973), p. 233.

General

The Dominican Republic is located in the centre of the West Indies. It is bounded by the Atlantic Ocean on the north, the Caribbean Sea on the south, the Canal de la Mona on the east, and the Canal de los Vientos on the west. It forms the eastern two thirds of the island of Hispaniola in the Caribbean Sea between Puerto Rico and Cuba, the western third being Haiti. It is 48,730 km^2 in area.

It is crossed east and west by four mountain ranges, separated by central valleys, the most important of which is the Cibao. The Cordillera Central, the principal range and watershed, cuts across the middle of the country. The highest mountain, Pico Duarte, is 3,800 m above sea level. Although the Republic is mountainous, it has an extremely fertile coastal plain.

The climate is generally tropical and humid, with high temperatures in the lowlands and more moderate temperatures in the mountains. The average temperature range is 19°-30°C in winter and 23°-35°C in summer. In some areas precipitation is high; in others, desert conditions prevail. The periods of heaviest rainfall usually occur from late April to late May and from August to early October. On the Caribbean coast, average annual rainfall reaches over 1,400 mm,

though a rainy season as such cannot be clearly defined. Average rainfall in Santo Domingo, the capital, is 1,340 mm (53 inches) per annum. May to October is hot and humid, November is somewhat cooler, and December to March is mild.

Population was 4.6 million in 1972, with an average annual growth rate of 2.7 per cent. Some 60.8 per cent of the working population was engaged in agriculture in 1970.

Agriculture is the chief source of wealth, and sugar production the principal industry, upon which the Dominican Republic depends heavily for both foreign exchange earnings and employment. In 1971, agriculture accounted for 22 per cent of GDP; mining and quarrying, 2 per cent; and manufacturing industries, 20 per cent.

The goals of the National Development Plan covering the period 1970-1974 were diversification of the economy and the creation of an agro-industrial economy, which should be operating efficiently by 1985. New activities, such as mineral development, tourism and light industry, will be encouraged.

GNP in 1971 at market prices was $1,750 million; per capita GNP was $430. The average annual growth rate of per capita GNP during the period 1965-1971 was 4.7 per cent.

Agriculture

The distribution of land according to use in 1971 was as follows (thousand hectares):

Total area	4 873
Arable land and land under permanent crops	972
Permanent meadows and pastures	1 436
Forests and woodlands	2 225
Other land	240

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In 1960, 110,000 ha were irrigated.[1/] The Government is introducing irrigation schemes and undertaking a land-resettlement project. The Tavera Dam irrigates approximately 6,000 ha of land.

The main agricultural products are (apart from sugar) coffee, rice (for domestic consumption) and cocoa. Maize and groundnuts are grown for local consumption. Cultivation of bananas and tobacco is increasing.

1/ FAO, Production Yearbook, 1974 (Rome, 1975), p. 4.

Production figures for 1974 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Cocoa beans	70F	500	35*
Sugar-cane	149*	63 442	9 481*
Coffee, green	145F	338	49*
Rice, paddy	66*	3 243	215
Maize	25*	1 512	38*
Cereals, total	96	2 816	270
Groundnuts in shell	85*	878	75*
Bananas	20F	15 750	315*
Tobacco leaves	30.6*	1 227	37.5*

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 41, 46, 50, 91, 157, 170, 176, 178 and 181.

Natural resources and industry

Minerals found include gold, copper, iron, bauxite, nickel, zinc, gypsum, silver, platinum, and rock salt. Bauxite is exported to the United States of America. Apart from very small reserves of petroleum, the country has no known fuel resources or indigenous raw materials that might serve as a base for a fertilizer industry.

The first refinery in the country is operated by the Shell International Petroleum Corporation at Santo Domingo. Using imported crude oil, it has a capacity of 30,000 bbl/d.

Electricity generated in 1968 was 699 million kWh. There are two large hydroelectric projects - the Tavera and the Valdesia dams. The Tavera project began generating electricity in January 1973. The goal of the National Development Plan is to add 202,000 kW to installed capacity.

The Falconbridge ferronickel complex produces nickel. Manufacturing is mostly concentrated on processing commodities, e.g. sugar, flour, rum, chocolate, peanut oil, cigars and meat. Other industries include cement, textiles, glass, paper and matches.

Fertiliser production

No chemical fertilizers as such are produced. Fertilizantes Químicos Dominicanos (FERQUIDO) near Santo Domingo has a fertilizer mixing and bagging plant with a capacity of about 200,000 t/a of mixed fertilizers at San Pedro de Macorís. It produced 125,000 tons of mixed fertilizers in 1973.

All raw materials for the mixing of fertilizers in the country are imported, 80 per cent from the United States of America and approximately 20 per cent from Europe. Granulated fertilizers ready for application are still being imported.

Another mixing plant has been constructed at Haina, near Santo Domingo, by Fertilizantes Santo Domingo (FERSAN). In 1973, it produced 35,327 tons of AS, 17,270 tons of urea and 28,880 tons of mixed fertilizers.

A sulphuric acid plant was commissioned in 1962. However, it is closed and awaiting renovation.

In 1973, FERQUIDO exported 24,730 tons of mixed fertilizers, and FERSAN exported 66 tons of urea and 661 tons of complex fertilizers.

Fertilizer consumption

Fertilizer consumption started to develop in the Dominican Republic only recently. The largest consumer is the sugar industry, followed by rice, tobacco, corn and coffee plantations.

In 1973/74, consumption was follows (tons): N, 41,300; P_2O_5, 15,800; and K_2O, 21,400.[2/]

Fertilizer use on arable and on agricultural land in 1973/74 was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	42.5	17.2
P_2O_5	16.3	6.6
K_2O	22.0	8.9
Total	80.8	32.6

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 48.

In the same year, per capita consumption was 16.5 kg nutrients.[1/]

Imports of fertilizers for 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrients	1971/72	1972/73	1973/74
N	28 192	33 900	41 300
P_2O_5	13 347	16 400	15 800
K_2O	16 617	18 500	21 400

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 114, 145 and 169.

Fertilizers imported by FERQUIDO and FERSAN in 1973 are shown below (tons):

Fertilizer	FERQUIDO	FERSAN
Urea	26 000	18 828
AS (21% N)	52 000	45 682
TSP (46% P_2O_5)	6 500	7 715
DAP	11 000	9 946
Muriate of potash (60% K_2O)	24 000	12 917
Potassium sulphate (50% K_2)	1 000	510
Other primary materials	500	

Source: Government of the Dominican Republic.

2/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

1/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 48.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Capacity				Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
			Product	Thousand tons per annum	Nutrient	Thousand tons per annum		
San Pedro Macoris	1948	PERQUIDO	Mixed fertilizers	200	NPK	...	...	...
Haina	1967	FERSAN	Mixed fertilizers	250	NPK	...	...	...
			AS	...	N	...	...	...
			Urea	...	N	...	...	...

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EL SALVADOR

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	12 466	8 595	45 000*	32 000	100 000
	Production	-	-	8 000*	...	...
	Deficit	12 466	8 595	37 000*	...	...
	Surplus	-	-	-	...	...
P_2O_5	Consumption	3 700	5 952	12 300*	16 500	...
	Production	-	-	2 000*	...	...
	Deficit	3 700	5 952	10 300*	...	...
	Surplus	-	-	-	...	...
K_2O	Consumption	4 953	2 823	7 687	3 200	...
	Production	-	-	-	...	...
	Deficit	4 953	2 823	7 687	...	...
	Surplus	-	-	-	...	...

Sources:
1960/61, 1965/66 and 1975/76: UNIDO, "Report and proceedings", Meeting on the Development of Fertiliser and Pesticide Industries in Latin America (in collaboration with ECLA and the Government of Brazil), 15-19 September 1970 (ID/WG.80/9), p. 170.

1970/71: FAO, Production Yearbook, 1973 (Rome, 1974), pp. 259 and 257.

1980/81: Raymond Ewell, UNIDO consultant.

General

El Salvador, the smallest mainland Central American republic, with an area of 21,390 km^2, is located approximately in the middle of the Central American isthmus. It is bounded on the north and east by Honduras, on the west and north by Guatemala, on the south by the Pacific Ocean, and on the south-east by the Gulf of Fonseca.

It is divided into three distinct mountain ranges running from east to west; a hot, narrow Pacific coastal belt in the south; a subtropical central region of valleys and plateaux, where most of the population lives; and a mountainous northern region. Approximately 90 per cent of the land is of volcanic origin.

The climate is tropical, but is modified inland by the altitude, with a wet season from May to October and a dry season for the rest of the year. The coastal lowlands are hot and humid, but the capital, San Salvador, at a height of 682 m has a pleasant climate. Average annual temperature in San Salvador is 23°C (maximum 32°C and minimum 18°C). These temperatures prevail in most of the country, with variations according to altitude. Rainfall averages on the Pacific lowlands 1,727 mm; on the mountain ranges, 1,778-2,464 mm; and in the deep valleys and plateaux, 1,143-1,524 mm.

In 1972, the population was 3.7 million, with a high average annual growth rate of 3.9 per cent. Some 56.8 per cent of the working population was engaged in agriculture in 1970.

Although El Salvador is the most industrialized of the Central American republics, its economy remains primarily agricultural. Coffee, on which the economy depends excessively, cotton and sugar are among the main crops. Raising livestock is also important.

GNP in 1972 was $1,190 million at market prices; per capita GNP was $320. During the period 1965-1971 per capita GNP grew at an average annual rate of 0.5 per cent.

A breakdown of GDP for 1972 shows that agriculture accounted for 26 per cent; mining and quarrying, 0.2 per cent; and manufacturing industries, 19 per cent.

The country's key location and entrepreneurial enthusiasm have made it the leading exporter of manufactured goods among the Central American countries. The United States of America is El Salvador's chief trading partner.

El Salvador is a member of the Central American Common Market.

The Five-Year Development Plan (1973-1977) allocates large expenditures for agricultural improvement, such as drainage and irrigation, forestry conservation and reforestation, and meat production. It seeks to reduce reliance on the traditional agricultural exports - coffee, cotton and sugar - by developing a stronger manufacturing sector. It also stresses the development of hydroelectric power.

Agriculture

The distribution of land according to use in 1971 was as follows (thousand hectares):

Total area	2 139
Arable land	488
Land under permanent crops	163
Permanent meadows and pastures	665
Forests and woodlands	250
Other land	73

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In 1973, 22,000 hectares were irrigated.[1/]

Coffee represents 41 per cent of total exports and cotton 13 per cent. El Salvador is the only Central American country that is not a traditional banana exporter, which is due to its having only limited lowlands. Corn, beans and sorghum are the chief subsistence crops grown. Almost all the country's arable land is under intense cultivation, and double-cropping is common. In view of the limited land available, the productivity of land devoted to export crops is generally high, and a substantial amount of fertilizers and insecticides is used.

Production figures for 1974 for the main crops are given below:

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Coffee, green	146.2	957	139.9
Cottonseed	...	...	124.4
Sugar-cane	38F	64 474	2 450F
Rice, paddy	10	2 977	30
Cereals, total	330	1 576	520
Maize	210	1 709	359
Sorghum	110F	1 192	131
Dry beans	45*	702	32

Source: FAO, Production Yearbook, 1974 (Rome, 1975), pp. 41, 46, 50, 56, 74, 122, 157 and 176.

Natural resources and industry

The land has not been fully surveyed, and no industrial or fertilizer minerals are yet known. There are no known domestic fuel resources.

One refinery, the Refinería de Petrolera Acajutla SA, at Acajutla, operates using imported orude. Its oapacity is 13,200 bbl/d.

In 1972, 835.2 million kWh of electricity were produced. It is planned to construct a 270,000-kW hydroelectric project at Cerron Grande and a 30,000-kW geothermal power plant at Ahuachapan. The Cerron Grande project will be situated on the River Lempa above an existing hydroelectric plant and should increase El Salvador's output of electricity by 80-100 per cent.

The country is undergoing extensive industrial development. The industrial sector is mostly ooncerned with the processing or production of light consumer goods. The major industries are food processing, tanning, textiles, furniture, metal goods, pharmaceuticals, leather goods, foot-wear, cosmetics, electric oables, light bulbs and fittings, detergents and assembly of motor vehicles. The manufacture of oement and articles of asbestos-cement, construction materials and various chemioals, including fertilizers, is also important. The tourist industry is also expanding.

Fertiliser production

In 1973/74, fertiliser produotion was as follows (tons): N, 7,000* and P_2O_5, 4,000*.[2/]

El Salvador exports fertilisers.

Guanos y Fertilizantes de Mexico SA has a fertiliser plant at Acajutla. Initial produotion in 1964 was (tons): SSP, 30,000; formulated fertilizers, 65,000; and sulphuric acid, 18,150. By 1971, the annual production rate was 117,000 tons of oomplex fertilisers and 33,100 tons of sulphuric aoid. The plant uses rock phosphate, sulphur and imported DAP as feedstock.

2/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 251.

Fertilizer consumption

Growth in fertilizer consumption is shown below (tons):

Nutrient	1971/72	1972/73	1973/74
N	63 000*	65 000*	68 000*
P_2O_5	11 800*	22 500*	31 800*
K_2O	6 000*	7 000*	8 000*

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

Per capita fertilizer consumption in 1973/74 was considerable at 28.2 kg nutrient.[3/] In the same year, fertilizer use on arable and on agricultural land was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	104.5	51.7
P_2O_5	48.8	24.2
K_2O	12.3	6.1
Total	165.6	81.9

Source: FAO, Annual Fertiliser Review, 1974 (Rome, 1975), p. 48.

Imports of fertilizers in 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	60 700*	67 629	66 629
P_2O_5	15 000*	26 525	35 800*
K_2O	13 400*	11 680	13 507

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 114, 145 and 169.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Capacity				Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
			Product	Thousand tons per annum	Nutrient	Thousand tons per annum		
Acatlán	1964	Guanos y Fertilizantes de Mexico SA	SSP	...	P	...	...	...
			TSP	...	P	...		
			Sulphuric acid	...				
			Complex fertilizers	...	NPK	...		

3/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

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GUATEMALA

Consumption and production of fertilisers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	7 533	7 301	28 977	32 000	70 000
	Production	-	-	-	...	...
	Deficit	7 533	7 301	28 977	...	...
	Surplus	-	-	-	...	...
P_2O_5	Consumption	3 639	4 864	11 560	16 500	...
	Production	-	-	-	...	...
	Deficit	3 639	4 864	11 560	...	...
	Surplus	-	-	-	...	...
K_2O	Consumption	3 089	2 327	5 775	3 200	...
	Production	-	-	-	...	...
	Deficit	3 089	2 327	5 775	...	...
	Surplus	-	-	-	...	...

Sources:

1960/61: FAO, Fertilisers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150.

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1980/81: Estimates of Raymond Ewell, UNIDO consultant.

General

Guatemala borders on Mexico to the north and west, the Pacific Ocean to the south and south-west, El Salvador and Honduras to the south-east and east, and Belize and the Atlantic Ocean to the north-east and east. It is the most northerly and most populated Central American republic. It is 108,890 km^2 in area. The Pacific coastline is 320 km and the Atlantic coastline 166 km long.

About two thirds of Guatemala is mountainous. A high mountain range, the Sierra Madre, extends from west to east along the Pacific coastal plains, the highest point of which is over 2,500 m. The remainder of the country, comprising the whole of the northern region and the coastal plains, is lowland.

The one rainy season is from May to October. The heaviest rainfall occurs in central Guatemala on the slopes that are exposed to winds from the Caribbean and in the south along the slopes that are exposed to winds from the Pacific. Rainfall averages 50-150 cm per annum.

Population in 1972 was 5.4 million, with an average annual growth rate of 3.4 per cent. In 1970, 62.7 per cent of the working population was engaged in agriculture.

The economy is principally agricultural, heavily dependent on the export of a few commercial crops, and therefore affected by world price changes. Guatemala has experienced rapid industrial growth since 1960 and produces a wide range of goods. However, industry still has relatively little influence on the economy.

GNP at market prices in 1971 was $2,120 million; per capita GNP was $390. During the period 1965-1971, per capita GNP grew at an average annual rate of 2.1 per cent.

In 1972, agriculture accounted for 28 per cent of GDP; mining and quarrying, 0.1 per cent; and manufacturing industries, 16 per cent.

The country's main trading partner is the United States of America.

The National Development Plan (1971-1975) specified substantial investment in transportation, power, telecommunications, tourism, health, education and housing. It visualized an average annual growth rate of 7 per cent and an annual increase in per capita income of 4.3 per cent. The main stress was on agricultural diversification and on tourism.

Guatemala has been a member of the Central American Common Market since its creation in 1960.

Agriculture

The distribution of land according to use in 1964 was as follows (thousand hectares):

Total area	10 889
Arable land	1 165
Land under permanent crops	319
Permanent meadows and pastures	1 015
Forests and woodlands	6 500*
Other land	1 890

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In 1971, 60,000 ha were irrigated.[1/] The area under irrigation was extended under the Development Plan.

A recent programme to encourage the highland Indians to fertilize their wheat crop proved successful.

Coffee is the chief export of the country, followed by cotton. Sugar and meat, bananas and essential oils are also exported. The staple subsistence crops are maize and beans; rice and tobacco are also produced for local consumption. Livestock raising is gaining importance. There is a small seafood industry, consisting mainly of shrimp, on the Pacific coast.

The dual production structure (subsistence economy and export-oriented plantation economy) in Guatemala is probably the most serious hindrance to a more rapid growth of agricultural production. The subsistence sector accounts for over 80 per cent of the farm units in the

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

country. The commercial sector is predominantly export-oriented, operates mainly on medium-sized and large farms, utilizes modern production techniques and still absorbs virtually all the financial assistance given to agriculture. However, a National Agricultural Development Bank has recently been set up to provide credit and technical assistance to small and medium-sized farms.

Production figures for 1974 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Bananas	59F	7 627	450F
Coffee, green	265F	521	138*
Cotton (lint)	...	...	114*
Seed cotton	103*	3 387	350*
Cottonseed	...	...	189*
Cereals, total	983	736	723
Sugar-cane	55F	71 818	3 950*
Tobacco leaves	3.64*	1 519	5.53*
Rice, paddy	18F	1 783	32
Maize	850*	721	613

Source: FAO, Production Yearbook, 1974 (Rome, 1975), pp. 41, 46, 50, 118, 122, 157, 170, 176 and 181.

Natural resources and industry

The land has not yet been completely surveyed. Mineral resources have so far played a minor role in the predominantly agricultural economy of Guatemala. Exploratory drilling for oil has been conducted for some years, and deposits were found recently in Las Tortugas Valley in Alta Verapas. Further wells are planned for this area, and more drilling is taking place off the Pacific coast.

Refining capacity is 26,000 bbl/d. There are two refineries in the country, both of which use imported crude:

	Crude capacity (bbl/d)
Refinería Petrolero de Guatemala-California Inc. (GUATCAL Atlantico), Puerto Sto. Tómas de Castilla	12 000
Refinería del Pacifico (TEXACO), Escuintla	14 000
Total	26 000

Source: International Petroleum Encyclopedia, 1974 (Tulsa, Oklahoma, Petroleum Publishing Co., 1974), p. 355.

Sulphur deposits are located in the Alta y Baja Verapaz. Deposits of copper, lead, zinc, silver, gold, uranium, tin, mica, mercury, chromite, iron, gypsum, barite and manganese are reported. The country is rich in nickel deposits. A United States company plans to begin mining nickel shortly, near Lake Izabal. Exploitation of the country's nickel resources should significantly strengthen the economy by providing an important new source of income.

In 1971, 531.6 million kWh of electricity were produced. In 1966, electric power was mainly generated by hydroelectric stations. Completion of a hydroelectric complex at Lake Atitlán, with generating capacity of 500,000 kW, is planned for 1982. The first stage of a thermal power station in Escuintla Department, with a capacity of 33,000 kW, was inaugurated in mid-1972.

The major industries are food processing, textiles, shoes, beverages, petroleum products, furniture, chemicals, pharmaceuticals, tobacco products and building materials. There are few large, modern industries. Most facilities produce articles requiring small capital investment and a relatively small labour force.

An autonomous government agency, the Corporación Financiera Nacional (CORFINA), was set up in June 1972 to provide financial and technical assistance for the development of industry and mining and the tourist trade.

Fertiliser production

Ammonium phosphate, compound and complex fertilizers are produced by Fertilizantes del Istmo Centro-Americana SA (FERTISMO). This company is a subsidiary of the State-owned Guanos y Fertilizantes de Mexico SA. Raw materials are supplied by the parent company and a percentage of the plant's output will later be exported to Mexico, El Salvador and other Central American countries.

FERTISMO's 100 t/d brimstone-based sulphuric acid plant at Teoun employs the Monsanto Enviro-Chem Systems Inc. process.

In 1971/72, 3,000* tons (nutrients) of N fertilizers were produced in Guatemala.[2/] No production is recorded for 1972-1973.

Fertiliser consumption

Per capita fertiliser consumption in 1973/74 amounted to 8.9 kg nutrients.[3/] Fertiliser use on arable and agricultural land in the same year was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	21.6	12.8
P_2O_5	8.8	5.2
K_2O	3.0	1.8
Total	33.3	19.8

Source: FAO, Annual Fertiliser Review, 1974 (Rome, 1975) p. 48.

Imports of fertilisers in 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	13 239	23 571	32 000
P_2O_5	8 738	15 700	13 010
K_2O	2 841	3 500	4 390

Source: FAO, Annual Fertiliser Review, 1974 (Rome, 1975), pp. 114, 145 and 169.

2/ FAO, Annual Fertiliser Review, 1972 (Rome, 1973), p. 67.

3/ FAO, Annual Fertiliser Review, 1974 (Rome, 1975), p. 48.

Status and capacity of fertiliser plants

Location	Start-up	Ownership	Capacity				Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
			Product	Thousand tons per annum	Nutrient	Thousand tons per annum		
Tecun-Uman	1972	Fertilizantes del Istmo Centro-Americana (FERTISMO)	Complex, blended fertilisers (average nutrient content) = 38.9% a/	...	N P_2O_5 K_2O	60-70	...	...
	Expansion planned	FERTISMO	Complex, blended fertilisers (average nutrient content) = 38.9% a/	...	N P_2O_5 K_2O	30	...	...

a/ Tennessee Valley Authority, February 1974.

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HAITI

Consumption and production of fertilizers
(Tons)

Nutrient		Actual			Estimated	
		1960/61	1965/66	1970/71	1975/76	1980/81
N	Consumption	328	400*	200*		
	Production	-	-	-		
	Deficit	328	400*	200*		
	Surplus	-	-	-		
P_2O_5	Consumption	292	500*	100*		
	Production	-	-	-		
	Deficit	292	500*	100*		
	Surplus	-	-	-		
K_2O	Consumption	287	1 000*	...		
	Production	-	-	...		
	Deficit	287	1 000*	...		
	Surplus	-	-	...		

Sources:

1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150;

1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151;

1970/71: FAO, Production Yearbook, 1972 (Rome, 1973), p. 233.

General

Haiti occupies the western third of the island formerly called Hispaniola in the Caribbean chain, which lies to the east of Cuba and west of Puerto Rico. It has a common frontier with the Dominican Republic to the east. The total area of the country is 27,750 km^2, which includes its satellite islands.

Haiti is a mountainous country with a narrow, coastal plain. Three main mountain chains out the country from east to west. The highest point is Morne La Selle (2,680 m) in the central zone.

Population in 1972 was 4.4 million, with an average annual growth rate of 1.6 per cent. In 1970, 83.5 per cent of the working population was engaged in agriculture.

The climate is torrid, tropical and humid on windward hills, but drier in the valleys. It is pleasant in winter, i.e. from November to March, and fairly hot in summer. Average temperatures in Port-au-Prince, the capital, in January/February are 20°C minimum and 29°C maximum, and in July/August they are 24°C minimum and 35°C maximum. The rainy season in Haiti varies depending on location. Near Port-au-Prince, it falls between March and October.

Haiti is still one of the poorest countries in the world. The economy is essentially based on agriculture. In marked contrast to the previous decade, however, the country has enjoyed relatively rapid, though somewhat unbalanced, economic growth in the last five years. In 1971 (in 1955 prices), GNP was $359 million, and *per capita* GNP was $83. During the period 1965-1971, the average annual growth rate of *per capita* GNP was 1.4 per cent. Haiti's *per capita* GNP is the lowest in Latin America.

In 1971, agriculture accounted for 50 per cent of GDP; mining and quarrying, 2 per cent; and manufacturing industries, 10 per cent.

Haiti's first Five-Year Development Plan was published in 1971 for the period 1972-1976.

Agriculture

The distribution of land according to use in 1970 was as follows (thousand hectares):

Total area	2 775
Arable land and land under permanent crops	370
Permanent meadows and pastures	500
Forests and woodlands	700
Other land	1 205

Source: FAO, *Production Yearbook, 1974*, vol. 28-1 (Rome, 1975), p. 4.

In 1974, 70,000 ha of land were irrigated.[1/] The Government's present five-year plan has as a goal to construct and restore irrigation systems.

Most of the cultivated land lies on hillsides that are too steep to be cultivated without protective techniques. Soil erosion, arising from large-scale deforestation, heavy rains and failure to rotate crops and to use contour ploughing, is common.

Haiti's agricultural difficulties are also caused by the large number of uneconomic, small farms; primitive farming methods, with the exception of those used on some large coffee, banana and sugar-cane plantations; unavailability of improved seeds; periodic drought; and the relative isolation of most producing areas from existing or potential markets. Haiti has been struck by several hurricanes, sometimes in successive years, since 1960.

The Government is attacking soil erosion by means of a long-term reafforestation programme, terracing and regulation of rivers. Numerous efforts are being made to modernize agricultural methods. The Government has launched a campaign to promote better farming practices.

Coffee and sugar are the most important commodities produced. Secondary crops are rice, cocoa, cotton, pineapples, mangoesand other tropical fruits.

The Government plans to increase production of foodstuffs of animal and vegetable origin for the domestic market and to export surpluses of maize, beans, bananas, rice and meat. Introduction of new varieties of rice and cotton should increase output. Livestock raising is also being encouraged.

1/ FAO, *Production Yearbook, 1974*, vol. 28-1 (Rome, 1975), p. 4.

Production figures for 1974 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Coffee, green	30F	1 100	33*
Bananas	15F	12 200	183F
Sugar-cane	75F	47 733	3 580F
Sisal	32F	594	19*
Rice, paddy	57*	3 509	200
Cocoa beans	1.5F	2 333	3.5F
Cottonseed	...	...	1.9F
Cotton (lint)	...	...	0.957F
Seed cotton	8F	400	3F
Pineapples	...	...	1F
Mangoes	...	...	94F
Maize	320*	781	250*
Cereals, total	657	1 018	669
Tobacco leaves	3.4F	735	2.5F

Source: FAO, Production Yearbook, 1974 (Rome, 1975), pp. 41, 46, 50, 118, 122, 157, 168, 170, 176, 178, 181, 187 and 189.

Natural resources and industry

Haiti's mineral resources include bauxite and copper. Lignite has also been found, which may become a new and economically important mineral resource. The feasibility of exploiting the Maissade lignite deposits in the centre of the country for power generation is now being explored by the United Nations Development Programme (UNDP). Little is known about other mineral resources.

There are no known domestic fuel resources, although some oil prospecting is going on. No refineries exist in the country.

Electric power production capacity in 1970 was 20,500 kW. This consisted mainly of thermal power. The large hydroelectric power station planned for Peligre was completed at the end of 1973. Two 15.7-MW turbo-alternator groups were installed in 1971 and 1972, and a third one of identical capacity in late 1973. Peligre's capacity is now about 45 MW, but hydraulic constraints limit average capacity to about 30 MW. The Peligre Dam seems to be the only major economic source of hydroelectric power in Haiti, and future increases in generating capacity will probably have to rely on thermal sources even though other medium-sized hydroelectric power stations may be built.

Sugar refining, rum and essential oil manufacturing are the main industries. Cement and textiles are also produced. The tourist industry is continuing to expand. Manufacturing has recently been one of the most dynamic sectors of industry, growing at approximately 9 per cent per annum since 1970. Several new industries have been introduced recently. A steel plant has been set up. Authorization has been granted for the construction of a brewery.

Fertiliser production

No chemical fertilisers are produced in Haiti.

Fertilizer consumption

Little use is made of fertilizers, partly because they are expensive and have to be imported and partly because no adequate distribution system exists. The Government's plans to stimulate agricultural production should create greater demand for fertilizers. Recently, co-operatives and agronomic schools were set up.

In 1973/74, fertilizer consumption was as follows (tons): N, 700*; P_2O_5, 200*; and K_2O, 500*.[2] Per capita fertilizer consumption in the same year was only 0.3 kg nutrients.[3]

Imports of fertilizers in 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	-	670	700*
P_2O_5	100F	235	200*
K_2O	100*	493	500*

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 114, 145 and 169.

Fertilizer use on arable and agricultural land in 1973/74 was as follows (tons):

Nutrient	Arable land	Agricultural land
N	1.9	0.8
P_2O_5	0.5	0.2
K_2O	1.4	0.6
Total	3.8	1.6

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 48.

2/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

3/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 48.

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HONDURAS

Consumption and production of fertilizers
(Tons)

Nutrient		Actual			Estimated	
		1960/61	1965/66	1970/71	1975/76	1980/81
N	Consumption	7 391	10 027	15 000*	17 000	30 000
	Production	-	-	-	...	...
	Deficit	7 391	10 027	15 000*	17 000	30 000
	Surplus	-	-	-	...	...
P_2O_5	Consumption	264	688	1 500*	4 200	...
	Production	-	-	-	...	...
	Deficit	264	688	1 500*	4 200	...
	Surplus	-	-	-	...	...
K_2O	Consumption	437	4 980	7 500*	7 500	...
	Production	-	-	-	...	...
	Deficit	437	4 980	7 500*	7 500	...
	Surplus	-	-	-	...	...

Sources:
1960/61, 1965/66 and 1975/76: UNIDO, "Report and proceedings", Meeting on the Development of Fertilizer and Pesticides Industries in Latin America (in collaboration with ECLA and the Government of Brazil), Rio de Janeiro. 15-19 September 1970 (ID/WG.80/9). p. 170.

1970/71: FAO, Production Yearbook, 1973 (Rome, 1974), p. 259.

1980/81: Raymond Ewell, UNIDO consultant.

General

The second largest country in Central America with an area of 112,090 km^2, Honduras borders on Guatemala to the north-west, El Salvador to the south and Nicaragua to the south-east. Its main boundary is the coastline on the Caribbean Sea, and it also has a short southerly coastline on the Pacific Ocean.

Two major mountain ranges cut Honduras from north-west to south-east, and tropical lowlands are found along both coastal areas. Between the mountain branches lie extensive fertile valleys and plateaux.

The climate ranges from temperate in the mountains to tropical in the lowlands. The dry season, from November to May, seriously affects the south, west, and interior of the country. The one rainy season is from June to October. The average mean temperature is from 18°C to 29°C, with variations according to altitude rather than to season.

The population in 1972 was 2,896 million, with an average annual growth rate of 3.0 per cent. In 1970, 66.7 per cent of the working population was engaged in agriculture.

The economy is based largely on agriculture and forestry. In 1972, agriculture accounted for 30 per cent of GDP, the largeet share; mining and quarrying, 2 per cent; and the manufacturing industries, 14 per cent.

In 1971, GNP was $780 million; per capita GNP was $300, one of the lowest in Central America. During the period 1965-1971, per capita GNP grew at an average annual rate of 1.4 per cent.

Economic development is hampered not so much by deficienciee in capital or natural resources as by lack of technical and administrative skille and traneportation and communicatione eysteme.

One of the founder membere of the Central American Common Market in 1960, Honduras virtually withdrew in December 1970. The United Statee of America ie the principal deetination for Hondurae's exports.

Agriculture

The distribution of land according to uee in 1963 wae as followe (thousand hectares):

Total area	11 209
Arable land and land under permanent crope	823
Permarent meadows and pasturee	3 413
Forests and woodlands	3 019
Other land	3 954

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In 1964, eome 66,000 ha were irrigated.[1/] A feasibility study was recently made to prepare for extensive irrigation facilitiee in the eouth.

The chief agricultural area of the country ie the north-west coastal etrip. Some potentially valuable agricultural land etill remaine unexploited.

The principal crops for domestic consumption are corn, beans and sorghum. Production for export includee bananas, coffee, lumber and tobacco. The moet important export item after bananas ie beef. The most technologically advanced eector of agriculture and the largeet employer of labour is the banana industry.

There ie a need for more modern farming methode, irrigation and technical assistance. A two-year agrarian reform programme etarted in January, 1973; in the same year, a programme for rural technical education began, with assistance provided by the United Nations.

Production figures for 1974 for the main crope are given below:

Crop	Area harveeted (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Bananas	48F	28 333	1 360*
Sugar-cane	48F	27 083	1 300F
Coffee, green	103F	428	44
Tobacco leaves	3.5F	1 229	4.3*
Cotton (lint)	...	...	5*
Rice, paddy	15	1 323	19
Maize	290*	897	260*
Cereals, total	335	952	319
Sorghum	30F	1 313	39

Source: FAO, Production Yearbook, 1974 (Rome, 1975) pp. 41, 46, 50, 56, 157, 170, 176, 181 and 189.

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Natural resources and industry

No exploitable oil deposits have yet been found, though exploration is being carried out at Puerto Lempira in the east and also off-shore. A recent find by a United States company on the north coast is being evaluated.

Deposits of coal are estimated at 1 million tons of hard coal and 4 million tons of brown coal, but no coal is mined. There are also deposits of metallic ores (silver and gold), porphyritic copper ores, and mixed lead and zinc ores.

Forestry resources rank among the best remaining in the Western Hemisphere.

The Refinería Texaco de Honduras SA, at Puerto Cortes, operates on imported crude and has a crude capacity of 10,300 bbl/d.

Hydroelectric power is being developed. Plans for a 250,000 hydroelectric plant at El Cajon are being discussed. Output of electricity in 1966 was 204 million kWh, over 60 per cent of which came from hydroelectric plants.

Local industries are small, but their production covers a wide range, mainly of consumer goods. Most of the existing industries are based on the processing of wood and agricultural commodities. Among the most important of the manufacturing industries are furniture, textiles, foot-wear, cigars and cigarettes, processed food and beverages. There is also a small range of metal manufacturers, and a steel rolling mill operates at San Pedro Sula in the north.

Tourism is to become a major industry.

A steel mill north of Tegucigalpa, the capital, is reported to be under consideration. It would be situated near iron deposits estimated to contain enough ore to satisfy needs for at least 40 years.

Fertilizer production

No fertilizers are produced in Honduras.

Fertilizer consumption

Fertilizer use on arable and on agricultural land in 1973/74 was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	17.0	3.3
P_2O_5	2.4	0.5
K_2O	9.7	1.9
Total	29.2	5.7

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 48.

Per capita consumption was 8.0 kg nutrients in the same year.[3]

2/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

3/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 48.

Imports of fertilizers in 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	20 000*	14 000*	15 000*
P_2O_5	2 000*	2 000*	2 000*
K_2O	9 500*	7 900*	8 000*

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 114, 145 and 169.

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JAMAICA

Consumption and production of fertilisers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	4 789	7 510	9 190	...	...
	Production	-	-	-	...	...
	Deficit	4 789	7 510	9 190	...	...
	Surplus	-	-	-	...	...
P_2O_5	Consumption	1 767	2 115	3 018	...	...
	Production	-	-	-	...	...
	Deficit	1 767	2 115	3 018	...	...
	Surplus	-	-	-	...	...
K_2O	Consumption	5 010	6 424	9 626	...	...
	Production	-	-	-	...	...
	Deficit	5 010	6 424	9 626	...	...
	Surplus	-	-	-	...	...

Sources:

1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150.

1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151.

1970/71: FAO, Production Yearbook, 1973 (Rome, 1974), p. 259.

FAO note: Jamaica reports its fertilizer statistics on a calendar-year basis. Data are stated under the split year of which its first part corresponds to the calendar year.

General

Jamaica, an island 91 km long and 32 km wide, lies in the Caribbean Sea to the south of Cuba. The interior is mountainous, with peaks rising to over 4,000 m. Its area is 10,960 km^2. There are coastal plains, mainly alluvial; hills; and some interior valleys. Numerous rivers, mostly small, exist. Much of the land is unproductive. Soil erosion also presents a serious problem

The climate is tropical at sea level but temperate in the mountains. Rainfall averages 50-100 cm per annum. Mean temperature is 24°C in winter and 27°C in summer.

In 1972, the population was estimated at 2.1 million, with an average annual growth rate of 1.3 per cent. Some 27 per cent of the working population was engaged in agriculture in 1970/71.

In 1971, GNP was $1,370,000 at market prices, and per capita GNP was $720. During the period 1965-1971, the GNP growth rate was 3.5 per cent.

Until recently, Jamaica has had an agricultural economy, but industry has become increasingly important to the economy. Other areas of substantial development have been the mining of bauxite (including its conversion into alumina) and the tourist industry.

The manufacturing sector of the economy now makes the largest contribution to Jamaica's GDP. In 1972, manufacturing industries accounted for 13 per cent of GDP; agriculture, 8 per cent; and mining and quarrying together, 11 per cent.

The Jamaica Industrial Development Corporation (JIDC), a statutory board under the Minister of Industry and Tourism, was formed by the Government in 1952 and is responsible for promoting the country's industrial development.

The goal of the Development Plan is to expand the industrial sector in particular. Emphasis is accordingly being placed on the strengthening of small and medium-sized enterprises.

Some 200 government-approved industries now operate under the industrial incentives programme. Over 1,400 registered factories and service industries exist in Jamaica, providing employment for approximately 46,000 workers. There are several industrial estates, the largest being just outside the capital, Kingston.

Government policy for further industrialization along conventional lines is both to promote import substitution and to increase imports. A transshipment and container port, and a foreign trade zone are being created, and an oil refinery is being established.

Jamaica is a member of the British Commonwealth and of the Caribbean Common Market, formed with Barbados, Guyana and Trinidad and Tobago in July 1973.

Agriculture

The distribution of land according to use in 1965 was as follows (thousand hectares):

Total area	1 096
Arable land and land under permanent crops	241
Permanent meadows and pastures	247
Forests and woodlands	208
Other land	400

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In 1965, some 24,000 ha were irrigated.1/

Although the bauxite and the tourist industries have overtaken agriculture as the largest foreign exchange earners, agriculture is still the highest employer of labour in the country. However, recently many workers have shifted from agriculture to industry.

The main crop is sugar, the second most important, bananas. Other crops include rice, citrus fruits, coffee, cocoa, coconuts, copra and ginger. Livestock raising and fishing are also important. Agricultural output has been declining.

Government policy is to emphasize diversification of agriculture. Efforts are being made to increase the production of crops for local consumption to reduce the island's dependence on imported foodstuffs.

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Production figures for 1974 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Sugar-cane	62*	62 921	3 920*
Bananas	30F	6 333	190F
Rice, paddy	...	1 050	...
Coffee, green	4.2F	286	1.2F
Cocoa beans	4.3F	512	2.2*
Coconuts	...	...	141.1F
Copra	...	...	12.5F

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 46, 126, 128, 157, 170, 176 and 178.

Natural resources and industry

Jamaica is the world's largest producer of bauxite, the most important mineral in the country. Bauxite production in 1971 was 12.2 million long tons. Deposits of gypsum, quartz sand, ceramic clays, limestone, dolomite and marble also exist.

Although off- and on-shore exploration for fuel resources has been carried out for several years, no commercially viable discoveries have so far been made.

Two steam-generating power stations, five hydroelectric and five interconnected diesel stations provide the Jamaica Public Service (Hunt's Bay) Company's present generating capacity. The total installed capacity of the public supply system is 315,860 kW. In 1972, electricity production was 116.4 million kWh.

Industry is flourishing on the island. Industries include ceramics, leather and foot-wear, furniture, handicrafts, a metal industry (in its early stages) and cement. Tourism is the country's third largest industry. There is a sulphuric acid plant (35,000 t/a sulphuric acid) belonging to Industrial Chemical Co. (Jamaica) Ltd. at Spanish Town.

At Luana Point, Sarjam Co. Ltd. is planning a 250,000 bbl/d oil refinery complex. The first stage should be completed in 1976. The refinery will be an important source of both naphtha and sulphur.

Fertiliser production

One fertiliser plant exists at Kingston, the Antilles Chemical Co. Ltd. It produces ammonium phosphates, binary and ternary complex fertilizers.

The company started production in 1966 under the Industrial Incentives Law. Until 1969, it was a wholly owned subsidiary of Standard Oil Ltd. In 1969, ownership was transferred to W.R. Grace and Co. The firm's initial production capacity was 45,000 tons of complex fertilizers. Since 1967, the Antilles Chemical Co. has also held the exclusive right to import and bag straight fertilizers. Since Antilles is involved only in the mixing and granulation of highly processed raw materials (imported and purchased from associated companies), the local value added in the operation is relatively small.

Shell Co. (West Indies) Ltd. entered the fertilizer trade in 1966 with the establishment of Jamaica Fertilizers Ltd. It imports complex fertilizers for sale on the local market. It operates on a much smaller scale than the Antilles Chemical Company. In 1971, for example, Shell imported some 10,000 tons of complex fertilizers while Antilles mixed locally approximately 27,000 tons.

The long-range goal of the Government is self-sufficiency in production of fertilizers. The UNIDO/FAO/World Bank Ad-Hoc Working Group on Fertilizers, which recently examined Jamaica's fertilizer needs, has suggested the possibility of establishing either a medium-sized plant to produce nitrogen or a satellite plant with a capacity of 20,000-100,000 t/a of N. The plant would be established by 1980.

Fertilizer consumption

In 1973/74, fertilizer consumption was (tons): N, 11,000*; P_2O_5, 3,600*; and K_2O, 7,000*.[2] In the same year, per capita fertilizer use was 10.2 kg nutrients.[3]

Fertilizer use on arable and on agricultural land in 1973/74 was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	45.6	22.5
P_2O_5	14.9	7.4
K_2O	29.0	14.3
Total	89.6	44.3

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975) p. 49.

Since it is considered that AS will continue for some time to be the most important single fertilizer in demand in Jamaica, the creation of a facility for its production (using feedstock from the planned oil refinery) may give the greatest potential for domestic manufacture of fertilizers.

Imports of fertilizers for 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	15 000*	14 000*	10 000*
P_2O_5	5 700*	3 400*	3 600*
K_2O	10 000*	8 000*	8 500*

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 114, 145 and 169.

2/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

3/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Status and capacity of fertiliser plants

Location	Start-up	Ownership	Capacity				Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
			Product	Thousand tons per annum	Nutrient	Thousand tons per annum		
Kingston	1966	W. R. Grace and Co. (Antilles Chemical Co.)	Ammonium phosphates	...			...	...
			Binary and ternary complex fertilisers	...				
			Compound fertilisers	...				

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MEXICO

Consumption and production of fertilizers
(Tons)

Nutrient		Actual			Estimated	
		1960	1965	1970	1975	1980
N	Consumption	128 556	250 647	404 999	629 423	885 556
	Production	48 376	138 240	353 827	782 800	1 866 500
	Deficit	80 180	112 407	51 172	-	-
	Surplus	-	-	-	153 377	980 944
P_2O_5	Consumption	35 370	77 630	117 800	229 614	309 012
	Production	19 974	76 126	181 401	240 589	405 619
	Deficit	15 396	1 504	-	-	-
	Surplus	-	-	63 601	10 975	96 607
K_2O	Consumption	6 479	22 755	21 693	39 162	48 687
	Production	-	-	-	-	1 227
	Deficit	6 479	22 755	21 693	39 162	47 460
	Surplus	-	-	-	-	-

Source: Division of Studies and Programming of GUANOMEX and Annual Statistics of Foreign Trade of Mexico.

General

Mexico, or the United Mexican States, is the northernmost country of Latin America. It shares a frontier with the United States of America on the north and with Guatemala and Belize on the south-east. It is bounded by the Gulf of Mexico and the Caribbean Sea to the east and the Pacific Ocean and the Gulf of California to the west. Mountains and a central plateau cover most of the country; average elevation is 1,000-2,500 m above sea level. The coastal strips are low land. Mexico is the third-largest country in Latin America after Brazil and Argentina, with a total area of 1,972,550 km^2.

For its size, Mexico is among the poorest areas in the world as regards water. Its water supply is not only limited, but also not readily available in some areas of major demand. Some 52 per cent of the land area is located in zones that receive less than 50 cm of rainfall a year, while another 11 per cent of the surface area receives 50-75 cm per year. Over 75 per cent of the country is either arid or semi-arid. The location of water supplies does not coincide with that of demand. The Central Plateau, the north-east and north-west are dry; the southern area is wet.

Population in 1973 was estimated at 56.2 million [1] with the high average annual growth rate of 3.4 per cent. In 1970, 46.6 per cent of the working population was engaged in agriculture.

GNP at market prices in 1972 was $41,096 million, and per capita GNP was $760. During the period 1968-1972, per capita GNP grew at an average annual rate of 3.0 per cent. [2]

1/ Projection for 1973 based on 1972 data.

2/ Banco de México, Annual Report, 1972 (Mexico City, 1973).

In 1972, agriculture accounted for 10 per cent of GDP; mining and quarrying, 4 per cent; and the manufacturing industries, 23 per cent. In spite of considerable progress in other sectors, agriculture is still the mainstay of the economy. In 1973, it supplied about 40 per cent of all exports.

Mexico is a founding member of the Latin American Free Trade Association (LAFTA). Its main trading partner is, however, the United States of America.

Agriculture

The distribution of land according to use in 1970 was as follows (thousand hectares):

Total area	202 206
Arable land	25 776
Land under permanent crops	1 693
Permanent meadows and pastures	69 789
Forests and woodlands	18 478
Other land	86 470

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In 1970, 4,282,900 ha were irrigated.

In the last decade the amount of cultivable land has increased by about 15 per cent largely owing to government irrigation schemes. Most of the capital investment in the agricultural sector has been used for irrigation and mainly to promote the commercial farming in the north-west and north-east.

The soils have a low nitrogen content, average phosphorus content and average-to-high potassium content. They are mostly alkaline in the north and acid in the south.

Corn (maize) and beans are the basis of the Mexican diet and the subsistence crops for most of the rural population. Recently the demand for corn has exceeded domestic production. Cotton is traditionally the largest single and most valuable agricultural export item, followed by tomatoes and coffee. The value of agricultural exports in 1972 was (thousand dollars) cotton, 147,921; coffee, 85,751 and tomatoes, 99,056. Sugar is also important. Crop production accounts for 60.5 per cent of the gross agricultural value, livestock for 33.5 per cent, and forestry and fishing for 27 per cent.[3/]

As a result of assistance from various organizations including the United Nations, some branches of Mexican agriculture are now quite sophisticated. Mexican dwarf wheats, for example, are world renowned. Double-cropping is often undertaken on vines, corn, beans and alfalfa.

High productivity in agriculture is essential for the continuing economic development of the country. To ensure that the funds used for irrigation produce a maximum return, intensive farming methods, designed to give high yields have been introduced, including the use of selected hybrid seeds, insecticides, and ever-increasing quantities of fertilizers.

3/ Banco de México, Annual Report, 1972 (Mexico City, 1973); and FAO, Production Yearbook, 1972 (Rome, 1973), pp. 149, 167, 45, 52, 59, 70, 120, 122, 179, 93, 171 and 130.

Production figures for 1974 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Sugar-cane	574F	64 773	37 174F
Coffee, green	330F	636	210*
Cereals, total	10 249	1 371	14 047
Wheat	778	3 559	2 764
Maize	7 840	993	7 784
Cotton (lint)	...	...	412
Cottonseed	...	...	724.5
Seed cotton	559	2 035	1 137*
Potatoes	40F	11 222	450*
Rice, paddy	170*	2 471	420*
Tobacco leaves	39.7*	1 798	71.4*
Tomatoes	53F	17 580	930F

Source: FAO, Production Yearbook, 1974 (Rome, 1975), pp. 41, 44, 46, 50, 63, 118, 122, 136, 157, 176, 181 and 189.

Natural resources and industry

Natural gas and associated crude oil are found in Zona Norte, Angostura, Poza Rica and Zona Sur, especially in the States of Chiapas and Tolasco. Total proved and probable reserves in 1972 were estimated at 325,000 billion m^3 of natural gas and 5,400 million bbl of crude oil. Production of natural gas in 1971 was 18,714 million m^3. Crude oil was produced at a rate of 427,400 bbl/d. The target for oil production in 1976 is a rate of 767,000 bbl/d.

Coal deposits are found at Coahuila, Oaxaca and Sonora. Deposits total 182.2 million tons. In 1973, production was 1,934,471 tons.[4/]

Phosphate rock deposits, found at San Luis Potosí, Oaxaca, Nuevo León and the Federal District amount to 46 million tons of 18 per cent P_2O_5. In 1973, production was about 70,000 tons.[5/] No significant deposits of potash exist.

Sulphur is found at Coahuila, San Luis Potosí, Huasoama, San Felipe, Baja and Sierra Banderas. Reserves amounted to 84.6 million tons in 1970. In 1973, production was 1,608,245 tons.[6/] Other resources exploited commercially include copper, silver, lead, gold, zinc, tin, antimony, mercury, and more recently, fluorspar. Ample deposits of limestone exist. Mexico's rich mineral resources are an important element in the country's foreign trade.

The raw materials for fertiliser production derive mostly from domestic sources. Raw materials rich in phosphate and potassium have traditionally been imported.

4/ Ministry of Industry and Commerce, Directorate of Statistics, Agenda estadística, 1974 (Mexico, D.F., November 1974), p. 95.

5/ Ibid. p. 95.

6/ Ibid.

The refinery expansion programme calls for an increase in capacity to 1,444,800 bbl/d. Two new refineries will be built, one near Monterrey and the other at Mazatlán. Two existing refineries will be expanded. The Tula Refinery, at present under construction, should be on stream by 1976. Its capacity will be 150,000 bbl/d crude.

The location and capacity of existing petroleum refineries, all operated by Petróleos Mexicanos (PEMEX), the national oil firm, are given below:

Location	Crude oil capacity (bbl/d)
Azcapotzalco	100 000
Salamanca Cuanajuato	100 000
Minatitlan	208 500
Ciudad Nadero	169 000
Poza Rica de Hidalgo	27 000
Reynosa	20 500
Total	625 000

Source: International Petroleum Encyclopedia 1974 (Tulsa, Oklahoma, Petroleum Publishing Co., 1974), p. 358.

A national energy plan to develop oil, electricity and nuclear power was recently announced, involving PEMEX, the Federal Electricity Commission, the National Atomic Energy Institute and government officials. The nuclear programme is still very much a pilot scheme, but a second plant, with a capacity of 660,000 kW, will be added to the installation at Laguna Verde, Veracruz. Another nuclear plant is also being considered, probably to be sited in the north of Mexico.

Electricity production in 1972 was 34,452 million kWh. The current plan aims to raise annual production to 50,000 million kWh by the end of 1976. At the end of 1972, installed electric capacity was 8,028 million kW and the Malpaco Dam, once completed, will add another 720,000 kW.

Mexico plans to construct an industrial complex along its Pacific coast to meet its iron and steel needs and promote the growth of a chemical industry. The complex, Lazaro Cárdenas - Las Truchas, will include iron mines, a steel mill and hydroelectric plants. The start-up of the final two stages will be in 1976.

The growth of the chemical industry is expected to be rapid enough to enable Mexico to be an exporter of chemicals by 1980.

The manufacturing industry has advanced rapidly. Other industries include iron and steel, aluminium, petrochemicals, pharmaceuticals, engineering, construction, cement, textiles, synthetic fibres, fishing and tourism.

Fertiliser production

In 1973, some 366,284 tons of N fertilizers and 239,410 tons of P_2O_5 fertilizers (both as nutrients) were produced. A breakdown of production figures is given below:

Nitrogen fertilizers	1972	1973
AS	82 728	101 015
AN	50 434	50 550
Urea	157 449	167 310
Ammonium phosphate	18 799	21 610
Other complex fertilizers	23 736	25 799
Other N fertilizers	...	...
Total	333 146	366 284

Phosphate fertilizers	1972	1973
SSP	54 141	52 581
Concsntrated supsrphosphate	97 923	105 708
Ammonium phosphate	48 043	55 153
Other complex fertilizers	21 065	25 968
Total	221 172	239 410

Sources: Division of Studies and Programming of GUANOMEX and Annual Statistics of Foreign Trade of Mexico.

Fertilizer production in Mexico is virtually in the hands of two large concerns, PEMEX and Guanos y Fertilizantes de México SA (GUANOMEX), a government-owned company.

The following fertilizers are produced:

Nitrogen fertilizers: anhydrous ammonia (for direct application), urea, AN and AS

Phosphate fertilizers: calcium superphosphate and TSP

Multi-nutrient fertilizers: DAP, normally used as an ingredient in formulations and complex fertilizers

Formulations: fertilizers formulated with varying ratios of N, P, and K

It is the aim of the Government to make Mexico self-sufficient in fertilizer supplies, bassd on domestically produced hydrocarbons and hydrogen together with imported phosphate rock and potash. In addition, it is hoped that an export trade in phosphates can be built up based on domestic sulphur and importsd rock, and also, to ths extent psrmitted by domestic demand, in nitrogen fsrtilizers.

Almost all the ammonia producsd at present comes from natural gas. Virtually all phosphate fertilizers produced have been based on phosphate rock imported from ths United States of America and North Africa. Almost all potash used has been imported, too.

Mexico has been sxporting fertilizers since 1962. In 1972 and 1973, the following fertilizers were exported (tons):

	1972	1973
Nitrogen fertilizers (N)		
Urea	58 081	35 823
Complex	82	-
Total	58 163	35 823
Phosphate fertilizers (P_2O_5)		
TSP	57 291	55 814
Complex	82	-
Total	57 373	55 814

Sources: Division of Studies and Programming of GUANOMEX and Annual Statistics of Foreign Trade of Mexico.

GUANOMEX, together with the University of Guanajuato, has developed a process to beneficiate alunite ores by which a fertilizing mixture of potassium sulphate and AS (15-0-17) is obtained on the one hand, and aluminium sulphate on the other hand. For Mexico, this processs implies the development of a domestic source of potassium, a mineral currently imported.

PEMEX is studying ths feasibility of a sixth ammonia plant to begin operations in 1978. It expects imports of ammonia (250,000 tons in 1972) to be eliminated temporarily by produotion from its fifth plant at Cosoleacaque. If imports are to be eliminated permanently, the sixth unit will be required by 1978/79 at the latest.

Negotiations continue between Mexico and Peru for the joint production of phosphate fertilizers. Mexico would supply the sulphur raw material and Peru the phosphate.

Fertilizer consumption

Consumption of fertilizers in 1973/74 was as follows (tons): N, 531,159; P_2O_5, 180,647; and K_2O, 35,729.[7]

Over the last 10 years, consumption has increased considerably. The largest nutrient consumed in Mexico has been N, followed by P_2O_5 and K_2O. This is in proportion to soil deficiencies. Nitrogen needs have been met by domestic AS, AN, anhydrous ammonia and urea, as well as mixtures and complex fertilizers. Phosphate requirements have been met by domestic SSP and TSP as well as by mixtures and compounds. Potash needs have been supplied principally as muriate.

The medium-term fertilization programme drawn up by several government agencies extended to the end of 1975. It provided for the fertilization of 10.8 million ha, a net increase of 6.8 million ha over 1967. According to the programme, the additional 6.8 million ha consisted of 1.2 million ha of irrigated land and 5.6 million ha of land with a seasonably heavy rainfall. A joint survey made by the Ministries of Agriculture and Water Resources concluded that, on a long-term basis, the total area to be fertilized would be 16.4 million ha (i.e. 9 million ha of irrigated land and 7.4 million ha of land with seasonably heavy rainfall).

One feature of significance for the future is the expanding use of ammonia for direct application, especially in the north and north-west.

Imports of fertilizers (in nutrients) in 1971 and 1973 were as follows (tons):[8]

	1971	1973
N fertilizers: (N)		
AS	23 275	43 388
AN	7 956	7 033
Urea	10 820	-
Ammonium phosphate	1 582	-
Other complex fertilizers	-	2 278
Ammonia	95 232	202 735
Total	138 865	255 434
P fertilizers: (P_2O_5)		
Ammonium phosphate	4 043	-
Other complex fertilizers	-	1 430
K fertilizers: (K_2O)		
Potassium sulphate	2 633	5 150
Muriate	25 089	35 166
Other complex fertilizers	-	1 108
Total	27 722	4 424

7/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

8/ Division of Studies and Programming of GUANOMEX.

Fertilizer use in 1973/74 on arable and on agricultural land was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	19.3	5.5
P_2O_5	6.6	1.9
K_2O	1.3	0.4
Total	27.2	7.7

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Per capita consumption in the same year was 13.3 kg nutrients.[9/]

9/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Status and capacity of fertiliser plants

Location	Start-up	Ownership	Product	Capacity (t/a)	Production in 1973 (tons)	Feedstock and fuel used
San Luis Potosí	1947 1950	GUANOMEX	SSP Mixed	55 000 5 000	61 489 317	H_2SO_4, phosphate rock, $(NH_4)_2SO_4$
Moaclova	1959 1963	GUANOMEX	AN Complex	68 000 50 000	68 373 51 899	Ammonia from PEMEX, phosphate rock, H_2SO_4, potash
Coatzacoalcos	1966 1970	GUANOMEX	$(NH_4)_2SO_4$ DAP	100 000 80 000	38 753 78 122	Ammonia from PEMEX, phosphate rock, sulphur
Salamanca	1963 1969	GUANOMEX	Urea $(NH_4)_2SO_4$	56 000 60 000	54 820 47 879	CO_2 and ammonia from PEMEX, H_2SO_4
Torreón	1966 1968	GUANOMEX	$(NH_4)_2SO_4$ Mixed	100 000 5 000	47 677 8 805	Ammonia from PEMEX, H_2SO_4, NH_4NO_3, DAP
Camargo	1968	GUANOMEX	Urea	85 000	76 767	CO_2 and ammonia from PEMEX
Guadalajara	1968 1968 1968	GUANOMEX	$(NH_4)_2SO_4$ SSP Mixed	120 000 120 000 60 000	95 015 78 232 5 247	Ammonia from PEMEX, sulphur, phosphate rock, DAP, TSP
Minatitlán	1962 1962 1962	GUANOMEX	NH_4NO_3 Urea Complex	110 000 305 000 140 000	82 523 232 130 138 592	CO_2 and ammonia from PEMEX, sulphur, phosphate rock, potash
Cuautitlán	1951 1953 1961 1951	GUANOMEX	$(NH_4)_2SO_4$ SSP Mixed Ammonia	225 000 190 000 60 000 22 000	186 170 123 184 74 975 22 893	Natural gas, sulphur, phosphate rock, potash
Coatzacoalcos	1967	Fertilizantes Fosfatados Mexicanos SA	TSP	230 000	105 800	Phosphate rock, sulphur
Salamanca	1973	UNIVER SA	$(NH_4)_2SO_4$[a/]	173 000		Cyclohexane, ammonia, H_2SO_4, NaOH, benzene
Salamanca	1962	PEMEX	Ammonia	91 000	85 902	Natural gas
Cosoleacaque	1962 1968	PEMEX PEMEX	Ammonia Ammonia	60 000 330 000	288 014	Natural gas
Camargo	1967	PEMEX	Ammonia	132 000	156 005	Natural gas
Guadalajara		Industrias Químicas de México SA	Nutrofos (0-40-0) AS	40 000		
Escapa		Industrias Químicas de México SA	AS	40 000		
Nueva Rosita		Asarco Mexicana SA	AS	5 000		
Nueva Rosita		Cía. Mexicana de Zinc SA	AS	3 000		
México		Magnesio SA	AS	30 000		

Table (continued)

Location	Start-up	Ownership	Product	Capacity (t/a)	Production in 1973 (tons)	Feedstock and fuel used
Torreón		Mexicana de Coque y Derivados	AS	8 000		
Sinaloa	1973	Fertila de Culiacán, SA de CV	Liquid mixes	10 t/h		Ammonia, phosphoric acid and potash
Sinaloa	1970	Nutrientes Líquidos Mexicanos SA	Liquid mixes	15 t/h		Ammonia, phosphoric acid and potash
México		Fertilizantes Foliares SA	Fluid fertilizers			
		Química Foliar SA de CV	Fluid fertilizers			

Location	Start-up	Ownership	Product	Capacity (t/a)	Feedstock and fuel used
			Fertiliser plants in construction or planned		
Salamanca	1976	GUANOMEX	$K_2SO_4 \cdot (NH_4)_2SO_4$	3 965	Alunite, H_2SO_4, ammonia
Coatzacoalcos	1977	GUANOMEX	Urea	495 000	CO_2 and ammonia from PEMEX
Salamanca	1976	GUANOMEX	Urea	330 000	CO_2 and ammonia from PEMEX
San Juan del Río, Qro.	1977	GUANOMEX	SSP $(NH_4)_2SO_4$	300 000 200 000	Ammonia from PEMEX, phosphate rock, sulphur
Manzanillo	1977	GUANOMEX	NH_4NO_3 Complex DAP	99 000 100 000 200 000	Ammonia, phosphate rock, sulphur
Culiacán	1974	Petroquímica de México SA	Base solution 8-24-0	5 000	Ammonia and phosphoric acid
Cosoleacaque	1974	PEMEX	Ammonia	300 000	Natural gas
Cosoleacaque	1977	PEMEX	Ammonia	445 000	Natural gas
Cosoleacaque	1977	PEMEX	Ammonia	445 000	Natural gas
Salamanca	1976/77	PEMEX	Ammonia	300 000	Natural gas

Sources: Guanos y Fertilizantes de México, SA, 30 años, 1973; Guanos y Fertilizantes de México, SA, Programa de Inversiones para 1975 y 1976; and Petróleos Mexicanos (PEMEX), Memoria de Labores 1973.

a/ By-product in caprolactam production.

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NETHERLANDS ANTILLES

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960	Actual 1965/66	Actual 1970/71	Estimated 1975	Estimated 1980
N	Consumption	...	...	...		
	Production		28 000*	43 500*		
	Deficit					
	Surplus					
P_2O_5	Consumption					
	Production					
	Deficit					
	Surplus					
K_2O	Consumption					
	Production					
	Deficit					
	Surplus					

Sources:
1965/66: FAO, Fertilisers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), p. 100.
1970/71: FAO, Annual Fertilizer Review, 1972 (Rome, 1973), p. 67.

General

The Netherlands Antilles consists of two groups of islands, one comprising Aruba, Bonaire and Curaçao; and the other comprising St. Maarten, St. Eustatius and Saba. Both groups are situated in the Caribbean Sea; the first lies off the north coast of Venezuela approximately halfway between the Panama Canal and Trinidad; and the second is in the vicinity of the Virgin Islands. In 1972, the total population of the islands was 230,000.

In 1954, the Netherlands Antilles was granted autonomy by the Netherlands, with which it has a joint foreign and defence policy.

Mainly because of the operations of the two giant refineries in Aruba and Curaçao, the per capita income of the islands is one of the highest in the Caribbean area. In 1967, it was $1,200. The oil industry in 1970 accounted for 20 per cent of GNP of the Netherlands Antilles as a whole. Both refineries import most of their crude and partly refined oil from Venezuela and ship refined petroleum products to North America and West European markets.

The Netherlands Antilles is an associate member of the European Economic Community.

The main purpose of the free zones in Aruba and Curaçao is to encourage the establishment of commercial and industrial enterprises by offering them attractive conditions. Goods imported into the free zones are duty free, and no duties are levied on exports. This enhances the Antilles as a centre for storage and packing or processing of bulk shipments.

During the period 1961/62-1965/66, production of nitrogen fertilizers was 11,600* tons. In 1970/71, it reached 43,500* tons, but dropped to 11,500* the next year. In 1973/74, it was 6,600* tons.[1/]

No data on fertilizer consumption are available.

ARUBA

General

Aruba is located in the Caribbean Sea, 24 km from Venezuela. The tropical island is 32 km long and 10 km wide. The average temperature range is 25°-32°C; the heat is tempered by the trade winds. In 1970, the population was about 60,734.

Owing to its free trade zone and its location in the midst of travel lanes, Aruba is a busy centre of international commerce. The economy is based mainly on oil refining, although tourism is gaining in importance.

Agriculture

Owing to low rainfall and the generally unsuitable nature of the land, agriculture is relatively unimportant. There is little vegetation, and the soil is rocky. Some aloe is produced, from which a resin used in pharmaceuticals is extracted.

Natural resources and industry

Aruba has few natural resources.

The centre of the island's industry is the Lago Oil and Transport Co. Ltd. refinery near St. Nicolaas. The refinery currently processes 440,000 bbl/d of crude, obtained mainly from Venezuela. In mid-August 1971, a 100,000 bbl/d residual oil desulphurization unit came on stream. At the end of 1971, the 100,000 t/a sulphur recovery unit associated with this facility was inaugurated. Both are operating successfully. Capacity of the refinery is (bbl/d): naphtha, 107,000; kerosene, 40,000; and gas oils, 114,000. It also produces 100,000 t/a of sulphur.

The fuel oil produced contains less than 1 per cent sulphur, which meets anti-pollution regulations in the eastern United States of America, the major market for Caribbean fuel oil.

After the oil industry, the second most important contributor to the economy is the tourist industry.

Aruba also has a chemical plant, a petrochemical plant and a tobacco factory. A rum factory is planned.

To prevent excessive reliance on oil refining and to create more jobs, the Investment Incentives Programme is currently encouraging foreign investment in Aruba.

Fertilizer production

Chemicals produced include ammonia, nitric acid, AN and urea. Facilities for producing NPK fertilizers have also been installed but have been used to manufacture CAN.

1/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 87.

Aruba Chemical Industries NV (W.R. Grace and Co.) at Oranjestad, the capital of the island, produces 347 t/d of ammonia, using refinery gas from the Antilles Chemical Co. as feedstock.

Fertilizer consumption

The fertilizer produced is all exported.

CURAÇAO

General

Curaçao, in the Leeward Islands, the largest and most densely populated of the six islands of the Netherlands Antilles, is of volcanic origin, low and hilly with little natural vegetation. It is 60 km long and 5-13 km wide and lies approximately 60 km off the coast of Venezuela. In area, the island is 178 square miles. It has a population of about 141,000.

The climate is tropical. The average temperature range is 25°-32°C. There is little rainfall, and the rainy season is from October to February.

Curaçao's economy is based on oil refining and international shipping. The importance of tourism is growing. The island's free-zone facilities attract international trade.

Agriculture

Agriculture is of only slight importance to the island.

Natural resources and industry

The only important natural resources in the entire Netherlands Antilles are the phosphate deposits on Curaçao, which are mined by the Curaçao Mining Corporation. About 143,000 tons of calcium phosphate were produced in 1970.

All crude oil used in the refinery on Curaçao is imported. Most of the finished product is sold to the United States of America; the rest is absorbed as bunker fuel and on the local market.

Royal Dutch Shell Ltd. established a refinery near Willemstad, the capital of the country and of the island, in 1917. It is now being modernized. At present, it has a capacity of some 300,000 bbl/d.

Curaçao also has a petrochemical plant at Willemstad. A factory for micro-electronic production is planned, and an aluminium plant is under consideration. There are brewery facilities, a grain factory and a paint factory. A tobacco industry also exists.

The tourist trade is expanding rapidly.

Fertilizer production

No chemical fertilizers are manufactured in Curaçao.

Fertilizer consumption

No data on fertilizer consumption are available.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Capacity				Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
			Product	Thousand tons per annum	Nutrient	Thousand tons per annum		
Oranjestad	...	Antilles Chemical Co. Aruba Chemical Industries (W. R. Grace)	Ammonia	...	N	136	...	...

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NICARAGUA

Consumption and production of fertilizers
(Tons)

Nutrient		Actual			Estimated	
		1960/61	1965/66	1970/71	1975/76	1980/81
N	Consumption	1 506	15 014	16 295	40 000	50 000
	Production	-	-	-	...	...
	Deficit	1 506	15 014	16 295	...	...
	Surplus	-	-	-	...	...
P_2O_5	Consumption	1 099	10 387	7 026	15 500	...
	Production	-	-	-	...	...
	Deficit	1 099	10 387	7 026	...	...
	Surplus	-	-	-	...	...
K_2O	Consumption	551	3 824	2 549	6 500	...
	Production	-	-	-	...	...
	Deficit	551	3 824	2 549	...	...
	Surplus	-	-	-	...	...

Sources:

1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150;

1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151;

1970/71: FAO, Production Yearbook, 1973 (Rome, 1974), p. 259.

1975/76: UNIDO, "Report and proceedings", Meeting on the Development of Fertilizer and Pesticides Industries in Latin America, Rio de Janeiro, 15-19 September 1970 (ID/WG.80/9), p. 170; and estimates of E. Montano, UNIDO consultant.

1980/81: Estimates of Raymond Ewell, UNIDO consultant.

General

Nicaragua is bounded by Honduras to the north, Costa Rica to the south, by the Caribbean Sea to the east and the Pacific Ocean to the west. Nicaragua is the largest of the Central American republics. Its area is 130,000 km^2.

The country is of low to moderate relief. The Pacific coastal plain, only slightly above sea level, gradually rises eastward towards mountains in the central north. The two largest lakes of Central America, Lake Managua and Lake Nicaragua, lie in the west. The interior of the country consists of a sparsely inhabited wilderness of timbered plains and rolling hills cut by rivers. The eastern coastal plain, which is partly swamp, stretches for 70-80 km inland.

Apart from the central mountainous zone, the country has a tropical climate, with one rainy season. The mean temperature, 20°-30°C, varies with altitude. Annual rainfall varies according to region. The rainy season in Managua, the capital, is from June through November. Mean relative humidity is 82 per cent. Rainfall on the Pacific coast ranges from 150-165 cm per annum; along the Caribbean coast, it averages 380 cm (and in some sections, 760 cm); in the interior, it averages 305 cm and falls between April and December.

In 1972, population was about 2.2 million, with an average annual growth rate of 3.0 per cent. About 55.8 per cent of the working population was engaged in agriculture in 1970.

The country's resources are still primarily agricultural. Agriculture is by far the most important economic activity. Livestock production is expanding rapidly and fishing is showing potential.

To lessen the reliance of the economy on production and export of cotton and coffee, the Government is encouraging diversification of agriculture and the expansion of cattle raising.

GNP at market prices in 1971 was $950 million, and per capita GNP was $450. During the period 1965-1971, per capita GNP grew at an average annual rate of 1.3 per cent.

In 1971, agriculture accounted for 25 per cent of GDP; manufacturing industries, 20 per cent; and mining and quarrying, 0.8 per cent.

Nicaragua has been a member of the Central American Common Market since its establishment in 1960.

Agriculture

The distribution of land according to use in 1963 was as follows (thousand hectares):

Total area	13 000
Arable land	715
Land under permanent crops	158
Permanent meadows and pastures	920
Forests and woodlands	6 450
Other land	4 757

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In 1967, some 29,000 ha were irrigated.1/

The problem of soil erosion is being studied. Many parts of the country, especially the cotton-growing areas, are heavily eroded. FAO experts have advised the appropriate authorities on soil conservation and reafforestation measures.

In view of the small area under cultivation, great efforts are being made to open up the eastern part of the country, where large tracts of potentially arable and pasture land lie, by building roads and improving communications.

Timber is a valuable export, and plans for large-scale afforestation have been drawn up.

The major crops for export are cotton, coffee and sugar. Cattle raising is also important. Production figures for 1974 for the main crops are given below:

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Maize	164*	1 173	193*
Cotton (lint)	...	...	138
Cottonseed	...	...	225.4
Seed cotton	182F	1 992	363
Coffee, green	83.2	500	41.6
Sugar-cane	36	57 310	2 054
Sesame seed	8F	658	5.3*
Bananas	40F	6 250	250F
Rice, paddy	27*	3 011	82*
Sorghum	56*	1 072	60*
Cereals, total	247*	1 353	335*

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 41, 46, 50, 56, 105, 119, 122, 157, 170, 176 and 189.

Natural resources and industry

No commercially workable industrial or fertilizer minerals are known to exist. The land has still to be fully surveyed. A search is under way for off-shore oil. A subsidiary of Texaco, will explore along the Continental Shelf of Nicaragua's Atlantic coast.

There is one refinery, at Managua, the Refinería de Managua (Esso Standard Oil SA Ltd), which uses imported crude oil and has a capacity of approximately 12,000 bbl/d. A refinery is also planned for Punta Mono.

In 1964, some 156 million kWh of electricity were produced, mainly from diesel units. Although Nicaragua has no known coal resources, it has moderate hydroelectric potential. Preliminary studies by the Economic Commission for Latin America (ECLA) estimated the country's hydroelectric potential at 20,000 kWh/a, only 2 per cent of which is being utilized. The Government requested UNDP assistance to study the feasibility of utilizing the hydroelectric potential of the San Juan River. Initial prospects for the construction of a high-capacity hydroelectric plant here are reported to be favourable.

The main industries are associated with the processing of agricultural products. However, metal products, plastics components, cosmetics, textiles, paints and detergents are also produced. Gold and silver have been mined since the sixteenth century. Copper is mined and tungsten deposits worked in Nueva Segovia. A large gypsum deposit is being worked in the Santa Rosa area. A new zinc and lead plant that started operation in 1972 will generate additional exports.

There are plans for the development of the plastics industry.

The aims of the emergency and rehabilitation plans for industry that were drawn up after the earthquake of 1972 include: decentralization of industry, rehabilitation of medium and large-scale industry, reconstruction and development of small enterprises, the creation of a free export zone, development of an industrial park at Managua and promotion of building-materials enterprises and agro-industries.

Fertilizer production

There are three plants producing mixed fertilizers at Corinto with the following capacities (t/a):

Interoro, 11,800; Abonos Superior, 27,200; and Fenisa, 9,100.

Fertilizer consumption

Annual fertilizer requirements, based on the acreage cultivated at present, have been estimated as follows (thousand tons): N, 57-65; P_2O_5, 46; and K_2O, 24-35.[2/]

Per capita fertilizer consumption in 1973/74 was 24.5 kg nutrient.[3/] In the same year, fertilizer use on arable and on agricultural land was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	40.1	19.5
P_2O_5	13.7	6.7
K_2O	8.6	4.2
	62.4	30.4

Source: FAO, Annual Fertiliser Review, 1974 (Rome, 1975) p. 49.

All fertilizers used in the country are imported. Fertilizer imports for 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	17 312	17 500*	35 000*
P_2O_5	9 100	4 200*	12 000*
K_2O	3 770	5 400*	7 500*

Source: FAO, Annual Fertilizer Review, 1974, (Rome, 1975), p. 114, 146, and 169.

2/ UNIDO, "Chemical fertilizer complex feasibility study for Nicaragua" (UNIDO/TCD.136), p. 17.

3/ FAO, Annual Fertiliser Review, 1974 (Rome, 1975), p. 49.

Status and capacity of fertiliser plants

Location	Start-up	Ownership	Capacity: Product	Capacity: Thousand tons per annum	Capacity: Nutrient	Capacity: Thousand tons per annum	Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
Corinto	...	Interoro (mixing plant)	Mixed fertilizers	11.8	...	...	...	...
Corinto	...	Abonos Superior (mixing plant)	Mixed fertilizers	27.2	...	...	...	...
Corinto	...	Fenisa (mixing plant)	Mixed fertilizers	9.1	...	...	...	...

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Restricted distribution.

PANAMA

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	-	8 000*	15 000*	23 100	32 000
	Production	-	-	-	...	...
	Deficit	-	8 000*	15 000*	...	...
	Surplus	-	-	-	...	...
P_2O_5	Consumption	-	-	...	...	...
	Production	-	-	-	...	...
	Deficit	-	-	...	...	...
	Surplus	-	-	...	...	...
K_2O	Consumption	-	-	...	...	...
	Production	-	-	-	...	...
	Deficit	-	-	...	...	...
	Surplus	-	-	...	...	...

Sources:

1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150.

1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151.

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1975/76 and 1980/81: Estimates of F. J. E. van Dierendonck, UNIDO consultant.

General

Panama lies at the southern end of the isthmus between North and South America and is bisected by a 16-km-wide strip of territory known as the Canal Zone. Costa Rica is Panama's neighbour to the north, and Colombia lies to the south. Between the Cordilleras de Veraguas and San Blas lies an east-west belt of valleys and high hills nearly 80 km wide, and it is here that the east-west routes are concentrated, including the Panama Canal. In area, the country is 75,650 km^2 (excluding the Canal Zone).

The climate is tropical, warm and humid, with high rainfall. The rainy season is from April to December. The average annual temperature is 27°C, and average humidity is 85-98 per cent.

In 1972, population was about 1.6 million with an average annual growth rate of 3.1 per cent. About 43.1 per cent of the working population was engaged in agriculture in 1970.

The economy is largely based on agriculture. Principal exports are bananas, which account for 45 per cent of total exports, sugar-cane, beef, shrimp and refined petroleum products.

The Colón Free Zone, established in 1948 at the Atlantic end of the Panama Canal, offers useful facilities to exporters. The principal trading partner of Panama is the United States of America. Panama is also one of the most important banking and financial centres in Latin America.

In 1971, GNP at market prices was $1,210 million and per capita GNP was $820. During the period 1965-1971, per capita GNP grew at an average annual rate of 4.5 per cent.

In 1971, agriculture accounted for 18 per cent of GDP; mining and quarrying, 0.3 per cent; and the manufacturing industries, 16 per cent.

Agriculture

The distribution of land according to use in 1971 was as follows (thousand hectares):

Total area	7 565
Arable land	431
Land under permanent crops	111
Permanent meadows and pastures	1 141
Forests and woodlands	5 800*
Other land	82

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In 1961, 14,000 ha were irrigated.1/

The Pacific plains and hilly lands of the Azuero peninsula have fertile soil and are the centre of banana production. Bananas are also grown in the north-east on the Atlantic coast. The Sierra de Chiriquí and Cordillera de Veraguas are rainy and rugged. Their northern slopes are uninhabited, while 13 per cent of the population lives on their southern slopes, where fruit, tobacco, coffee are grown and cattle are raised.

Cotton growing started only recently. Apart from the large-scale commercial farming of export crops (primarily bananas and sugar-cane), agriculture consists of the cultivation of staples (beans, corn and rice). The raising of beef cattle dominates the livestock sector.

The main agricultural problem is still low productivity. Over 85 per cent of the plots are worked by manual labour alone. In many areas, the quality of the land is poor as it has been exploited for many years without renewal through fertilization. Soil erosion is widespread, since only small areas are irrigated. Serious flooding and droughts also present problems.

Production figures for 1974 for the main crops are given below:

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Tobacco leaves	1.2	862	1.0
Bananas	230F	4 217	970F
Cocoa beans	3.2F	156	0.5*
Coffee, green	22.4F	214	4.8*
Sugar-cane	26	54 695	1 433
Dry beans	12	289	3
Rice, paddy	109	1 569	171
Cereals, total	182	1 273	231
Sesame seed	0.22F	545	0.12F
Maize	73*	828	60*

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 41, 46, 50, 74, 105, 157, 170, 176, 178 and 181.

Natural resources and industry

Since Panama's mineral resources have not yet been fully explored, the country's potential in this regard is still largely unknown. To help correct this situation, a United Nations mineral resources team conducted a survey in the country, the preliminary findings of which showed the existence of possibly rich copper deposits at Petaquilla in Colón Province. These were estimated at 200-300 million tons of low-grade ore. Copper reserves discovered recently in Chiriquí Province have been estimated at 2.2 billion tons ore with average copper content of 81 per cent.

Phosphate deposits in central Panama have been found, but the possibility of using them for fertilizer has still to be explored. Other natural resources include bauxite and black sands. Magnetite ore from these sands is of a high grade (65 per cent Fe content) and is exported.

In the Bay of Panama the first test borings for oil began off shore in November 1973.

There is one refinery in the country - the Refinería Panamá SA, at Bahia Las Minas, Province of Colón. It has been operating since 1962, using crude oil imported from Venezuela. Its crude capacity was initially 55,000 bbl/d, but was later expanded to 75,000 bbl/d. It is owned by Ultramar.

Electricity produced in 1972 amounted to 8,376 million kWh. Panama has plans to exploit its hydroelectric power potential over the next few years. The Bayano River project now under way, and financed by assistance from the World Bank, will supply 150,000 kW. Other projected plants include the La Fortuna hydroelectric power project on the Chiriquí River and additional thermoelectric facilities at Bahia Las Minas.

The country has no heavy industry. Industrial production consists mainly of basic consumer necessities and processing of agricultural commodities. Fish processing is important. Other industries include textiles, pharmaceuticals, cement, metalwork, furniture, shoes, clothing, soaps, fats and oils, cigarettes, brewery products and soft drinks. The trend has recently been towards import-substitution industries with export potential. There are two small steel rolling mills and an aluminium extrusion plant. The tourist industry is one of the leading growth industries.

Fertilizer production

In 1970, the Government requested the United Nations Industrial Development Organization (UNIDO) to assist the Office of Planning and Management, Ministry of Commerce and Industry, in studying the feasibility of a domestic fertilizer industry. The UNIDO expert concluded that it would be feasible to convert locally produced or imported nitrogen into nitric acid, which could then be further processed into either AN (33.5 per cent N) or CAN (25 per cent N) and complex fertilizers. The plant would have naphtha as feedstock.

The status of the Government's present plans to develop a fertilizer industry is not known.

Fertilizer consumption

Fertilizer consumption in 1973/74 was as follows (tons): N, 16,500; P_2O_5, 6,800*; and K_2O, 7,000*.[2/]

Fertilizer use on arable and on agricultural land in 1973/74 was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	30.4	9.8
P_2O_5	12.5	4.0
K_2O	12.9	4.2
Total	55.9	18.0

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Per capita fertilizer consumption in the same year was 18.7 kg nutrients.[3/]

Fertilizer use according to crop can be divided into five groups - bananas, cereals, sugar-cane, horticultural crops (including tobacco and pastures) and tree crops (cocoa, coffee and citrus). In 1969, the percentage of use was: bananas, over 40; cereals, 30; sugar-cane, 13.5; tree crops, 10; and horticultural crops, 6.5.

The principal fertilizers used are urea, which accounts for 95 per cent of nitrogen fertilizer consumption, and compounds of various composition. The use of straight potash and phosphate fertilizer has become negligible in recent years. AN (33.5 per cent N) and CAN (20-23 per cent N) have only recently been introduced and are used mainly in cereal cultivation and on sugar-cane plantations, where they are reported to be as effective as urea.

The average nutrient content of compounds during the period 1966-1969 was 13.4-17.8-13.2 (44.4 per cent NPK). The trend now towards 1-1-1 ratios indicates increased selectiveness and awareness of the need for more balanced nutrient application. Compounds high in P_2O_5 content (such as 12-24-12 and 10-30-10 formulae) are favoured as a basic dressing in cereal growing. Compounds high in N and K_2O content are used for perennial crops.

All chemical fertilizers are imported. The chief source of supply of nitrogen fertilizers is Western Europe, especially the Federal Republic of Germany and the Netherlands. Some urea and AN are also imported from the Caribbean area, in particular from Costa Rica.

2/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

3/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

A characteristic aspect of the Panamanian market for fertilizers is that consumer demand is fairly steady throughout the year.

Imports of fertilizers in 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	15 300*	15 500*	16 500
P_2O_5	4 000F	5 300*	6 800*
K_2O	4 000F	5 300*	7 000*

Source: FAO, Annual Fertiliser Review, 1974 (Rome, 1975), pp. 114, 146 and 169.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Capacity: Product	Thousand tons per annum	Nutrient	Thousand tons per annum	Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
Suggested for Colón or Aguadulce	...	...	Anhydrous ammonia	33	N	27	...	...
			Nitric acid	62.7	N	13.8		
			AN	60	N	20		
			CAN	80	N	20		
			Complex fertilisers (average composition: 13.4-17.8-13.2 = 44.4NPK)	50	N	6.5		

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PUERTO RICO

Consumption and production of fertilizers

The FAO Production Yearbook, 1974 gives no information on production and consumption of fertilizers in Puerto Rico.

General

Puerto Rico, with an area of some 8,900 km^2, is the easternmost island in the Greater Antilles and lies between Hispaniola and the Virgin Islands. It is largely mountainous. Cultivated lands lie mainly along the north coast on a narrower strip along the south coast where cultivation has been made possible by irrigation. The climate is mild. Temperatures average 24°-27°C the entire year round.

Puerto Rico has been a semi-autonomous commonwealth in free association with the United States of America since 1952. It lies within the United States currency, customs and postal areas, though it is not subject to federal taxation other than customs duties.

In 1972, the population was estimated at 2.8 million, with an average annual growth rate of 1.2 per cent. In 1970, 13.9 per cent of the working population was engaged in agriculture.

In 1971, GNP at market prices was $5,050 million; per capita GNP was $1,830. During the period 1965-1971, per capita GNP grew at an average annual rate of 5.9 per cent.

In 1971, agriculture accounted for 3 per cent of GDP; mining and quarrying, 2.5 per cent; and manufacturing industries, 23 per cent.

During the last few years, rapid industrial growth has taken place in Puerto Rico. This trend is expected to continue. The tourist industry is becoming an increasingly important source of income for the country.

A free zone in Mayaguez was opened in 1962. There is a smaller free zone at Peñuelas and one is planned for San Juan.

Agriculture

The distribution of land according to use in 1970 was as follows (thousand hectares):

Total area	890
Arable land and land under permanent crops	207
Permanent meadows and pastures	330
Forest land	126
Other land	227

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In 1973, some 39,000 ha of land were irrigated.1/

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In the lower areas of the island, the main crop is sugar-cane. The foothills of the Central Mountains support the cultivation of coffee and tobacco as cash crops.

Livestock and vegetable production have expanded considerably over the last few years, and they now account for over 60 per cent of the country's total net income from agriculture. The traditional exports of sugar, coffee and rum have recently tended to decline. Coffee production, however, shows signs of increase.

Production figures for 1974 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Sugar-cane	50	65 706	3 252
Citrus fruits	...	...	...
Coffee, green	51F	235	12*
Tobacco leaves	1.5	2 026	3.04
Cocoa beans	...	...	...
Rum	...	...	...
Rice, paddy	3F	727	2F

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 46, 157, 166, 176, 178 and 181.

Natural resources and industry

The oil refineries in Puerto Rico, with associated chemical industries, include the world's largest petrochemical aromatics plant. They are: the Caribbean Gulf Refining Corporation at Bayamón (crude capacity, 37,800 bbl/d); the Commonwealth Oil Refining Co., Inc. Peñuelas at Guyanilla (oruds capacity, 185,000 bbl/d); and the Yabucoa Sun Oil Refinery at Yabucoa (crude capacity, 85,000 bbl/d).[2/] The refineries at Bayamón and Guyanilla use crude oil imported from Venezuela.

Puerto Rico is the petrochemical centre of the Caribbean area. The chemical industry includes pharmaceuticals, organic and inorganic chemicals, plastics and other synthetic materials.

At the Sun Oil Refinery, two sulphur-recovery (28 t/d) and ammonia-processing units were commissioned in May 1972. The first phase of this oil refinery comprises an oil-processing unit and a lubricating-oil plant.

Copper deposits exist in the south-central area near Adjuntas and Utuado. A copper-mining and smelting operation has been proposed for the west-central part of the island.

Electricity production in 1972 was 112.56 million kWh.

Fertiliser production

The Caribe Nitrogen Corporation at Guanica produces AS. No other data on fertiliser production in Puerto Rico are available.

Fertiliser consumption

No data on fertilizer consumption in the country are available.

2/ International Petroleum Encyclopedia, 1974 (Tulsa, Oklahoma, Petroleum Publishing Co., 1972), p. 359.

Status and capacity of fertiliser plants

Location	Start-up	Ownership	Product	Capacity: Thousand tons per annum	Nutrient	Capacity: Thousand tons per annum	Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
Guanica	...	Caribe Nitrogen Corporation	AS	...	N	...	...	...

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TRINIDAD AND TOBAGO

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	12 829	27 677	5 700*	...	...
	Production	-	34 847	100 000*	...	...
	Deficit	12 829	-	-	...	...
	Surplus	-	7 170	94 300*	...	...
P_2O_5	Consumption	425	907	1 000*	...	...
	Production	-	-	-	...	...
	Deficit	425	907	1 000*	...	...
	Surplus	-	-	-	...	...
K_2O	Consumption	2 710	4 974	2 500*	...	...
	Production	-	-	-	...	...
	Deficit	2 710	4 974	2 500*	...	...
	Surplus	-	-	-	...	...

Sources:

1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 149 and 150.

1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151.

1970/71: FAO, Production Yearbook, 1973, vol. 27 (Rome, 1974), pp. 259 and 257.

General

Since 1888, the islands of Trinidad and Tobago have been under one administration. The country obtained independence in 1962, becoming a member of the British Commonwealth of Nations.

Trinidad is the largest and southernmost island of the Lesser Antilles chain in the Caribbean Sea, with an area of 4,830 km^2. It is about 11 km from the coast of Venezuela and is geologically an extension of the South American continent. There are three relatively low mountain ranges, the North, Central and South Ranges, the highest elevation of approximately 2,700 m being in the heavily forested Northern Range. The land between the Northern and Central Ranges is flat and well irrigated; south of the Central Range it is undulating. The supply of water is often short in the dry season. Half of the island is covered by tropical forests.

Tobago, with an area of 300 km^2, lies 30 km north-east of Trinidad. The main mountain ridge is of volcanic origin and reaches a maximum height of 600 m.

Trinidad's climate is tropical but pleasant with daily maximum temperatures averaging 33°C. The wet season lasts from June to December and the dry season from January to May. Mean temperatures vary little from season to season.

Temperatures are cooler in Tobago, owing to more constant exposure to the trade winds. Mean temperature ranges from 22° to 33°C. Rainfall varies from 125 to 250 cm a year. Relative humidity averages 82 per cent in the mornings and 71 per cent in the afternoons.

The main commercial centre of the East Caribbean, Trinidad and Tobago is favourably situated on the major sea and air lanes between South America, the United States of America and Europe. It is a member of the Caribbean Common Market.

Population in 1972 was about 1 million, with an average annual growth rate of 0.9 per cent.

Petroleum is the chief source of wealth in the country and the reason for the comparatively high standard of living. The industrial sector is largely devoted to the refining of crude oil. Refined and crude products supply 75 per cent of total exports.

In 1971, GNP was $970 million at market prices and per capita GNP was $940 - one of the highest in Latin America. During the period 1965-1971, per capita GNP grew at an average annual rate of 2.5 per cent.

The Third Five-Year National Development Plan (1969-1973) had as a goal to reduce dependence on petroleum by encouraging the growth of the manufacturing industry; agriculture, the diversification of which was emphasized, and tourism. Manufacturing has been expanding considerably. The Government is encouraging investment in new industries by granting tariff protection. Tourism has not yet developed to the same extent as in the northern Caribbean, but expansion in this sector is forecast.

Agriculture

The distribution of land according to use in 1963 was as follows (thousand hectares):

Total area	513
Arable land	57
Land under permanent crops	82
Permanent meadows and pastures	6
Forests and woodlands	232
Other land	136

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In 1964, some 11,000 ha of land were irrigated.1/

Approximately 30 per cent of Trinidad's land area and over 50 per cent of Tobago's is devoted to agriculture. Agriculture is the country's largest single source of employment. In 1970, 16.6 per cent of the working population was engaged in this sector.

The agricultural sector is characterized by domestic or peasant agriculture on the one hand and export or plantation agriculture on the other. Domestic agriculture produces low yields, mainly owing to non-application of modern farming techniques. Plantation agriculture enjoys relatively large inputs of capital and relatively high productivity as a result of more organized application of scientific research and modern farming techniques.

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In Trinidad soils are extremely varied and certain parts are very well suited to cultivation of sugar and other tropical or subtropical crops. Sugar is the largest agricultural earner.

Production figures for 1974 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Sugar-cane	38*	50 215	1 931*
Cocoa beans	20F	200	4
Coffee, green	10F	181	1.8*
Citrus fruits	...	...	2F
Bananas	1F	5 300	5F
Coconuts	...	...	55F
Rum	...	...	...
Rice, paddy	4F	2 795	12F
Tobacco leaves	0.271*	1 055	0.29*

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 46, 126, 157, 166, 170, 176, 178 and 181.

Natural resources and industry

Large deposits of oil have been found off the east coast of Trinidad. Their exploitation has already given a new impetus to the petroleum industry. In 1972, crude oil reserves were estimated at 1.5 million bbl (or 215 million tons); petroleum production was 7,248,000 tons of low sulphur, high-gravity crude.

Natural gas reserves in 1972 were estimated at 142 billion m^3; natural gas production was 1,617.6 million m^3. In 1976, Trinidad will become the first Western Hemisphere exporter of liquified natural gas.

There are three refineries in the country:

Company and refinery location	Crude capacity (bbl/d)
Shell Trinidad Ltd, Point Fortin	100 000
Texaco Trinidad Inc., Point-a-Pierre (with a new 90,000 bbl/d desulphurisation unit and an associated 250 t/d sulphur-recovery unit)	355 000
Texaco Trinidad Inc., Brighton	6 000
Total	461 000

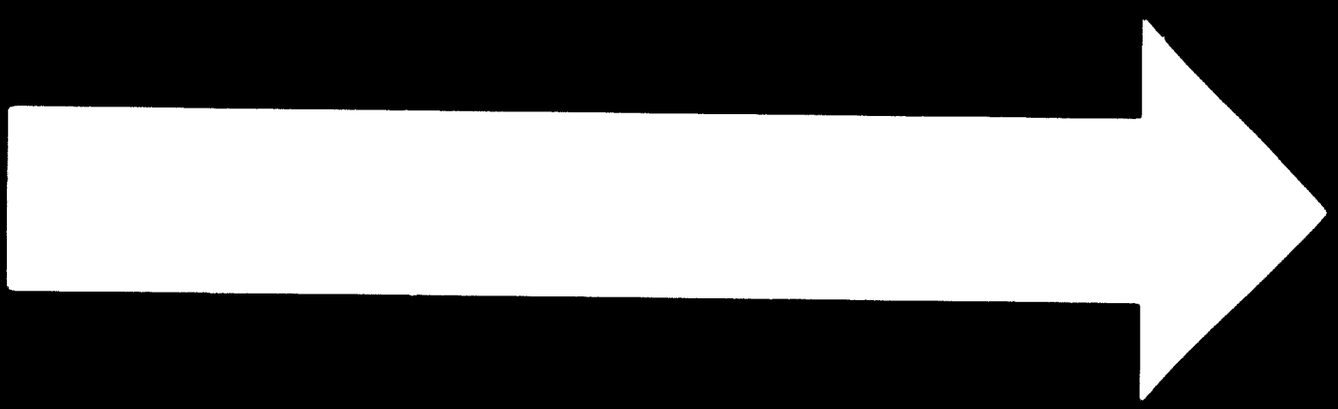
Source: International Petroleum Encyclopedia, 1974 (Tulsa, Oklahoma, Petroleum Publishing Co., 1974), p. 360.

The total refining capacity is therefore about 461,000 bbl/d. The refineries use almost all of the country's domestic crude oil production, in addition to substantial imports from Venezuela and the Middle East.

Electricity production in 1971 was 1,266.4 million kWh.

Other natural resources include asphalt, limestone and white sand (which is suitable for glass making).

B-348



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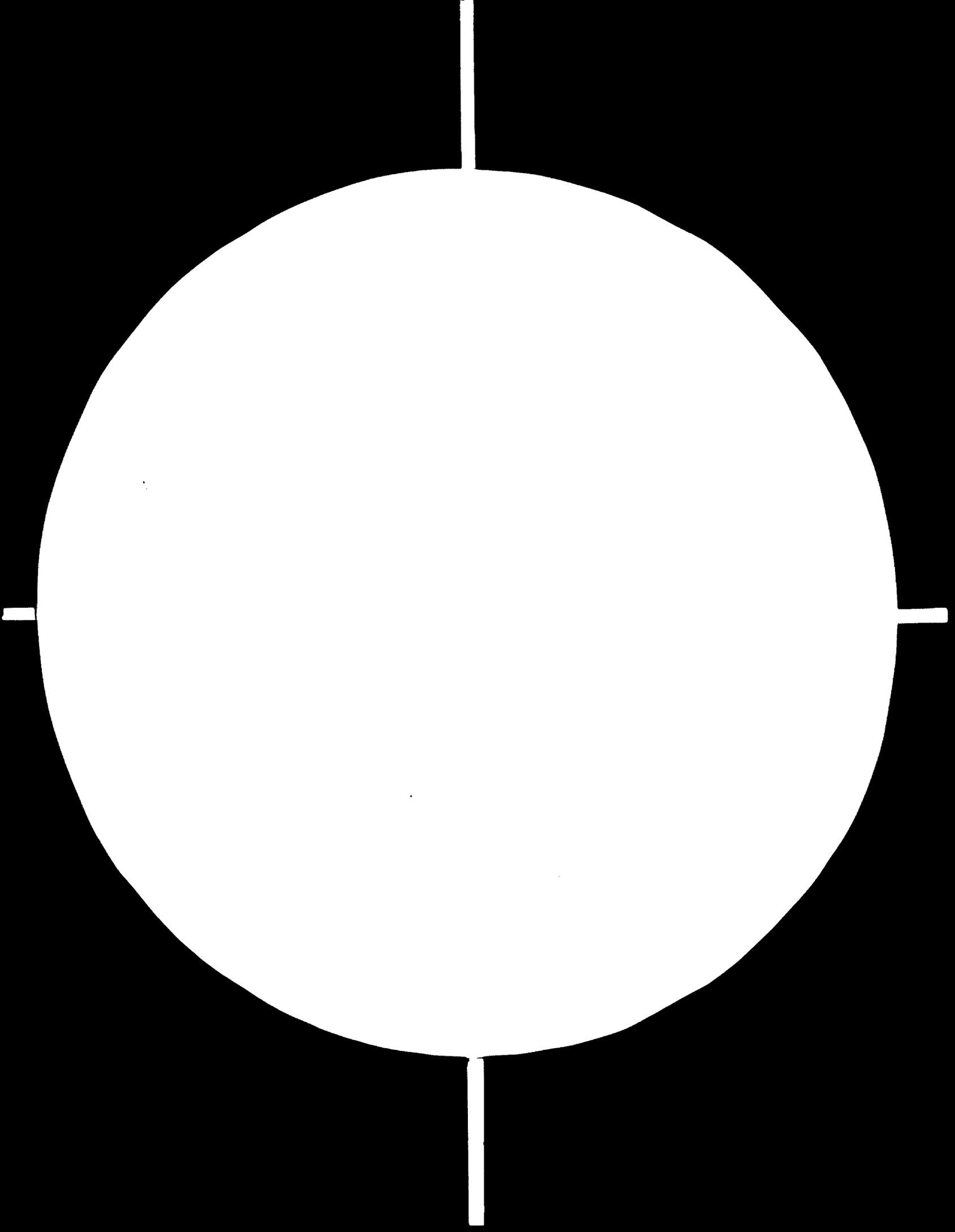

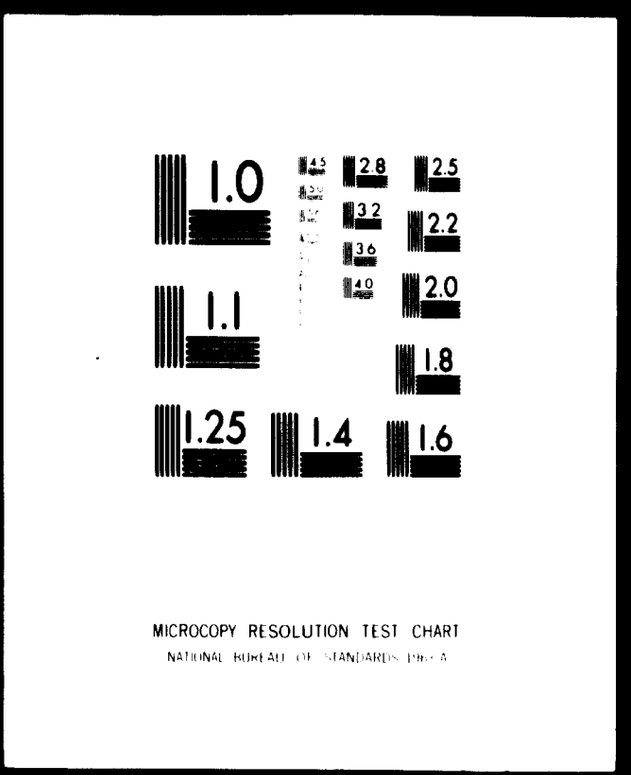

There are many industrial estates in Trinidad and Tobago. The petrochemical industry produces petrochemical building blocks, basic intermediates and by-product sulphur.

In 1959, the Trinidad and Tobago Industrial Development Corporation was established. Its goal is to accelerate economic development by encouraging and promoting a rational programme of industrialization.

Fertilizer production

In 1972/73, 114,300* tons of nitrogen fertilizers were produced in Trinidad and Tobago. In 1973/74, production dropped to 67,300 tons.[2/]

Federation Chemicals Ltd. (a subsidary of W. R. Grace and Co. of the United States of America) has a nitrogen fertilizer plant at Point Lisas using by-product sulphur from the Texaco Refinery. Products are ammonia, urea and AS. Rated capacity is 505,000 t/a of liquid ammonia, from which 75,000 tons of urea and 90,000 tons of AS are produced. Some 20 per cent of the AS is consumed locally, and the remainder is exported.

An expansion to the Point Lisas plant is the new, 1,200 t/d ammonia plant planned for 1976. A new joint-venture company - Trinidad Nitrogen Co., Ltd. - has been created to operate the plant by the Government and W. R. Grace and Co., Ltd. This new plant will more than replace the line at the existing unit, which was switched over to hydrogen manufacturing early in 1973. As a result of the changeover, ammonia production in 1973 fell to 280,000 tons as compared with 460,000 tons in 1972.

A further unit of similar size, together with a 3,000 t/d methanol unit, is also under consideration, although no definite site has yet been chosen.

Fertilizer consumption

In 1973/74, fertilizer use on arable and on agricultural land was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	50.4	48.3
P_2O_5	9.8	9.4
K_2O	34.6	33.2
Total	94.8	90.9

Source: FAO, Annual Fertiliser Review, 1974 (Rome, 1975), p. 49.

Per capita consumption of nutrients in the same year was 12.4 kg nutrients.[3/]

The Ministry of Agriculture has constructed a subsidy scheme with Federation Chemicals Ltd. to encourage the use of fertilizers in the country.

2/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 251.

3/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Imports of fertilizers for 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	400*	400*	400*
P_2O_5	800*	600*	1 365
K_2O	3 000*	6 300*	4 812

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 114, 146 and 170.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Capacity				Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
			Product	Thousand tons per annum	Nutrient	Thousand tons per annum		
Point Lisas	...	Federation Chemicals Ltd.	Ammonia	500	N	410	410	-
			AS	90	N	18		
			Urea	75	N	35		
Point Lisas (Expansion)	1976	Trinidad Nitrogen Co. Ltd.	Ammonia	438	N	360	360	-

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SOUTH AMERICA

ARGENTINA

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	8 525*	25 000*	41 003	100 000a/	400 000a/
	Production	...	4 000*	34 209	35 000	...
	Deficit	...	21 000*	6 794	65 000	...
	Surplus	...	-	-		...
P_2O_5	Consumption	4 636*	10 000*	38 890	100 000a/	400 000a/
	Production	...	4 000*	1 085	4 000	...
	Deficit	...	6 000*	37 805	96 000	...
	Surplus	...	-	-	-	...
K_2O	Consumption	2 769*	6 600*	7 143	13 500	22 000
	Production	-	-	-	-	-
	Deficit	2 769*	6 600*	7 143	13 500	22 000
	Surplus	-	-	-	-	-

Sources:

1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125 and 149.

1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 148 and 151.

1970/71: FAO, Production Yearbook, 1972, vol. 26 (Rome, 1973), pp. 231 and 233.

1975/76 and 1980/81: (marked a/): Nitrogen, No. 88 (March/April 1974), pp. 32-35.

1975/76 and 1980/81: (not marked a/): UNIDO, "Report and proceedings", Meeting on the Development of Fertilizer and Pesticides Industries in Latin America, Rio de Janeiro, 15-19 September 1970 (ID/WG.80/9), p. 162.

General

Argentina, with an area of approximately 2,776,890 km^2, is the most southerly country on the Atlantic seaboard of South America. Its western boundary with Chile is formed by the Andes. In the north, it borders on Bolivia and Paraguay, and in the north-east on Brazil and Uruguay.

The climate and the rainfall vary largely according to area. The eastern half of the country is lowland, and here the climate ranges from subtropical to temperate. The Pampas area of the southern half is steppe country with lower rainfall and a mild subtropical climate. Farther south, the climate is temperate, becoming progressively colder and wetter the farther south the location or because of the modifying effect of the high, rocky Patagonian plateau. The lowlands are drained by a river network.

In 1972, the population was some 25 million, with an average annual growth rate of 1.6 per cent. Some 15.2 per cent of the working population was engaged in agriculture in 1970.

In 1971, GNP was $28,920 million (at market prices), and the per capita GNP amounted to $1,230; the latter grew at an average annual rate of 2.6 per cent during the period 1965-1971.

The country is one of the world's most important producers of meat and grains, which accounted for some 90 per cent of export earnings for many years. But this situation started to change a few years ago. For example, in 1973, agricultural exports accounted for not more than 80 per cent and possibly only 75 per cent of export earnings.

A breakdown of GDP in 1970 shows that agriculture accounted for 16 per cent, mining and quarrying only 2 per cent, and manufacturing industries 26 per cent. Manufacturing is the most dynamic sector of the economy.

Argentina is a member of LAFTA, which includes Brazil, Mexico and all other Spanish-speaking countries of South America. Argentina is also a member of the Basin of the River Plate Association, a subregional group within LAFTA, formed in 1969 by Argentina, Bolivia, Brazil, Paraguay and Uruguay.

Agriculture

The distribution of land according to use in 1968 was as follows (thousand hectares):

Total area	277 689
Arable land	23 851
Land under permanent crops	2 177
Permanent meadows and pastures	144 947
Forests and woodlands	62 700
Other land	44 014

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In 1959, some 1.6 million ha were irrigated.[1/]

The dominant agricultural region and most heavily populated area is the Pampas (i.e. the Provinces of Buenos Aires, Córdoba, La Pampa and Santa Fé). The Pampas area is a gently rolling plain in the temperate zone, where average annual rainfall is 90-98 cm in the east and 51 cm in the west.

The soil is generally fertile, and the Pampas area contains some of the richest topsoil in the world. It is cultivated extensively in wheat and corn and provides all-year pasturage for most of Argentina's beef cattle.

Argentina produces a very wide variety of agricultural products. Agricultural production is the main source of hard currency earnings for the economy. Cereals are the basis of the export trade. About 85 per cent of Argentina's crop and livestock exports comes from the Pampas area, where the climate is ideally suited both to grain production and cattle raising. Production in the remainder of the country is mainly for home consumption. The main crops are wheat, barley, oats, oilseeds, sorghum and maize. The volume of agricultural output fluctuates widely in response to changes in prices on the world market in addition to wide variations in yields caused by changes in weather conditions.

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Little new land is available for agricultural expansion, and thus increased production must come from land already exploited. Goals of the National Development Plan are to implement irrigation projects, to promote soil conservation and pasturage development programmes, and to double wheat and livestock production by 1980. Emphasis is to be placed on using fertilizers on forage and industrial crops and on introducing use of fertilizers on cereals in the Pampas region.

Production figures for 1974 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Wheat	3 902*	1 435	5 600*
Barley	351*	923	324*
Oats	253*	1 249	316*
Rye	344*	892	307*
Maize	3 486	2 840	9 900
Cereals, total	11 200	2 068	23 160
Sugar-cane	339	51 954	17 600
Cotton (lint)	...	...	118
Sorghum	2 500*	2 440	6 100*
Grapes	325	10 849	3 528
Tobacco	86.7	1 126	97.6
Sunflower seeds	1 190	815	970
Rice, paddy	83	3 821	316
Flax fibre and tow	2.4F	625	1.5F
Sweet potatoes	51	6 324	320
Soya beans	334	1 483	496

Sources: FAO, Production Yearbook, 1974 (Rome, 1975), pp. 41, 44, 46, 48, 50, 52, 53, 56, 65, 86, 98, 153, 157, 181, 183 and 189; and C. C. Zárate, Demanda de Fertilizantes en la Argentina, paper prepared for the Third National Congress of Petrochemicals, Salta, Argentina, June 1974.

Natural resources and industry

Although mineral deposits are numerous, they are generally small or difficult to reach. The principal commercial exploitation is limited to petroleum, natural gas, coal and salt. Also mined are lead, zinc, sulphur, manganese and iron ore.

Proved and probable reserves of crude oil were estimated in January 1972 at 2,500 million bbl (or 349 million t). Production in 1972 amounted to 22,128,000 tons. All petroleum reserves are the property of the State. The State oil company is Yacimientos Petrolíferos Fiscales (YPF). There are deposits of crude oil at Santa Cruz Norte, Santa Cruz Sur, Pampa, and Tierra del Fuego. A new petroleum deposit was recently discovered in the Province of Salta.

Proved and probable reserves of natural gas were estimated in 1972 at 215 billion m^3; production in 1972 was 6,180 million m^3. Natural gas reserves exist at Santa Cruz, Jujuy, Salta, Mendoza, Neuquén, Rio Negro, Chubut, and Tierra del Fuego. About 50 per cent of Argentina's gas reserves are located in the Comodoro Rivadavia area. The supplies of natural gas would be ample for the production of nitrogen fertilizers. At present, however, there is not enough infrastructure to enable the natural gas to be exploited fully.

Natural phosphate rock exists, but its phosphorus content is very low. The largest known reserves of phosphate in the country are contained in the iron ores with high phosphate content in Jujuy Province and Sierra Grande.

The State Argentina Steel Company (HIPASAM), together with the Japanese Unioo International Corporation, is studying the feasibility of establishing a phosphate fertilizer plant based on the phosphate values in the iron ore deposits of the Sierra Grande to supply part of Argentina's expected growth in demand for P_2O_5. They are working on possible concentration of the phosphate content in iron ore to 15 per cent.

Production of sulphur, found mainly along the eastern slope of the Andes, reached 35,000 tons in 1969. Sulphur is, however, costly to mine and transport. The ore quality is variable (30-60 per cent S content); sulphuric acid is produced as a by-product in several installations. In 1972, production was 242,400 tons.

Alunite, which contains hydrated potassium aluminium sulphate, exists in Chubut.

Refining capacity in 1973 was 623,563 bbl/d. The following refineries operate in the country:

Company and refinery location	Crude capacity (bbl/d)
Astrasur, Refinerías Patagónicas de Petróleo SA, Comodoro Rivadavia, Chubut	6 800
Destileria Argentina le Petróleo SA, Lomos de Zamora	1 800
Cía. Cóndor, Avellaneda	1 300
Esso SAPA, Campana	91 900
Esso SAPA, Galván	17 000
Ragor, SAIC, Quilmes	600
Refinería de Petróleo la Isaura SA, Bahía Blanca	12 580
Shell Compañía Argentina de Petróleo SA, Buenos Aires	115 000
YPF, Campo Durán	28 305
Dook Sud	5 975
El Centauro, Tierra del Fuego	189
La Plata	191 845
Luján de Cuyo	113 200
Plaza Huincal	5 032
San Lorenzo	33 337
Total	623 563

Source: International Petroleum Encyclopedia, 1974 (Tulsa, Oklahoma, Petroleum Publishing Co., 1974). p. 352.

Astrasur Refineries, in Patagonia, are under construction. Their capacity is planned at 17,000 bbl/d crude.

Coal and limestone also exist. Coal production in 1972 amounted to 675,600 tons. Copper and tin are also to be found; aluminium will be produced when the Puerto Madryn plant in Northern Patagonia is opened. Other deposits include beryllium, tungeten, thorium and uranium.

The Government has announced a plan to reduce the country's dependence on petroleum through developing alternative energy sources, notably, hydroelectricity. Argentina has vast hydroelectric power potential but uses at present only a small portion. The programme of the Atomic Energy Commission is to establish nuclear power plants with a capacity of 2,500 MW by 1980. A power plant at Atucha began operations in 1974. A second nuclear power plant with a capacity of 600,000 kW is planned for Río Tercero (Córdoba). In 1972, some 20,556 million kWh of electricity were produced in the country.

Argentina has a highly developed industrial base, capable of producing almost any goods needed by the domestic market. However, many plants are out of date, and some entire industries are in need of thorough revitalization. Industrial estates and zones are planned for Comodoro Rivadavia and Rawson-Trelew. Argentina's industries include: plastics, wool, steel, industrial machinery and equipment, agricultural machinery, textiles, chemicals and petrochemicals, metallurgical industry and automotive industry.

Fertilizer production

Fertilizer production in 1971/72, 1972/73 and 1973/74 was as follows (tons):

Nutrient	1971/72		1972/73	1973/74
N	39 450	(47 000)[a]	38 000*	38 000*
P_2O_5	4 200*	(1 500)	5 000*	5 000*
K_2O	-		-	-

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 251.

a/ Figures in parentheses were provided by the Institute of Soils and Agricultural Technology and the Department of Fertilizers of the Secretariat of State for Agriculture and Livestock.

Imports of fertilizers in 1972/73 and 1973/74 were as follows (tons): N, 13,000*; P_2O_5, 28,000*; and K_2O, 16,600*.[2/]

A breakdown of N and P fertilizers produced in 1971/72 (tons of N and P) shows the following:[3/]

Ammonia	4 800	Excluding ammonia used for AN and urea
AS	49 400	Excluding where product is used for complex fertilizers
Urea	45 800	Excluding where product is used for complex fertilizers
Complex fertilizers (NPK)	19 600	
Basic slag	10 000	
Miscellaneous organic fertilizer	30 400	

The major plants in the country are described below.

Campana, Buenos Aires

This ammonia/urea plant, the first nitrogen fertilizer complex in Argentina, is operated by PETROSUR and uses natural gas from Campo Durán. Sulphur needed is mostly imported or obtained as by-product from smelters and coke ovens. The urea unit is of the partial-recycle type. The plant started up in 1968. Products are ammonia, sulphuric acid (98% H_2SO_4), urea, AS and NPK fertilizers.

2/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 115, 132 and 170.

3/ C. C. Zárate, Demande de Fertilisantes en la Argentina, paper prepared for the Third National Congress of Petrochemicals, Salta, Argentina, June 1974.

Rosario

PETROSUR also has a granulating plant here that began operating in 1968 and produces 30,000 t/a of NPK mixes. This plant prepares five different formulations of commercial fertilizer. A "pan granulator" process of the Düngemittel Technik AG (Federal Republic of Germany) is employed. The firm imports various raw materials and also uses end-products from the PETROSUR Campana plant.

Río Tercero, Córdoba

Dirección General de Fabricaciones Militares (DGFM) manufactures here ammonia for explosives. It also produces AS, which is marketed as fertilizer, although production is generally much lower than rated capacity. The plant is over 20 years old and uses the coal gasification process.

Jujuy

DGFM has a steel plant here that produces Thomas slag as a by-product.

San Nicolás, near Buenos Aires

Sociedad Mixta Siderúrgica produces AS here as a by-product of coking operations at its steel plant. Production is below rated capacity. The plant, which started up in the early 1960s, uses coke-oven gas as feedstock. The output of AS is distributed by DGFM.

Industrías Agrofert SA is considering the establishment of a granular TSP plant capable of meeting an estimated demand of 100,000 t/a. The company is at present evaluating the various alternatives of supply of raw materials. Industrías Agrofert expects demand for TSP to reach about 85,000 t/a by the mid 1970s. It is envisaged that sulphuric acid and phosphoric acid will also be manufactured on site.

San Lorenzo

YPF is again reviewing the possibility of building a 1,000 t/d ammonia plant with associated fertilizer units, producing urea, CAN and complex fertilizers and nitric acid. The feedstock would be natural gas, carried in from a spur of the natural gas pipeline recently constructed from Bolivia into northern Argentina. Phosphate rock and potash would be imported.

Industría Petroquímica para el Agro (IMPAGRO) plans to erect a large-scale ammonia plant using natural gas as feedstock. DGFM is planning an ammonia plant that also produces urea, AN and NPK fertilizers.

Cordonses-Argentina is constructing a 35,000 t/a caprolactam plant with 57,000 t/a co-product AS. The plant will utilize the DSM process. A complex fertilizer plant is also under consideration. The company will use NH_3 from YPF, and sulphur is to be imported.

Buenos Aires

A phosphoric acid plant owned by Villa Aufricht y Cía operates in Buenos Aires.

Future project

For nitrogen production, letters of intent were signed towarde the end of 1973 for the uee of natural gas from Santa Cruz in Bolivia in an ammonia/urea complex to be sited either in Bolivia or on the natural gas pipeline as far south as San Lorenzo. Growth in demand would support a 900 t/d ammonia/1,200 t/d urea plant (perhaps by 1978) giving Argentina its first nitrogen facility that could produce at a competitive coet against imported supplies. Under Argentina's new industrial legislation, this project would be reserved to the public eector.

Fertilizer consumption

Fertilizer consumption in 1971/72, 1972/73 and 1973/74 was as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	45 000*	49 000*	51 000*
P_2O_5	23 900* (23 400)[a/]	25 000*	28 000*
K_2O	8 200*	8 000*	16 600*

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

a/ Figure in parentheses was provided by the Institute for Fertilizere.

The nitrogen fertilizers include AS, urea, eodium nitrate, straight N fertilizers and anhydrous ammonie.

Regional fertilizer consumption in 1970/71 wae as follows (per cent):[4/]

Mesopotamia	16.1
North-east	22.5
Andes	21.7
Pampas	27.5
Patagonia	12.1

Most fertilizers are ueed on inteneively cultivated crops, such as sugar-cane, vegetablee, tobacco and fruit. There has been little incentive to fertilize grain crops becauee of low product pricee, while pasture has been scarcely fertilized at all because of the extensive areas involved.

Use of fertilizers in relation to area under cultivation ie among the lowest in the world. Fertilizer uee on arable and on agricultural land in 1973/74 was ae follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	2.0	0.3
P_2O_5	1.1	0.2
K_2O	0.6	0.1
Total	3.7	0.6

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

In the same year, per capita fertilizer consumption was 3.8 kg nutrients.[5/]

The main fertilizere used are AS and urea. Straight phosphate fertilizers used are almost exolusively TSP, with some domestically produced Thomae slag. The leading NPK fertilizers are 15-15-15, 14-14-14, 10-20-20, 20-10-10 and 12-24-12, and the leading NP fertilizere are 18-47-0, 18-46-0, 20-20-0 and 18-51-0.

4/ Nitrogen, No. 88 (March/April 1974), p. 32.

5/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Extensive soil testing throughout Argentina has shown positive results from the application of even small amounts of phosphate. It is proposed to introduce increasing quantities of P_2O_5 on all types of crop and pasture, but especially on forage crops. Once phosphates become established, nitrogen will be steadily introduced, particularly as top-dressing on the wheat crop. However, farmers are still reluctant to use chemical fertilizers, since use of such fertilizers is considered in some cases "unnatural" and soils are generally of exceptionally high quality in the first place.

The National Institute for Agricultural Technology, an agency of the State Secretariat for Agriculture and Livestock, was established in 1956. Its work includes research into soil fertility and demonstrations to farmers on fertilizer use.

Overseas producers dominated the supply pattern for fertilizers until 1968, when the PETROSUR Campana plant became operational, and even for some time after this. In 1969, the Government imposed a ban on importation of products that were also manufactured by PETROSUR, including AS, urea, some compound fertilizers and anhydrous ammonia.

A large proportion of the Argentine compound fertilizer market has until now been filled by DAP from the United States of America (18-46-0).

In 1973, the Fertilizer Promotion Law (No. 20,496) was passed. The target is annual consumption of 237,000 tons of P_2O_5 and 249,000 tons of N by 1980. Fertilizers are to be made available to farmers at favourable prices. Until 1978, the increase in fertilizer consumption will probably still be met by imports. Estimates of potential achievement suggest consumption of 75,000-88,000 tons each of N and P_2O_5 by 1976/77.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Capacity				Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
			Product	Thousand tons per annum	Nutrient	Thousand tons per annum		
Campana	1968	PETROSUR SA	Ammonia	68	N	55	55	...
			Urea	55	N	25		
			AS	50	N	10		
			NPK fertilizers	30	NPK	...		
			Sulphuric acid (98% H_2SO_4)	...	-			
Rosario	1968	PETROSUR SA	NPK fertilizers	30	NPK	...	...	...
Río Tercero Córdoba	Approximately 1961	DGFM	AS	13	N	6	6	-
Jujuy	...	DGFM	Thomas slag	...	P	...	-	...
San Nicolás near Buenos Aires	Early 1960s	Sociedad Mixta Siderúrgica Argentina	AS	6	N	1	1	-
...	Under consideration	Industrias Agrofert SA	TSP	100	P	45	-	45
San Lorenzo, Santa Fé Province	Planned	YPF	Ammonia	300	N	246	246	...
			Urea	200	N	92		
			CAN	160	N	24		
			NPK fertilizers	200	NPK	...		
San Lorenzo	Planned	INPAGRO	Ammonia	209	N	172	172	-
San Lorenzo	Planned	DGFM	Ammonia	104	N	86	86	...
			Urea	42	N	19		
			Ammonium nitrate	36.3	N	-		
			NPK fertilizers	...	NPK	...		

Table (continued)

Location	Start-up	Ownership	Capacity			Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
			Product	Thousand tons per annum	Nutrient	Thousand tons per annum		
San Lorenzo	Under construction	Cordoneee-Argentina SA	AS	57	N	11	11	-
Bahía Blanca	Planned	...	Ammonia Derivatives	100 100	N ...	82	82	-
Buenos Aires	...	Villa Aufricht y Cía, Bolivia	Phosphoric acid	...	P	16	-	16
Either in Bolivia or on the natural gas pipeline in Argentina	Planned	YPF	Ammonia Urea	279 432	N N	229 198	229	-

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BOLIVIA

Consumption and production of fertilizers
(Tons)

Nutrient		Actual			Estimated	
		1960/61	1965/66	1970/71	1975/76	1980/81
N	Consumption	...	2 714	589	10 000	...
	Production	-	-	-	-	...
	Deficit	...	2 714	589	10 000	...
	Surplus	...	-	-	-	...
P_2O_5	Consumption	...	664	945	15 000	...
	Production	-	-	-	-	...
	Deficit	...	664	945	15 000	...
	Surplus	...	-	-	-	...
K_2O	Consumption	...	-	11	-	...
	Production	-	-	-	-	...
	Deficit	...	-	11	-	...
	Surplus	...	-	-	-	...

Sources:
1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 149 and 150.
1965/66: Government of Bolivia.
1970/71: FAO, Production Yearbook, 1973 (Rome, 1974), p. 259.
1975/76: Government of Bolivia.

General

A land-locked country, and one of the less developed countries of South America, Bolivia is situated in the eastern half of the continent. It has an extensive border with Brazil to the north-east and shorter frontiers with Paraguay to the south-east and Argentina to the south. On the west, it borders on Peru and Chile. It has an area of 1,098,580 km^2. The seat of Government is at La Paz, while the official capital of the country is Sucre.

The country is divided into three main regions, each of which differs from the other in climate, vegetation and density of population:

The Altiplano, the cold, dry and largely barren highlands occupying roughly 10 per cent of the total land area

The temperate and humid valleys (Valles)

The tropical and subtropical plains (Llanos)

Rainfall of the Altiplano averages annually 400-600 mm and occurs between December and March. The average temperature in La Paz, its major city, is 11°C with little difference between summer and winter. In the valleys, temperatures vary with altitude. In the valleys of Cochabamba, Sucre and Tarija, rainfall is similar to that of the La Paz area. To the north,

in the valleys descending to the Amazon Basin, known as "yungas", rainfall is much higher. The lowlands have two fairly distinct climatic zones: to the south of Santa Cruz lies the subtropical and semi-arid Chaco, with temperatures ranging from 0° to 40°C and a rainy season from December to March; to the north of Santa Cruz, the influence of the Amazon River makes for high temperatures and humidity.

Population in 1972 was about 4.9 million, with an average annual growth rate of 2.5 per cent. In 1970, about 58.3 per cent of the working population was employed in agriculture. About 70 per cent of the population lives in the Altiplano.

The economy depends to a large extent on the production and sale of minerals, especially tin. The main mineral deposits are to be found in the Altiplano. Mining is at present the backbone of the economy. The petroleum industry, however, is becoming increasingly important. In 1971, agriculture accounted for 18 per cent of GDP; mining and quarrying, 14 per cent; and manufacturing industries, 14 per cent.

Despite Bolivia's wealth of material resources and potential self-sufficiency in most of the essential ones, the country's development is greatly hampered by topography and climate, inadequate transport and communications, and the scarcity of local sources of investment.

In 1971, GNP was $950 million and *per capita* GNP was $190. The average annual growth rate of *per capita* GNP during the period 1965-1971 was 2.2 per cent. *Per capita* income in Bolivia is one of the lowest in South America.

Bolivia is a member of LAFTA and of the two subregional groups, the Andean Group and the Basin of the River Plate Association.

Agriculture

The distribution of land according to use in 1973 was as follows (thousand hectares):

Total area	109 858
Arable land	2 841
Land under permanent crops	80
Permanent meadows and pastures	28 365
Forests and woodlands	38 121
Other land	40 451

Source: FAO, *Production Yearbook, 1974*, vol. 28-1 (Rome, 1975), p. 4.

In 1973, 100,000 ha were irrigated.[1/]

The most highly developed agricultural region is the yungas, which covers the Departments of La Paz, Cochabamba, Chuquisaca, Tarija and western Santa Cruz. Agriculture is mainly of the subsistence type. Bolivia is at present self-sufficient in the production of sugar, rice and cotton. The principal crops are sugar, potatoes, barley, corn, wheat and rice. Production of coffee and bananas is increasing. Sheep and cattle farming predominate in animal husbandry.

1/ FAO, *Production Yearbook, 1974*, vol. 28-1 (Rome, 1975), p. 4.

Production figures for 1972 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Sugar-cane	37	39 657	1 468
Potatoes	112	6 285	703
Barley	101	694	70
Wheat	63	845	54
Rice, paddy	46	1 142	53
Cereals, total	445	1 031	459
Coffee, green	15	844	13
Bananas	17	19 940	339
Cocoa beans	2.5	560	1.4

Source: Government of Bolivia, Ministry of Rural and Agricultural Affairs, Division of Statistics.

Natural resources and industry

Reserves of crude oil in January 1972 amounted to 217 million bbl, or 27 million tons. Refinery capacity in 1971 was 34,500 bbl/d (or 1.6 million t/a). Petroleum has recently become Bolivia's largest export commodity. The bulk of the oil yield comes from the Santa Cruz fields, which are owned by the State oil and gas company, Yacimientos Petrolíferos Fiscales Bolivianos (YPFB).

Reserves of natural gas in 1972 were 142 billion m^3. Production in 1971 was 2,857 million m^3. The gas reserves of Santa Cruz are the largest in Latin America, but they have remained mostly unused owing to lack of a local market.

The Government has given YPFB responsibility for developing petrochemicals in Bolivia and a natural gas industry. The natural gas pipeline from Santa Cruz to Yacuiba on the Argentine border is now operating fully. Bolivia has a 20-year (1970-1990) contract with Argentina to supply the country with natural gas.

Sulphur is produced from deposits estimated at 32 million tons.

The five YPFB refineries in the country have a total refining capacity of 25,500 bbl/d, as shown below:

Location of YPFB refinery	Crude capacity (bbl/d)
Camiri	1 500
Cochabamba	16 500
Santa Cruz	3 000
Santandita	500
Sucre	4 000
Total	25 500

Source: International Petroleum Encyclopedia, 1974, Tulsa, Oklahoma, Petroleum Publishing Co., 1974, p. 353.

The vast timber resources of the country have remained so far largely unexploited, mainly because of transport difficulties.

Tin ie the most important mineral. Vaet depoeite of iron ore (approximately 40,000 million tons gross) have been diecovered in the Mutun area. Estimated deposits of manganese amount to 30 million tone. There is a large uranium deposit in the east, but access ie difficult. Approximately 115 million tons of limestone exist. Aebeetoe deposite are aleo present. Tin, antimony, tungeten (wolfram), some silver, copper, lead and zinc are produced.

Both the terrain and the climate provide many poseible eites for the development of hydro-electric power, which accounted for over 80 per cent of the 584 million kWh of electricity generated in 1966. An expaneion programme for the power eector (1969-1972) was deeigned to provide a system adequate to meet the rising demand for electric power. The largest single project, the hydroelectric power station at Santa Isabel, hae a capacity of 34 MW.

The manufacturing industry ie important, though it consiets primarily of small-scale textile and apparel industries, followed by foods and beverages, and development is limited by the smallnees of the market.

Expanding industries that are being promoted under the Government's induetrialization programme include non-ferroue metals, steel, petroleum, petrochemicals, building materials and engineering industriee.

Fertilizer production

The only fertilizere produced at preeent are eome SSP, at Vinto.[2/] Assietance in establishing a fertilizer industry, including education of farmers is being provided by the Government of the United States of America and other eources.

UNIDO recently aeeisted the Argentine and Bolivian State oil concerns, YPF and YPFB, in negotiating an agreement on construction of an integrated ammonia (1,000 t/d)/urea (1,500 t/d) complex, peeticides plant and liquefied gas facility, which is likely to be located at Santa Cruz. It will be based on natural gae. Output from the plant, which is suppoeed to start up in 1978, will be destined principally for northern Argentina (Mesopotamia region), where fertilizer ooneumption is growing rapidly, and for southern Brazil, the most dynamic consuming area of that country.

Fertilizer consumption

In 1971/72, Bolivia consumed 772 tons of nitrogen fertilizers and 3,536 tons of phosphate fertilizers.[3/] In 1973/74, consumption was as follows (tons): N, 4,783; P_2O_5, 2,030; and K_2O, 1,300*.[4/]

Fertilizer use on arable and on agricultural land in 1973/74 was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	1.6	0.2
P_2O_5	0.7	0.1
K_2O	0.4	-
Total	2.8	0.3

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

2/ World Fertilizer Atlas, vol. 4 (London, British Sulphur Corp., 1973), p. 84.

3/ Data supplied by the Government of Bolivia.

4/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

In 1973/74, per capita fertilizer consumption was 1.6 kg of nutrients.[5/]

Annual fertilizer consumption is low, being confined mainly to a few thousand tons of DAP and other materials imported from the United States of America and Europe, and a small quantity of superphosphate produced locally. High transport costs and the absence of steady demand have in the past restricted the growth of fertilizer consumption. As a result of the increasing emphasis the Government is now placing on the development of agriculture and livestock farming, increased consumption of fertilizers is expected to follow.

Imports of fertilizers for 1970/71, 1971/72 and 1972/73 were as follows (tons):

Nutrient	1970/71	1971/72	1972/73
N	903.5	772.7	1 221.3
P_2O_5	2 119.6	3 536.5	1 173.9
K_2O	-	-	-

Source: Government of Bolivia.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Capacity: Product	Capacity: Thousand tons per annum	Capacity: Nutrient	Capacity: Thousand tons per annum	Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
Vinto	...	Bolivian Army	SSP	...	P	...	-	...
Santa Cruz	1978	YPFB	Ammonia Urea	365 568	N N	299 252	299	-

5/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

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BRAZIL

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61 [1]	Actual 1965/66 [2]	Actual 1970/71 [3]	Estimated 1975/76	Estimated 1980/81
N	Consumption	65 000 [5]	70 000 [5]	276 000 [5]	555 000 [4]	1 400 000 [5]
	Production	15 726	14 445	20 400 [5]	156 000 [5]	356 000 [5]
	Deficit	49 274	55 555	255 600	399 000	1 044 000 [5]
	Surplus	-	-	-	-	-
P_2O_5	Consumption	106 000 [5]	100 000 [5]	416 000 [5]	655 000 [4]	1 600 000 [5]
	Production	45 019	61 056	59 500 [5]	471 000 [5]	781 000 [5]
	Deficit	60 981	38 944	356 500	184 000	819 000 [5]
	Surplus	-	-	-	-	-
K_2O	Consumption	106 000 [5]	100 000 [5]	307 000 [5]	550 000 [4]	1 000 000 [5]
	Production	-	-	-	-	-
	Deficit	106 000	100 000	307 000	260 000	1 000 000
	Surplus	-	-	-	-	-

Sources:

1/ FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 149, and 150.

2/ FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1966 (Rome, 1967), pp. 100, 104, 124, 129, 149, and 151.

3/ FAO, Annual Fertilizer Review, 1972 (Rome, 1973), pp. 67, 76, 103, 111, 132 and 138.

4/ Sindicato de Industria de Adubos e Colasdro, São Paulo [Trade Union of the Fertilizer and Glue Industry. São Paulo] Gonçalvez Report, p. 20.

5/ Conselho de Deeenvolvimento Económico (CDE), Programa Nacional de Fertilizantee e Calcario Agrícola (October 1974), pp. 21, 24 and 25.

General

Brazil, with an area of 8,512,000 km^2, is the largeet South American country. It has a long coastline on the Atlantic Ocean, which forms its boundary to the north-east and east. To the north, its neighbours are French Guiana, Surinam, Guyana, Venezuela and Colombia, with Peru to the west, Bolivia and Paraguay to the south-west, and Argentina and Uruguay to the eouth.

Much of the total area is accounted for by the Amazon basin, which is characterized by deep tropical forest, difficult terrain and communication and is only sparsely inhabited.

Most of the population lives in the eastern half of the country, where much of the surface oonsiste of plateaux of 500-1,500 m elevation and diseected by valleys. These Brazilian Highlands cover 60 per cent of the area. Many rivers have the potential for hydroelectric power.

In the highlands, climate variee with altitude and rangee from eubtropical to temperate. Rainfall is adequate except in the north-east areae of drought. Many eoils are highly leached and low in fertility. Except in the arid north-east, eoils are generally very acidic and infertile.

Mineral resources, largely unexploited, abound. There are vast iron-ore deposits and also manganese, bauxite, lead, tin (cassiterite), wolframite, platinum, chromium, nickel, zinc, copper, magnesium, potassium, niobium, gold, titanium, beryllium, uranium, graphite, diamonds (industrial), asbestos, talc, gypsum, granite, salt, coal and oil-bearing shale (the most important known exploitable deposits outside the United States of America).

In 1974, the population was 104,230 million, with an average annual growth rate of 3.3 per cent. The density of the population was approximately 12 persons per km^2. Agriculture, employing 43.7 per cent of the population, accounts for more than 50 per cent of Brazil's exports. Industry is the most rapidly growing sector.

In 1972, GNP was $52 billion at market prices and the per capita GNP was $530. During the period 1965-1972, the GNP growth rate averaged 5.6 per cent.

Agriculture

The distribution of land according to use in 1970 was as follows (thousand hectares):

Total area	851 197
Arable land	26 047
Land under permanent crops	8 035
Permanent meadows and pastures	107 274
Forest and woodlands	517 936
Other land	191 905

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Brazilian agriculture can be divided into a traditional and a modern sector. In the first sector, fertilizer is scarcely used; in the second, all new techniques are applied, e.g. mechanization, use of selected seeds, and application of pesticides and fertilizers. Farmers obtain minimum prices guaranteed by the Government.

A wide variety of crops is grown, of which coffee is the most important, followed by maize, rice, wheat, cotton, beans, sugar-cane, cassava, fruits and vegetables. Cattle, pig, sheep and poultry farming grew rapidly between 1950 and 1960, with cattle being at present the principal livestock.

Production figures for 1974 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Coffee, green	2 600F	623	1 620
Rice, paddy	4 378	1 557	6 817
Maize	12 000	1 339	16 065
Wheat	2 500*	1 100	2 750*
Potatoes	171*	9 772	1 671*
Cassava	2 196F	13 661	30 000F
Dry beans	3 500F	619	2 168
Coconuts	-	-	301.3
Sugar-cane	2 000	47 500	95 000
Cocoa beans	410.3	478	196
Cotton (lint)	...	...	575
Soybeans	4 793*	1 565	7 500*

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 44, 46, 50, 63, 67, 74, 86, 126, 157, 176, 178 and 189.

Agricultural products currently account for more than 50 per cent of exports.

Natural resources and industry

Despite abundant natural resources in Brazil, there are only relatively small known reserves of crude oil and natural gas. In the States of Sergipe and Alagoas, reserves were estimated at a billion barrels in 1972, and production of 167,600 bbl/d was reported for 1971.

Brazilian oil is deficient in light fractions, and naphtha for the petrochemical and fertilizer industries will have to be imported or supplied by cracking operations of higher fractions.

The known reserves of natural gas in the States of Bahia and Sergipe are relatively small. The gas fields are located 2,000 km from the fertilizer market in the south-central region. Total reserves of 5,000 billion ft^3 (in January 1972) and 43 billion ft^3 of production were reported in 1971.

Large deposits of mineral phosphates are distributed throughout the country in the States of Pernambuco (Olinda phosphorite), São Paulo (Ribeira Valley apatite) and Minas Gerais (Araxá apatite). Total known reserves exceed 180 million tons containing over 45 million tons of P_2O_5.

The domestic phosphate industry, which is given priority by the Government, is dominated at present by Quimbrasil's Jacupiranga mine, where capacity is being boosted to 250,000 t/a to support the phosphoric acid plant commissioned in 1974, with a capacity of 233,000 t/a (in 1973). A large mine at Araxá is being developed. A semi-commercial-scale plant is already operating, and it is expected that a 750,000 t/a mine will be producing by 1977.

The Government is eager to have two other phosphate reserves exploited. The Tapira deposits are to be exploited by a subsidiary of the State-owned company, Cia. Vale do Rio Doce. The second, at Catalão, is being prospected by Metago, which is owned by the Government of Goiás. It is hoped that both deposits will yield 500,000 t/a of phosphate concentrate.

For the time being, most of the demand for phosphates will still have to be met by imports. Brazil already imports nearly 1 million tons of phosphate rock per annum. The Government is now trying to organize a private consortium for the production of 240,000 t/a of phosphoric acid in the south of the country.

Almost all the sulphur required has to be imported at relatively high prices, which increases the cost of production for phosphoric acid. There are no reserves of elemental sulphur or pyrites.

A consortium of Brazilian companies, under the direction of the Government, is investigating the possibility of establishing a potash mine in northern Brazil, which is expected to change Brazil's potash supply/demand pattern. Production of potash was tentatively scheduled for January 1975. The minimum production capacity is to be 500,000 t/a of K_2O product from the estimated 40 million-ton reserve. The reserves are predominantly of carnallite, a potassium magnesium chloride.

Brazil has abundant potential hydroelectric power, which is gradually being harnessed. In 1973, the installed electric power generating capacity from all sources was 15.8 million kW.

Brazil's hydroelectricity potential is more than adequate to meet domestic requirements in the immediate future. It is estimated at 150 million kW. Some 40 large power stations, almost all of them hydroelectric, are being built or expanded with the aim of reaching 25 million kW installed capacity by 1977.

The chemical industry is expanding. A massive investment in petrochemicals will move Brazil into seventh place in the world and into first place in Latin America by 1980.

Among other important industries are shipbuilding, iron, steel, metalworks, textiles, food and beverage and cement.

With the establishment of an agricultural policy and thereby increased use of fertilizers in the years following 1960, a massive expansion of the fertilizer industry began in Brazil. Nitrogen fertilizer production was started at Cubatão in the State of São Paulo in 1959. About 16,000 t/a of N is produced from refinery off-gas feedstock. Information on existing and planned ammonia plants is given below.

Company	Location	Capacity (t/d)	Feedstock	Actual status
Petroquisa	Cubatão SP	100	Refinery gas	In operation
Ultrafertil	Piassaguera SP	450	Naphtha	In operation
Petrofertil	Camaçari BA	200	Natural gas	In operation
Petrofertil	Camaçari BA	1 000	Natural gas	Starting in 1977
Petrofertil	Sergipe	1 000	Natural gas	Under planning
Petrofertil	Paulínea SP ou Araxá MG	1 000	Natural gas from Bolivia or fuel oil	Under planning
Petrofertil	Araucária PR	1 000	Fuel oil	Under planning
Cia, Rio-Grandense de Nitrogenados	Rio Grande RS	1 000	Fuel oil	Under planning

Source: Associação Nacional para Difusão de Adubos (ANDA) [National Association for the Promotion of Fertilizers].

Petroquisa, the State-owned petrochemical company, is expected to play a major role in controlling the country's future nitrogen-based fertilizer industry. The plant at Bahia is expected to be expanded to produce 1,000 t/d of ammonia and 900 t/d of urea. Petrofertil has similar expansion plans. If natural gas from Bolivia becomes available in the São Paulo area, additional production facilities for ammonia-based nitrogen fertilizer will be planned. Three 1,000 t/d ammonia plants are now under consideration. Two of these are expected to rely on natural gas from Santa Cruz in Bolivia. The pipeline now under construction will be large enough to provide the plants with the required raw material. Another project using fuel oil from domestic refinery as feedstock is planned for Araucária near Curitiba.

Brazil has indigenous phosphate rock reserves at Patos, Minas Gerais, that have been estimated at 180 million tons.[1/] The Government is to set up a plant to upgrade the rock from an average 15 per cent to 35 per cent P_2O_5. The plant is expected to produce at a rate of 150,000 t/a in 1976 rising to 900,000 t/a by 1977. By 1980, the production rate is expected to increase to 1.8 million t/a. Arafertil, a joint venture involving 40 per cent ownership by Quimbrasil,

1/ European Chemical News, vol. 27, No. 680 (London, March 1975), p. 8.

40 per cent by Itau (Brazilian Cement and Fertilizer Co.), 20 per cent by the National Development Bank, is scheduled to produce 500,000 t/a of phosphate rock by 1976 from the Raxa area, also in Minas State. Arafertil will also process the phosphate rock for producing phosphoric acid, MAP and TSP. Uniagro, another joint venture between Fertilizantes União, a group operating mixing plants (60 per cent), and Agrico Chemical Co. (40 per cent), which is part of the William's group in Tulsa (Oklahoma, United States of America), is expected to produce 400,000 t/a of phosphoric acid in southern Brazil. Phosphate rock for this plant will be imported. Companhia Rio Grande de Adubos (CRA) has also plans to produce phosphoric acid and superphosphates. In this project, Wintershall A.G., a subsidiary of Badische Anilin und Soda-Fabrik (BASF) has a minority interest. Copebras (São Paulo) is to augment its current production of 30,000 t/a of superphosphate and has plans to produce MAP and DAP.

Quimbrasil is one of the largest producers of superphosphate fertilizers in Brazil and has recently commissioned a 150,000 t/a NPK granulation plant at Ponta Grossa, which uses MAP produced at the Cajati plant. The company also operates a 150,000 t/a granulating plant at Jacupiranga. These granulating plants receive their feedstock from a 198,000 t/a sulphuric acid plant coupled with a 65,000 t/a phosphoric acid plant and a 125,000 t/a MAP plant. Manah SA, a privately owned company, is expected to produce 150,000 t/a of MAP at Cubatão. MAP is being used as an intermediate in Brazil for granulation plants, and compound fertilizers are also produced by União de Empresas Brasileiras SA at Recife, at a rate of 300,000 t/a and by Industria Agropecuaria at Conceiçaozinha near Santos, which has a 250,000 t/a granulation plant. Apart from Quimbrasil, there are several producers of sulphuric and phosphoric acid, among which significant production comes from Industria Carbo Química Catarinense and Cia. Nitroquímica Brasileira as well as Uniagro Química Ltd. The Agrico Chemical Co., together with União Fertilizers and several private investors, plans to construct a plant for 240,000 t/a of P_2O_5 phosphoric acid in southern Brazil.

Because of the expansion of Brazil's fertilizer industry, the production of sulphuric acid during the last decade has increased at a rate of 12 per cent per year. It reached 586,000 tons at the end of 1973.[2/] Petrobrás had six units for sulphur recovery with a combined capacity of 63,000 t/a by the end of 1972. New projects were under consideration at that time to increase Brazil's sulphuric acid capacity based on pyrite and gypsum by at least 500,000 t/a. For its supplies of raw materials, however, the sulphuric acid industry has to rely almost entirely on imports. The rapid growth in demand for sulphur (brimstone) started in the 1960s. In 1970, sulphur imports amounted to 289,000 tons, and Brazil became one of the largest importers of sulphur. Information on existing and planned sulphuric acid plants is given below.

2/ Associação Nacional para Difusão de Adubos (ANDA), Brazilian Sulphur and Sulphuric Acid Industry (T-11/75) (May 1975).

Company	Location	Annual capacity of H_2SO_4 (thousand tons)	Starting date	Expected utilization (percentage)
Quimbrasil	Jacupiranga	200	1974	In operation
Copebrás	Cubatão	330	1975	Under construction
Nitroquímica	São Miguel	67	1975	Under construction
Indag	Sto. André	200	1975/76	99
Agrico/Fertisul	Rio Grande	1 200	1978	75
Arafertil	Araxá	600	1978	99
ILM	Rio Grande	500	1979	50
	Tapira	600	1979	50
	Catalão	600	1979	25

Brazil has to meet all its requirements for potash through imports. The demand for potash has grown as new complex fertilizer plants have come on stream during the last five years. By 1971, the level of potash imports amounted to 285,000 t/a of 60 per cent K_2O. For this reason the rate of growth in consumption of the NP fertilizer nutrients is expected to increase faster than that of potassium.

Santos is the main port through which fertilizers are imported.

The development authority for the north-east of Brazil is actively investigating a possibility that promises to revolutionize Brazil's potash supply/demand pattern. The potash reserves, predominantly carnallite, were discovered near Carmópolis in the State of Sergipe. The Companhia Nacional de Alcalis was given charge of this venture. A consortium has been formed composed of Petróleo Ipiranga SA, Banco Itau-Americoa, Petrobrás-Petroquisa and Camargo Carreia for establishing a commercial mining operation.

Fertilizer consumption

Consumption in 1973/74 was as follows (tons): N, 425,000*; P_2O_5, 725,000*; and K_2O, 523,154.[3/]

Fertilizer consumption has been increasing steadily since 1966/67. According to FAO statistics, total consumption of fertilizer nutrients has risen from 256,000 tons in 1966/67 to 1,074,243 tons in 1971/72 to 1,673,154 tons in 1973/74. This means an average annual increase of 30 per cent.

Agricultural products currently account for more than 50 per cent of Brazil's exports. The Government's emphasis on agriculture has spurred local demand for fertilizers. To meet the increased demand and to reduce Brazil's heavy dependence on fertilizer imports and vulnerability of its agriculture, which requires fertilizers, a massive investment programme for the fertilizer industry is currently under way. As a consequence, fertilizer consumption can be expected to increase steadily.

In 1973/74, fertilizer use on arable and on agricultural land, was as follows (kg/ha):

3/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

Nutrient	Arable land	Agricultural land
N	12.5	3.0
P_2O_5	21.3	5.1
K_2O	15.3	3.7
Total	49.1	11.8

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Per capita consumption of these nutrients was 11.2 kg in 1971/72[4/] and 16.5 kg in 1973/74.[5/] The quoted figures are somewhat larger than the average figures elsewhere in Latin America.

4/ FAO, Annual Fertilizer Review, 1972 (Rome, 1973), p. 48.

5/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

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CHILE

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	47 697	33 047	42 626	159 900	228 400
	Production	148 217	183 000	124 200*	...	...
	Deficit	-	-	-	...	...
	Surplus	100 520	149 953	81 574	...	...
P_2O_5	Consumption	29 626	63 067	90 686	172 000	275 500
	Production	8 026	7 500*	14 400*	...	...
	Deficit	21 600	55 567	76 286	...	...
	Surplus	-	-	-	...	...
K_2O	Consumption	16 232	12 988	12 625	27 300	32 600
	Production	11 372	20 000*	21 300*	...	...
	Deficit	4 860	-	-	...	...
	Surplus	-	7 012	8 675	...	...

Sources:

1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150;

1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151;

1970/71: FAO, Production Yearbook, 1973 (Rome, 1974), pp. 259 and 257;

1975/76 and 1980/81: Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), Analisis del mercado de fertilizantes en la región Andina y paises de la Cuenca del Plata (La Paz, May 1974), pp. 10 and 11.

General

Chile is the southern most country on the Pacific coast of South America, forming a long, narrow strip along the Pacific Ocean through which the Andes Mountains extend from north to south. It is bordered on the north by Peru, on the east by Argentina and Bolivia, on the south by the Drake Passage and on the west by the Pacific Ocean. Chile is 3,976 km long and its average width is 176 km. The total area is 756,950 km^2. The country falls between latitudes 17°S and 56°S. It also has several Pacific island possessions, among which is Easter Island.

There are three clearly defined zones, each with a different climate and economic activity.

Climatic conditions vary widely owing to the country's great north-south extension. The north is dry, the extreme north (Provinces of Tarapacáe and Antofagasta) being one of the world's most arid zones. Inland in the north at 900-1,500 m above sea level, daytime temperatures reach 30°-35°C but may drop to 5°-15°C at night, depending on season and location. Although much of the north is situated in the tropics, the climate is not tropical owing to the influence of the cold Humboldt current near the coast and to the nearness of the Andes. In central Chile, the

climate is moderate, and temperatures rise beyond 34°C in summer or fall below 0°C in winter. In south-central Chile, the climate is colder and wetter; while in the far south, high winds, heavy rains and long, cold winters are the principal climatic features. The average annual rainfall varies with the latitude, varying from 10 cm in the north to 100 cm in the south.

The northern desert is rich in minerals. The fertile valley in the central zone is the agricultural and industrial heart of Chile. The south consists of densely forested islands, mountains and glaciers. The country's rivers are important for irrigation and the generation of hydroelectric power.

Chile is a volcanic country and light earth tremors occur frequently.

Population in 1972 was 10.2 million, with an average annual growth rate of 2.3 per cent. In 1970, 25.4 per cent of the working population was engaged in agriculture.

In 1971, GNP at market prices was $7,550 million and per capita GNP was $760. The latter grew at an average annual rate of 2.4 per cent during the period 1965-1971.

Chile is one of the most industrialized countries in Latin America. In 1971, agriculture accounted for 8 per cent of GDP; mining and quarrying, 7 per cent; and manufacturing industries, 26 per cent. Mining, especially copper, is the mainstay of the economy, although in recent years manufacturing has become increasingly important. Chile is also the second most important fish-producing country in Latin America.

Chile is a member of LAFTA and of its regional subdivision, the Andean Group.

Several free zones exist in the country, the most important of which are Arica and Punta Arenas.

Agriculture

The distribution of land according to use in 1973 was as follows (thousand hectares):

Total area	75 695
Arable land	5 480
Land under permanent crops	192
Permanent meadows and pastures	11 538
Forests and woodlands	20 686
Other land	37 799

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In 1973, 1.2 million ha were irrigated.[1/] Irrigation is being expanded.

Agricultural production has recently fallen behind many other sectors of the economy, despite Chile's rich resources of fertile land.

In recent years, crops have accounted for 57 per cent of total agricultural production, livestock, for 43 per cent. Wheat is the main cash crop among the grains and is grown on over half of the harvested area. Corn, oats, barley and rice are important, too. The chief root crops are potatoes, onions, garlic and sweet potatoes; the principal fruit crops are apples, grapes, peaches, nectarines, pears, melons, oranges and lemons. Rapeseed, sunflower seed, sugar-beets and tobacco are also produced.

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Chile's forest products industry is one of the most important in Latin America.

Production figures for 1974 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Cereals, total	1 002	1 702	1 706
Wheat	675	1 408	950
Oats	97	1 458	142
Maize	108	3 400	367
Barley	99	1 949	193
Rice, paddy	14	2 876	40*
Rapeseed	28	1 070	30*
Sunflower seed	9	1 052	10*
Sugar-beets	40*	33 000	1 320*
Tobacco	2.5*	1 903	4.8*

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 41, 44, 53, 50, 48, 46, 101, 98, 159 and 181.

Natural resources and industry

Mineral deposits found mainly in the north are Chile's principal source of wealth. Chile is the world's third largest copper producer after the United States of America and the Union of Soviet Socialist Republics. Most of the copper is exported and provides 50-60 per cent of Chile's foreign exchange. Large deposits of iron ore, lead and zinc, nitrates, limestone and coal also exist and there are smaller deposits of phosphate, sulphur, potassium salts, molybdenum, ulexite, manganese, mercury, silver and gold. Chile is the world's only producer of natural nitrates and the largest producer of iodine. Among Latin American countries, it takes first place in coal production (1.3 million tons in 1972), third in iron ore production and sixth in petroleum production.

Chile is now almost self-sufficient in oil and its by-products following exploitation of petroleum and natural gas fields in Magallanes Province in the south. In 1972, crude petroleum production was 1.6 million tons. Estimated proved and probable reserves in 1972 were 120 million bbl, or 15 million tons.

Natural gas production in 1972 was 4 billion m^3. Reserves in 1974 were estimated at 120 billion m^3. About 8 billion m^3/d will be available for LPG operations at Caso Negro.

Small reserves of low-quality phosphate rock exist as well as some now-dwindling supplies of bird guano. In 1970, guano production was about 14,894 tons.

Ores containing medium-grade sulphur exist, often in remote locations. Volcanic sulphur occurs in the north. Sulphur production in 1967 was 42,000 tons. H_2SO_4 is obtained as a by-product of copper smelting.

Potash exists in the form of sodium and potassium nitrate minerals (caliche) and also in numerous salt lakes in the Andes and in the central plateau of northern Chile.

There are two petroleum refineries in Chile.[2] ENAP at Concón has a capacity of 44,000 bbl/d, which is to be expanded to 120,000 bbl/d by 1979. It uses locally available orude oil. ENAP at Concepción has a capacity of 36,000 bbl/d, which is to be expanded to 72,000 bbl/d. It also uses local crude.

Production of "salitre" (sodium and sodium-potassium nitrate[3]) is controlled by the Sociedad Química y Minera de Chile SA. The mineral is Chile's principal source of nitrogen and potassium. Production in 1970 was 632,000 tons of sodium nitrate and 154,200 tons of sodium-potassium nitrate, of which 107,000 tons of the former and 60,000 tons of the latter were intended for fertilizers. The recent world energy crisis has stimulated demand for Chilean natural sodium nitrate, and demand now far exceeds production capacity. Total output in 1973 was 670,000 tons. The target for 1975 was 1 million tons. Sodium nitrate, which may be either prilled or made into crystalline form, is guaranteed to contain not less than 16 per cent N.[4]

With respect to raw materials for fertilizers, Chile thus has natural gas, nitrates, phosphatic minerals, volcanic sulphur and potassium-containing caliche and potassium-rich brines and other complex salts.

Electric power production in 1971 was 8,520 million kWh. The high Andean range provides water resources for the central zone that are exploited both for irrigation and hydroelectric power. Electric generating capacity in 1968 was 1,720 MW.

Other industries include iron and steel, automotive assembly, glass, textiles, petroleum refining, petrochemicals, pulp and paper, tobacco, and a wide range of consumer goods. Food processing is one of Chile's oldest industries.

Fertilizer production

Fertilizer production in 1973/74 was (tons): N, 106,654; P_2O_5, 18,020; and K_2O, 19,327.[5]

Fertilizer manufacturing in Chile has great potential.

A plant operated by COSAF (Compañía Sudamericana de Fosfatos) began production of phosphoric acid, TSP and SSP in 1968 at Penco. The plant had operational difficulties for a while after start-up. Full capacity is 100,000 t/a TSP (or 46,000 t/a P_2O_5).

A very old plant in Antofagasta Province operated by the Sociedad Química y Minera produces sodium nitrate. There is substantial production of $NaNO_3$ at the Pedro de Valdivia and Niaría Elena plants. Sodium-potassium nitrate is made at the Coya Sur plant, also in Tarapacá.

In Tarapacá and Antofagasta Provinces, SOCHIF (Socided Chilena de Fertilizantes) has a mixing plant for 5-20-6 grade fertilizers. Capacity is 33,000 t/a mixed fertilizers. The basic raw materials are fossil bird guano (red guano) and fresh bird guano (white guano).

2/ UNIDO, "Reports and Proceedings," Meeting on the Development of Fertilizer and Pesticide Industries in Latin America (in collaboration with ECLA and the Government of Brazil), Rio de Janiero, Brazil, 15-19 September 1970 (ID/WG.80/9), p. 173.

3/ Sodium-potassium nitrate is a prilled fertilizer containing one third KNO_3 and two thirds $NaNO_3$.

4/ V. Sauchelli, ed., The Chemistry and Technology of Fertilizers (New York, Reinhold, 1960). (ACS Monograph No. 148).

5/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 251.

The Government is exploring the possibility of establishing an export-oriented 1,000 t/d ammonia plant.

The following fertilizer installations are also under consideration:

(a) Two DAP units, one to be located in Ventanas (capacity, 260,000 t/a) and the other in Caletones (approximate capacity, 350,000 t/a). The plant will have to import phosphate rock and ammonia for the time being;

(b) Plant to produce 11,000 t/a of thermic phosphates for Valdivia Province, to supply a part of local demand. This project had been abandoned earlier.

Petroquímica Chilena is planning a nitric acid and AN plant at Antofagasta, to be completed by 1976. Planned capacity is 30,000 t/a of nitric acid and 30,000 t/a of AN.

SYBETRA is making a study for the construction of a 1,000 t/d sulphuric acid plant, to use the Mechim (Génie Métallurgique et Chimique) process. The Chilean Corporación del Cobre plans to establish this plant as soon as the financing details have been worked out. SYBETRA is also the main contractor for the 106,000 t/a sulphuric acid plant planned by Empresa Nacional de Minera at Paipote, Copiapo, using the Mechim process. The plant is expected to start production in 1976.

The availability of natural sodium and potassium nitrate in Chile limited the local manufacture of ammonia-based fertilizers for a long time. Since the costs of indigenous nitrates for fertilizers are rising, the production of synthetic ammonia and derivatives from domestic natural gas, as planned at the Punta Arenas ammonia/urea plant, is becoming increasingly justified.

Plants at present operating in Chile have a production capacity of 170,000 t/a N, 50,000 t/a P_2O_5 and 24,000 t/a of K_2O.

Fertilizer consumption

Chile has used fertilizers for many years. During the period 1957-1968, the average annual increase in consumption of N was 12.2 per cent. The main source of approximately 95 per cent of the N consumed in the country until the mid-1960s was local natural nitrates. From 1967on, Chile began to import fertilizers, especially urea. The present trend towards the use of urea as opposed to N produced from natural nitrates is continuing.

In 1973/74 per capita consumption of fertilizer nutrients was 18.4 kg and fertilizer use on arable and on agricultural land was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	10.5	3.4
P_2O_5	20.4	6.7
K_2O	2.4	0.8
Total	33.3	11.0

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Fertiliser imports in 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	17 357	14 962	29 363
P_2O_5	83 743	59 309	96 942
K_2O	3 783	5 483	7 942

Source: FAO, Annual Fertiliser Review, 1974 (Rome, 1975), pp. 115, 146, 170.

A projection of demand for fertilizers for 1975/76, 1980/81 and 1985/86 is given below (tons):

Nutrient	1975/76	1980/81	1985/86
N	76 000	100 000	121 000
P_2O_5	141 000	185 000	226 000
K_2O	39 000	52 000	61 000

Source: "La situacion de la industria de fertilizantes en la Subregion Andina y sus perspectivas hacia 1980-1985" (E/CN.12/938), p. 8.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Capacity				Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
			Product	Thousand tons per annum	Nutrient	Thousand tons per annum		
Punta Arenas, Magallanes	...	Sociedad Petroquímica Chilena SA	Ammonia	365	N	300	300	-
			Urea	329	N	151		
Antofagasta Province	Old	Sociedad Química y Minera (SQM)	Sodium nitrate		N	144	...	...
Tarapacá Province	Old	Sociedad Química y Minera (SQM)	Sodium nitrate	900	N	...		
			Sodium-potassium nitrate		K	...		
Ponco	1968/69	Compañía Sudamericana de Fosfatos (COSAF)	SSP	40	P	7	...	...
			TSP	100	P	46		
			Phosphoric acid	...	P	...		
Tarapacá and Antofagasta Provinces	...	Sociedad Chilena de Fertilizantes (SOCHIF)	Mixed fertilisers (grade 5-20-6)	33	N	...	...	...
					P	...		
					K	...		
Antofagasta Province	Planned 1976	Petroquímica Chilena	Nitric acid	30			...	-
		AS		30	N	10		
Ventanas	Planned	...	DAP	860	N	47	47	180
					P	180		
Coletones	Planned	...	DAP	350	N	63	63	161
					P	161		

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COLOMBIA

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	19 000*	45 000*	70 000 1/ 64 000* 2/	125 000	153 000 3/ 200 000 4/
	Production	...	39 000*	56 200 1/ 58 000 2/	120 000	136 000 3/ 250 000 4/
	Deficit	...	6 000*	13 800 1/ 6 000 2/	5 000	17 000 3/ - 4/
	Surplus	...	-	-		- 3/ 50 000 4/
P_2O_5	Consumption	...	55 800*	55 000 1/ 61 000 2/	85 000	129 000 3/ 125 000 4/
	Production	...	10 000*	29 700 1/ 26 000 2/	25 000	- 3/ 50 000 4/
	Deficit	...	45 800*	25 300 1/ 35 000 2/	60 000	129 000 3/ 75 000 4/
	Surplus	...	-	-	-	- 3/ - 4/
K_2O	Consumption	...	30 000*	45 000 1/ 52 000 2/	75 000	81 000 3/ 100 000 4/
	Production	-	-	-	-	-
	Deficit	...	30 000*	45 000 1/ 52 000 2/	75 000	81 000 3/ 100 000 4/
	Surplus	-	-	-	-	-

Sources:

1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150; calendar year refers to the first part of the split year;

1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151;

1970/71: 1/ E/CN.12/938, p. 24;
2/ FAO, Production Yearbook, 1973 (Rome, 1974), pp. 259 and 257.

1975/76: UNIDO, "Review of World Production, Consumption and International Trade in Fertilizers with Projections to 1975 and 1980", paper prepared for the Second Interregional Fertilizer Symposium held at Kiev, USSR (21 September-1 October 1971) and New Delhi, India (2-13 October 1971) (ID/WG.99/4/Rev.1), pp. 51, 53 and 55.

1980/81: 3/ Yacimientos Petrolfferos Fiscales Bolivianos (YPFB), Análisis del Mercado de Fertilizantes en la Región Andina y Países de la Cuenca del Plata (La Paz, May 1974), p. 5;
4/ UNIDO, "Review of World Production, Consumption and International Trade in Fertilizers with Projections to 1975 and 1980", paper prepared for the Second Interregional Fertilizer Symposium held at Kiev, USSR (21 September-1 October 1971) and New Delhi, India (2-13 October 1971) (ID/WG.99/4/Rev.1), pp. 51, 53 and 55.

General

Colombia is situated in the north-west of South America. It has a coastline interrupted by the Isthmus of Panama on the Caribbean Sea and the Pacfic Ocean. To the south lie Ecuador and Peru, and to the east, Brazil and Venezuela. The total area is 1,138,910 km^2.

Altitude varies from sea level to over 5,000 m in the Andean Cordilleras. Despite Colombia's tropical location, four climatic zones can be distinguished: tropical, 0-1,000 m, with mean temperature over 24°C; subtropical, 1,000-2,000 m, with mean temperature not below 17.5°C; temperate, 2,000-3,000 m, with mean temperature not under 12°C; and cold, over 3,000 m, with mean temperature under 12°C.

Rainfall is generally adequate, although some areas experience shortages during the dry season.

In 1972, the population was 22.9 million, with an average annual growth rate of 3.2 per cent. About 45 per cent of the working population was engaged in agriculture in 1970.

GNP at market prices in mid-1971 was $8,180 million, and *per capita* GNP was $370; the latter grew at an average annual rate of 2.3 per cent during the period 1965-1971.

In 1970, agriculture accounted for 26 per cent of GDP; manufacturing industries, 18 per cent; and mining and quarrying, 2 per cent.

Colombia is a member of LAFTA and its subdivision, the Andean Group.

The 1971-1974 National Development Plan had four main aims: urban development, increased agricultural productivity, export promotion, and a more equitable distribution of personal income.

Agriculture

The distribution of land according to use in 1970 was as follows (thousand hectares):

Total area	113 891
Arable land	3 596
Land under permanent crops	1 458
Permanent meadows and pastures	17 084
Forests and woodlands	51 251
Other land	40 502

Source: FAO, *Production Yearbook, 1974*, vol. 28-1 (Rome, 1975), p. 4.

In the same year, 135,000 ha of land were irrigated.[1/]

The country can produce a wide variety of foods because of its wide range of altitudes and temperatures. In the coastal regions and lowest valleys bananas, cocoa, cotton, palms, rice, sesame, sugar-cane, tobacco and maize are grown. The extensive grasslands support a large number of cattle. Cattle raising is the second most important agricultural activity after coffee growing, which is the major activity in the lower Cordilleras. Barley, wheat, potatoes, maize and beans are cultivated higher up in the mountain valleys. About 40 per cent of the country's coffee is grown and 40 per cent of its cattle raised in the central tropical lowlands along the Atlantic coast.

1/ FAO, *Production Yearbook, 1974*, vol. 28-1 (Rome, 1975), p. 4.

About 60 per cent of the coffee crop is exported, which brings 70 per cent of Colombia's foreign exchange. Colombia ranks second only to Brazil in world coffee production. Efforts are being made to reduce the country's dependence on coffee, a crop that is rather often in oversupply on the world markets. Cotton is now providing a new source of foreign exchange.

Production figures for 1974 for the major crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Coffee, green	820F	637	522*
Sugar-cane	367F	49 905	18 315F
Bananas	68F	14 029	954*
Cotton (lint)	152	...	890F
Cottonseed	...	...	280F
Seed cotton	287*	1 516	435F
Rice, paddy	362	4 003	1 449
Wheat	70	1 229	86
Sesame seed	45	622	28
Tobacco leaves	28.3*	1 730	49*
Soybeans	78	2 000	156
Maize	650	1 192	775
Cereals, total	1 263	2 118	2 676
Potatoes	89F	12 753	1 135
Cocoa beans	58F	397	23
Palm kernels	...	...	10F
Sorghum	98	2 398	235
Barley	73	1 644	120

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 41, 44, 46, 48, 50, 63, 86, 105, 119, 122, 130, 157, 170, 176, 178, 181 and 189.

Natural resources and industry

Reserves of crude oil in 1972 were estimated at 1,663 million bbl, or 236 million tons. Production in 1973 averaged 183,258 bbl/d. Crude oil is found at the following locations: Pelagua, Tetuán, Ermitaño, Rio Negro, Sogamoso, Cocorna, Tisquirama, Totumal, Orito, Azao, Zulia, Roble-Limon, Neiva, Violo, Yondo, El Difícil, La Nocha, Los Alpes-Sampues and Jobo-Tablón.

Reserves of natural gas exist at Yondo, San Pablo, Cantagallo, La Cristalina Barco, Cicuco, Damares, Payoa, Pp. Guaguaquí, El Difícil, and Jobo-Tablón. In 1972, estimated reserves totalled 71 billion m^3. Production in 1973 averaged 316.7 million ft^3/d.

In 1973, some 10,000 tons of phosphate rock were produced. The most important deposits are found at Boyaca and Santander. These are now under experimental exploitation. To date, proved reserves are 9 million tons of 28 per cent P_2O_5 and 5 million tons of 24 per cent P_2O_5. Estimates of probable deposits total 100 million tons. In general, the deposits are located far from the coast, but near the border with Venezuela, and therefore are of regional interest.

Reserves of pyrites exist. Volcanic sulphur exists at Puracé (Cauca). Estimated total proved and probable reserves are 8.5 million tons of 32 per cent S. In 1969, production was 174,736 tons. No known significant deposits of potash exist.

Refining capacity is at present approximately 166,100 bbl/d from the following refineries:

Company and refinery location	Crude capacity (bbl/d)
Colombian Petroleum Co., Tibú, North Santander	3 000
Empresa Colombiana de Petróleos, Barrancabermeja	110 000
International Petroleum (Colombia) Ltd., Cartagena	44 000
International Petroleum (Colombia) Ltd., La Dorada	5 600
Texas Petroleum Co., El Guamo	2 500
Texas Petroleum Co., Orito (with Gulf Oil)	1 000
Total	166 100

Source: International Petroleum Encyclopedia, 1974 (Tulsa, Oklahoma, Petroleum Publishing Co., 1974), p. 354.

Empresa Colombiana de Petróleos (ECOPETROL) is planning two additional refineries, at Tumaco and Valle (Cali), with respective capacities of 75,000 and 40,000 bbl/d crude. The ECOPETROL refinery at Barrancabermeja is to be expanded by 30,000 bbl/d capacity by 1976.

Other resources include nickel, bauxite and copper ores. There are ample reserves of coal and calcitic and dolomitic limestone.

In 1972, production of electricity was 8,088 million kWh.

Efforts to stimulate industrial growth are at present concentrated on the manufacture of machinery and on the petrochemical industry.

Fertilizer production

In 1973/74, fertilizer production was as follows (tons): N, 85,760; and P_2O_5, 78,500*.[2/]

Little fertilizer was manufactured before the 1960s, although mixing had been carried out for some time. Fertilizer plants were constructed in the early 1960s and later, around 1970. Production is based on sources of feedstock for N from the petroleum industries of Colombia and Venezuela and on phosphate rock and phosphoric acid, which are for the most part imported, and on potash salts, which are entirely imported. The large-scale manufacturing of phosphate fertilizers from indigenous phosphate rock is still in the planning stages.

Colombia's first plant for the production of urea and complex fertilizers started up at Barrancabermeja in 1962. It was operated by Industria Colombiana de Fertilizantes SA, which later became Fertilizantes Colombianos (FERTICOL). Soon after this, Abocol started producing urea and complex fertilizers at Cartagena. In 1971, Monómeros Colombo-Venezolanos (MCV) started up a plant producing AS at Barranquilla.

Only recently have the principal plants been operating near their rated capacities. Abocol, for example, has been operating at almost full capacity only since 1971.

2/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 251.

Two fertilizer complexes are operating on natural gas - one at Barrancabermeja, and the other at Mamonal near Cartagena.

The complex at Barrancabemeja, operated by FERTICOL, came on stream in 1962, at which time it consisted of a 14,000 t/a ammonia plant using natural gas from the ECOPETROL refinery at Barrancabermeja; a nitric acid plant; a 74,000 t/a urea plant; and a 40,000 t/a complex fertilizer unit for the ammoniation of superphosphates. A prilled ammonium nitrate plant was built in 1963. The plants were closed for redesign and expansion between 1965 and 1967. The new plant capacities are (t/a): ammonia, 19,000; urea, 175,000; and complex fertilizers, 140,000. Production is usually limited to prilled ammonium nitrate and urea. In 1971, this complex was operating at 65 per cent of capacity and, in 1972, at 85 per cent. The main shareholder in FERTICOL is Caja Agraria.

The complex at Mamonal, is operated by Abocol/Amocar. In 1963, the capacities of its plants were as follows:

Plant	Capacity (t/a)
Ammonia	115 000
Nitric acid (100%)	50 000
Urea	85 000
Complex fertilizers (13-20-13)	140 000

The ammonia plant is supplied with natural gas by the Intercol Refinery at Mamonal. Phosphoric acid is supplied to the terminal built at Cartagena and used in the complex fertilizer plant to produce complex fertilizers of the following main types: 10-30-10; 10-20-20; 14-14-14 and 12-12-17. In 1969, the plant produced 60,285 tons of urea and 124,600 tons of complexes.

Some 3,000 t/a of AS can be recovered from the coke works of Paz del Río.

In 1971, Monómeros Colombo-Venezelanos (MCV) started up a plant at Barranquilla for the production of caprolactam and by-product AS. Approximately 60,000 t/a of AS are obtained in the production of approximately 17,000 t/a of caprolactam. Nitric acid is also produced in this plant (capacity, approximately 74,000 t/a) and sulphuric acid (capacity, 28,000 t/a). Also produced are high-concentrate complex fertilizers such as 15-15-15, 25-20-0 and 20-20-0, among others. The over-all capacity for granulated complex fertilizers is 300,000 t/a expressed in nutrients as follows:

	N	P_2O_5	K_2O
Maximum capacity (300,000 t/a)	60 000	55 000	20 000
Average capacity (270,000 t/a)	54 000	50 000	18 000
Probable production in the initial stages (i.e. 1972-1974) (200,000 t/a)	40 000	36 600	13 400

This plant was set up as a joint venture between Colombia and Venezuela with Netherlands participation. By-product ammonia is imported from Venezuela.

In addition to the preparation of formulations by mixing fertilizers, some sulphuric acid producers, such as Sulfacidos SA at Medellín, manufacture small quantities of SSP (approximately 5,000 t/a in the case of Sulfacidos). Others produce 3,000-5,000 t/a of natural ground phosphates (20-22 per cent P_2O_5). Basic slag from the Paz del Río coke-works (P_2O_5 content averaging 14 per cent) makes for a local contribution of 6,700 t/a P_2O_5.

The major producer of mixed fertilizers is the Caja Agraria. At its three blending plants, at Bogotá, Cali and Tunja, the most common mixtures produced are: 5-20-12 and 8-24-14; its total capacity of 300,000 t/a is still underutilized.

Recently there has been some production of foliar, liquid and natural organic fertilizers.

A nitric acid plant is planned, to produce in addition to nitric acid approximately 300,000 t/a of complex fertilizers with the AS obtained from the caprolactam plant at Barranquilla. The plant will require the following (t/a): ammonia, 50,000; phosphoric acid, 48,000; phosphate rock, 90,000; and potassium salts, 30,000.

Colombia will probably long remain dependent on imports of potash and phosphate. In the 1980s the country will need annually 80,000-90,000 tons of K_2O, and 130,000-165,000 tons of P_2O_5. Colombia will have to either increase its ammonia-producing capacity or import annually 80,000-100,000 tons of ammonia or else increase its urea imports accordingly.

A facility for sulphur production is being installed at Barrancabermeja (capacity 40 t/d), which should be completed by 1976. By 1977, sulphur-producing capacity will also exist at Tumaco (estimated capacity, 30 t/d).

An 18,000 t/a sulphuric acid plant is scheduled for Medellín. Electroquímica Colombiana plans to use this acid in sodium tripolyphosphate production. Also planned at Barranquilla is a plant for the production of fertilizers and caprolactam, to be set up by Colombian investors, IVP of Venezuela, with Netherlands technical assistance.

Fertilizer consumption

In 1973/74, fertilizer consumption was as follows (tons): N, 153,833; P_2O_5, 100,000*; and K_2O, 58,151.[3/] In the same year, per capita consumption was 13.1 kg nutrients.[4/] Fertilizer use on arable and on agricultural land was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	30.4	6.9
P_2O_5	19.8	4.5
K_2O	11.5	2.6
Total	61.7	14.1

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Per capita use of fertilizers is low, but application rates have in general been high because of the practice of double or continuous cropping of certain products, which is common in tropical zones. Fertilizer consumption has increased quite rapidly in recent years, while the wide range of crops produced can be seen from the wide range of formulations used. A definite preference is shown for high-analysis compound and mixed fertilizers.

3/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

4/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

The use of N has increased, but that of P_2O_5 and K_2O has decreased in recent years. The amount of phosphate used is rather small, while potash is used only in complex and mixed fertilizers. Straight N, especially urea, is applied to grass, banana, rice, maize and cotton; organic fertilizers are often used by coffee growers; and foliar fertilizers are sometimes used by tobacco planters.

Imports of fertilizers in 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	9 494	35 918	68 073
P_2O_5	27 000*	34 200*	50 000*
K_2O	40 653	40 008	58 151

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 115, 146 and 170.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Capacity				Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
			Product	Thousand tons per annum	Nutrient	Thousand tons per annum		
Barranquilla	1971	MCV	AS	60	N	12	...	...
			Nitric acid	74				
			Sulphuric acid	28				
			Complex fertilizers	300	NPK	...		
			SSP	...	P	...		
Barranquilla	Planned 1975	...	Nitric acid	...			...	...
			Complex fertilizers	300	NPK	...		
Medellín	...	Sulfoácidos SA	SSP	5	P	0.9	-	0.9
Medellín	Planned	...	Sulphuric acid	...				
Barrancabermeja	1962	Particol	Ammonia	19	N	16	...	...
			Nitric acid	...				
			Urea	15	N	7		
			AN	30	N	9		
	Planned 1975-1977	Particol	Ammonia	36				
			Nitric acid (53%)	32				
			Urea	22				
			AN	46-90				
Manizal	1963	Abocol/Amocar	Ammonia	115	N	94	...	...
			Nitric acid	50				
			Urea	85	N	39		
			Complex fertilizers	140	NPK	...		
Paz del Río	...	...	AS	3	N	0.6	0.6	-

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ECUADOR

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	5 176	4 894	18 011*	25 900	100 000 1/ 59 300 2/
	Production	-	-	2 200*	...	...
	Deficit	5 176	4 894	15 811*	...	...
	Surplus	-	-	-	...	...
P_2O_5	Consumption	3 210 a/	7 095	9 600*	21 400	48 800 2/
	Produotion	43 a/	...	3 300*	...	...
	Deficit	3 167	...	6 300*	...	...
	Surplus	-	...	-	...	...
K_2O	Consumption	3 939	3 394	6 487	12 700	29 100 2/
	Production	-	-	-	...	...
	Deficit	3 939	3 394	6 487	...	...
	Surplus	-	-	-	...	...

Sources:

1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150;

1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151;

1970/71: FAO, Production Yearbook, 1973 (Rome, 1974), pp. 259 and 257.

1975/76: Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), Análisis del Mercado de Fertilizantes en la Región Andina y Países de la Cuenca del Plata (La Paz, May 1974), p. 15;

1980/81: 1/ Estimates of Raymond Ewell, UNIDO consultant;
2/ Yacimientos Petrolíferos Fiscales Bolivianos (YPFB) Análisis del Mercado de Fertilizantes en la Región Andina y Países de la Cuenca del Plata (La Paz, May 1974), p. 15.

a/ Refers to organics.

General

Ecuador is situated in the north-west of South America, with Colombia as its neighbour to the north and Peru to the south and east. It is bounded on the west by the Pacific Ocean. The Cordillera, or central mountain range of the Andes, is over 5,000 m high in places and is the centre of economic activity. To the east and west of the mountain range lie lowland areas, of which the western part is important for agriculture. Ecuador's total area is 283,560 km^2.

The country may be divided conveniently into four geographical areas: (a) the Costa, or coastal plain; (b) the Sierra, which includes two Andean ranges; (c) the Oriente, or Amazon Basin; and (d) the Galapagos Islands in the Pacific Ocean.

Ecuador has a variety of climates and soils that provide the basis for numerous agricultural crops, livestock and forestry. The climate varies from tropical to semi-tropical in the lowlands and foothills, is temperate over much of the mountain range, but cold over 3,500 m. Rainfall is heavy in the north but low in the south.

Population in 1973 was 6.72 million, with an average annual growth rate of 3.4 per cent. About 53.6 per cent of the working population was engaged in agriculture in 1970.

The economy is predominantly agricultural, although only a small percentage of the land is under cultivation. In 1972, agriculture accounted for approximately 65 per cent of the country's export earnings.

GNP at market prices in mid-1971 was $1,960 million, and *per capita* GNP was $310. During the period 1965-1971, *per capita* GNP grew at an average annual rate of 2.6 per cent.

In 1972, agriculture accounted for 25 per cent of GDP; mining and quarrying, 4 per cent; and manufacturing industries, 7 per cent.

Ecuador is a member of LAFTA and the Andean Group. Its main trading partners in order of importance are the United States of America, Japan and the Federal Republic of Germany.

The country's present National Development Plan covers the period 1973-1977.

Agriculture

The distribution of land according to use in 1968 was as follows (thousand hectares):

Total area	28 356
Arable land	2 843
Land under permanent crops	972
Permanent meadows and pastures	2 200
Forests and woodlands	18 085*
Other land	4 256

Source: FAO, *Production Yearbook, 1974*, vol. 28-1 (Rome, 1975), p. 4.

In 1968, 463,000 ha were irrigated.[1/]

Few modern farming methods are used. In the Sierra, primitive cropping methods have eroded the soil. However, in the Costa, farmers with large estates have introduced some mechanization, and they also use fertilizers.

Bananas, coffee and cocoa alone account for 90 per cent of Ecuador's total exports. Attempts are being made to diversify agriculture and to introduce higher-yielding strains of wheat and rice. The Government is promoting the cultivation of tea, oilseeds, African palms, manioc, cotton and rice.

Ecuador can produce most of its domestic food requirements; wheat and edible oils, however, must be imported. Animal products are an important part of agricultural output for the domestic market.

1/ FAO, *Production Yearbook, 1974*, vol. 28-1 (Rome, 1975), p. 4.

Production figures for 1974 for the most important crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Tea	700F	1 429	1 000*
Bananas	160*	17 500	2 800*
Cocoa beans	300F	200	60*
Coffee, green	212*	290	61.5*
Sugar-cane	100F	88 000	8 800 F
Rice, paddy	95*	2 554	241*
Cottonseed	...	...	22*
Seed cotton	35*	986	34*
Cotton (lint)	...	...	12.4*
Palm oil	...	...	9.6*
Pyrethrum	...	...	...
Tobacco leaves	1.6*	1 069	1.7*
Maize	270F	944	255*
Barley	61	941	57
Wheat	59	969	57
Cereals, total	492	1 249	614
Potatoes	48	9 200	441

Source: FAO, Production Yearbook, 1974 (Rome, 1975), pp. 41, 44, 46, 48, 50, 63, 119, 122, 131, 157, 170, 176, 178, 179, 181 and 189.

Natural resources and industry

Before 1967, the only oil-producing area in Ecuador was the Santa Elena peninsula, whose small fields had been heavily exploited since 1917. A new phase in the country's economic development began in 1967, when large reserves of oil were discovered in the Oriente region. Reserves were estimated in 1972 at 5,748 million bbl (or 758 million tons). In 1972, production was some 37.2 million tons of crude petroleum. Ecuador is now the second largest petroleum producer in Latin America, surpassed only by Venezuela. In 1972, Ecuador began exporting petroleum.

Large reserves of natural gas are being exploited. In 1972, reserves were estimated at 170 billion m^3. Production in 1971 was 91 million m^3.

Small deposits of natural guano exist, but no appreciable phosphate rock deposits are known. Large deposits of sulphur are being developed. Potash is known to exist, but in insignificant amounts.

Other resources include coal, gold, silver, copper, lignite, uranium and small amounts of lead and zinc. Significant deposits of limestone have been found. Prospecting for minerals is now being carried out under an agreement with the United Nations Development Programme (UNDP).

The refining capacity of Ecuador is 35,183 bbl/d, from the three refineries at present in operation:

Refinery and location	Capacity (bbl/d)
Anglo-Ecuadorian Oilfields Ltd	27 233
Petróleos Gulf del Ecuador, La Libertad	7 000
Texaco Petroleum Co., Lago Agio	950
Total	35 183

Source: International Petroleum Encyclopedia, 1974 (Tulsa, Oklahoma, Petroleum Publishing Co., 1974), p. 354.

A refinery with a capacity of 60,000 bbl/d is planned for Quito.

Hydroelectric power potential is high. The power sector has not kept pace with the country's electricity requirements. Four major hydroelectric stations are planned, however, at Pisayambo, Paute, Toachi and Montúfar. It is estimated that they will add some 450 MW in installed capacity within the next 10-15 years. In 1966, electric power generation was 700 million kWh, of which approximately 35 per cent came from hydroelectric plants.

The industrial sector is growing fast. Industries include food processing, textiles, light consumer goods, chemicals, oil refining and fish processing.

Fertilizer production

Fertilizer production in 1973/74 consisted of 1,500* tons of AS and 2,000* tons of SSP.[2/]

The country's total annual capacity for fertilizer production was estimated in 1974 as follows (thousand tons): SSP, 20; complex fertilizers, 40; and AS, 40.[3/]

The AS plant capacity is to be increased from 40,000 to 80,000 t/a. The manufacture of ammonia and urea, based on the natural gas from the Gulf of Guayaquil, is being studied.

Ecuador's fertilizer industry will continue to depend on imports of rock phosphate and ammonia, in the absence of sufficient domestic supplies. The types of complex fertilizers produced are as follows:

10-30-10	10-25-25
10-40-10	13-13-20
12-24-12	14-14-14
6-24-24	12-0-27-2 (MgO)

The Corporación Financiera Nacional is studying ways to modernize and reorganize the industry.

The cost of primary materials is high, which makes production costs and the sales prices for complex fertilizers also high.

One fertilizer plant exists at Guayaquil, the plant of Fertilizantes Ecuatorianos SA (FERTISA). It has the following basic units:

(a) Sulphuric acid - capacity, 36,000 t/a as 100% sulphuric acid;

(b) Phosphoric acid (30% P_2O_5) - capacity, 30 t/d as P_2O_5. It is planned to increase capacity of this unit to 7,500 t/a;

(c) SSP - capacity, 8 t/h. This unit can make either SSP or TSP;

2/ FAO, Annual Fertilizer Review, 1974, vol. 28-1 (Rome, 1975), pp. 87 and 124.

3/ Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), Análisis del Mercado de Fertilizantes en la Region Andina y Paises de la Cuenca del Plata (La Paz, May 1974), p. 15.

(d) Complex fertilizere - capacity, 40,000 t/a. The leading grades produced are: 10-30-10; 12-24-12; 13-13-20; 14-14-14; and 12-0-27-2 (MgO). The unit uses the TVA process. Raw materials are anhydrous ammonia, sulphuric acid, phosphoric acid, TSP, DAP and potaesium chloride;

(e) AS - capacity, 8 t/h. This unit can also make ammonium phosphate.

In 1966, the firm produced 15,000 tons of diveree formulations. The small scale of production makes for difficulties, however. FERTISA plans to install a small unit for the production of crystalline AS.

Also at Guayaquil, a emall concentrated phosphate plant is being constructed (including wet-procees acid production). Its eetimated capacity ie 7,000 t/a of P_2O_5.

Fertilizer consumption

In 1973/74, fertilizer coneumption was as follows (tons): N, 28,700*; P_2O_5, 15,000*; and K_2O, 8,710.[4/]

In 1973/74 fertilizer uee on arable and on agricultural land was as followe (kg/ha):

Nutrient	Arable land	Agricultural land
N	7.5	4.8
P_2O_5	3.9	2.5
K_2O	2.3	1.4
Total	13.7	8.7

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

In the same year, per capita consumption was 7.8 kg nutriente.[5/] It can be eeen from the above that application ratee are still low.

Consumption ie mostly covered by imports, which consist for the most part of urea and euperphosphates. In 1971/72, 1972/73 and 1973/74 importe were ae follows (tons of nutriente):

Nitrogen fertilizers:	1971/72	1972/73	1973/74
AS	...	1 076	804
AN	...	-	-
Ammonium sulphate nitrate	...	-	-
Sodium nitrate	...	3	-
Calcium nitrate	...	79	44
Urea	...	13 140	20 409
Ammonium phosphate	...	1 980	3 060
Other N fertilizere	...	54	187
Other complex fertilizers	...	1 928	2 717
Total	8 600*	18 260	27 221

4/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

5/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Phosphate fertilizers:	1971/72	1972/73	1973/74
SSP	...	-	-
Concentrated superphosphate	...	1 672	2 105
Basic slag	...	67	34
Ammonium phosphate	...	5 060	7 820
Other phosphate fertilizers	...	18	-
Other complex fertilizers	...	1 493	3 400
Total	6 800*	8 310	13 359
Potash fertilizers:			
Potassium sulphate	...	202	588
Muriate over 45% K_2O	...	7 308	5 904
Complex fertilizers	...	1 877	2 218
Total	3 000*	9 387	8 710

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 115, 146 and 170.

Direct application of nitrogen fertilizers, especially urea for bananas, is widely favoured in the Costa region, while in the Sierra, the use of mixtures is slowly increasing. Many small farmers, however, still use no fertilizers at all.

Slightly over 50 per cent of all fertilizers consumed was applied to the export crops of bananas and sugar in 1970/71. Other crops to which fertilizers were applied include tobacco, potatoes, wheat and barley. Corn for animal feed is becoming increasingly important and as such is a major potential consumer of fertilizers.

Demand for DAP (18-46-0) is increasing. It has shown excellent results on grain crops, particularly wheat.

The types of fertilizer in greatest demand, in order of importance, are as follows:

Straight fertilizers	Compound fertilizers (NPK)
Urea	10-30-10
AS	16-16-16
DAP	13-13-20
TSP	12-24- 8
Potassium chloride	14- 9-20
CAN	13-13-21
	12-11-18
	12-12-12

It has been estimated that present capacity can meet demand until 1975/76 (i.e. 30,000-40,000 t/a NPK) as far as NPK fertilizers are concerned. Imports of urea and DAP will, however, be necessary.

By 1985/86, estimated fertilizer demand is as follows (tons):[6/]

N - 135,700
P_2O_5 - 111,700
K_2O - 66,600

6/ Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), Análisis del Mercado de Fertilizantes en la Región Andina y Países de la Cuenca del Plata (La Paz, May 1974), p. 15.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Capacity				Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
			Product	Thousand tons per annum	Nutrient	Thousand tons per annum		
Guayaquil	1969	FERTISA	Phosphoric acid (30% P_2O_5)	...	P	...	...	...
			AS	40	N	6		
			Complex fertilizers	40	NPK	...		
			10-30-10					
			12-24-12					
			14-14-14					
			13-13-20					
			12-0-27-2 (MgO)					
			Sulphuric acid	36				
			SSP	20	P	3		
Guayaquil	Planning	FERTISA	Crystalline AS	...	N	...		
Guayaquil	Under construction	...	Concentrated phosphate	...	P	7		

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GUYANA

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	3 847	6 044	6 537	...	...
	Production	-	-	-	...	...
	Deficit	3 847	6 044	6 537	...	...
	Surplus	-	-	-	...	...
P_2O_5	Consumption	1 099	1 870	1 363	...	...
	Production	-	-	-	...	...
	Deficit	1 099	1 870	1 363	...	...
	Surplus	-	-	-	...	...
K_2O	Consumption	1 409	1 439	2 051	...	...
	Production	-	-	-	...	...
	Deficit	1 409	1 439	2 051	...	...
	Surplus	-	-	-	...	...

Sources:

1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150.

1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151.

1970/71: FAO, Production Yearbook, 1973 (Rome, 1974), p. 259.

General

Formerly British Guiana, Guyana achieved independence in 1966 and became a republic within the British Commonwealth in February 1970.

Situated on the north-east coast of South America, Guyana borders on Surinam to the east, Venezuela and Brazil to the west, and Brazil also to the south. The country is generally lowland and is protected by sea-walls and dams. It is approximately 215,000 km^2 in area.

Temperatures range from 20°-35°C on the coast. The climate is equable and humid. There are two wet and two dry seasons, and the rainfall is heaviest from May to August. It varies from 60-150 cm per annum and is higher in the inland forest belt.

The population in 1972 was estimated at 800,000.

In 1970, 32.4 per cent of the working population was engaged in agriculture. Guyana's economy still depends basically on agriculture, which provides 25 per cent of the national income. At present, the most dynamic sector of the economy is, however, mining.

GNP in 1971 was $300 million (at market prices), and per capita GNP was $390. During the period 1965-1971, GNP grew at an average annual rate of 3.3 per cent.

In 1971, agriculture accounted for 19 per cent of GDP; mining and quarrying, 17 per cent; and manufacturing industries, 10 per cent.

Guyana is a member of the Caribbean Common Market.

The goal of Guyana's National Development Plan (1972-1976) is self-sufficiency in food supply by 1976 and the expansion of domestic production to replace imports.

Agriculture

The distribution of land according to use in 1972 was as follows (thousand hectares):

Total area	21 497
Arable land	809
Land under permanent crops	24
Permanent meadows and pastures	2 428
Forests and woodlands	14 164
Other land	4 072

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In 1967, 109,000 ha were irrigated.[1/]

Some 120,000 ha are devoted to rice culture, 50,000 ha to sugar-cane and 18,400 ha to coconut trees.

Agriculture is mainly restricted to the coastal belt area, where over 90 per cent of Guyana's population lives. This coastal belt contains some rich alluvial soils, which permit double-cropping in some areas. These low-lying coastal soils present drainage problems, however.

Sugar-cane and rice are the main crops, sugar-cane accounting for over 30 per cent of exports. The livestock industry is gaining in importance.

The Government plans greater diversification of agriculture and intends to encourage production of cereals, root and starchy vegetables, fruits, oils and fats. Agricultural production during the period 1965-1971 tended to stagnate.

Production figures for 1974 for the most important crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Sugar-cane	55F	75 455	4 150F
Rice, paddy	110F	2 055	226*
Coconuts	...	...	73.1F
Copra	...	...	7.3F
Coffee, green	1.4F	429	0.6*
Maize	2F	1 611	3F
Bananas	2F	5 313	9F

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 41, 46, 51, 126, 128, 157, 170 and 176.

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Natural resources and industry

Exploration for crude oil has so far shown no commercially interesting deposits.

Guyana's bauxite deposits have a relatively high alumina and low iron content, which makes them well suited to the production of calcinated bauxite, for which Guyana holds a virtual world monopoly. The bauxite/alumina industry is nationalized. Although the mining industry is almost exclusively concerned with bauxite mining and alumina processing, other minerals, such as molybdenum and kaolin, are now gaining importance; and copper, iron, radioactive minerals and gold have good potential for development.

Electricity production in 1972 was 338.4 million kWh.

The major industries are sugar processing and rice milling.

Fertilizer production

No fertilizers are produced in Guyana.

Fertilizer consumption

A breakdown of imports of fertilizers for 1971/72, 1972/73 and 1973/74 is given below (tons of nutrients):

N fertilizers	1971/72	1972/73	1973/74
AS	5 844	4 750	...
AN	-	-	...
Sodium nitrate	-	-	...
Calcium nitrate	-	61	...
Urea	1 656	2 481	...
Ammonium phosphate	-	-	...
Other N fertilizers	111	62	...
Total	7 611	7 354	9 260
P_2O_5 fertilizers			
SSP	1	18	...
Concentrated superphosphate	2 179	1 721	...
Basic slag	-	-	...
Ammonium phosphate	-	-	...
Other phosphate fertilizers	163	90	...
Total	2 343	1 829	70
K_2O fertilizers			
Potassium sulphate	1	4	...
Muriate over 45% K_2O	1 951	1 259	...
Other potash fertilizers	183	102	...
Total	2 135	1 365	2 300

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 115, 147 and 170.

Fertilizer use on arable and on agricultural land in 1973/74 was as follows (tons):

Nutrient	Arable land	Agricultural land
N	11.1	2.8
P_2O_5	0.1	0.0
K_2O	2.8	0.7
Total	14.0	3.6

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Per capita consumption of fertilizers in the same year was 14.2 kg nutrients.2/

The most important fertilizer used continues to be AS. Approximately 88-90 per cent of all fertilizers consumed are applied to sugar-cane. Almost one third of the urea imported is used on rice. The other principal imports are TSP (4,500 t/a), phosphate rock, and muriate of potash. NPK formulations have not yet made a great impression on Guyana's agriculture, and those currently used (e.g. 10-20-0 and 15-15-15) account for less than 3 per cent of consumption.

Almost all sugar-cane is fertilized at an average rate of 240 kg/ha in a nutrient ratio of 1.0 - 0.5 - 0.35. The nutrient ratio for rice is 1.0 - 0.55 - 0. Only a small proportion of the total land area reserved for rice is as yet fertilized, however. Over three quarters of all fertilizers are imported by Brookere Sugar Estates Ltd., the material coming principally from Trinidad and Tobago and Europe, although some P_2O_5 is purchased from the United States of America.

Fertilizer use on both sugar-cane and rice is officially forecast to expand by about 5 per cent per annum, with rice taking an increasing proportion of supplies.

2/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

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PARAGUAY

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	-	267	2 452	...	...
	Production	-	-	-	...	...
	Deficit	-	267	2 452	...	...
	Surplus	-	-	-	...	...
P_2O_5	Consumption		1 152	3 300	...	...
	Production	-	-	-	...	...
	Deficit	-	1 152	3 300	...	...
	Surplus	-	-	-	...	...
K_2O	Consumption	-	126	3 249	...	...
	Production	-	-	-	...	...
	Deficit	-	126	3 249	...	...
	Surplus	-	-	-	...	...

Sources:

1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150;

1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151;

1970/71: FAO, Production Yearbook, 1973 (Rome, 1974), p. 259.

General

Paraguay, a land-locked country, borders on Brazil to the north-east and east, Bolivia to the north and west and Argentina to the south. It is some 406,750 km^2 in area. The Paraguay River divides the country in two: the smaller part, 160,000 km^2, lies to the east, and the Chaco, a low, dry plain covered with marshes and dense, scrub forests, lies to the west.

The climate is subtropical. The western zone, the Chaco, is torrid. In the eastern zone, the average temperatures from 20°C (in the cool season, May-September) to 38°C (in the hot season, October-February). Average annual rainfall in the Chaco is 1,000 mm - in Asunción, the capital, 1,315 mm - and in Villarrica, in the centre of East Paraguay, 1,670 mm. The country suffers from periodic droughts and floods. Rainfall is irregular throughout the year, but the rains predominate in summer.

In 1972, the population was about 2.6 million, with an average annual growth rate of 3.1 per cent. Some 53.3 per cent of the working population was engaged in agriculture in 1970.

The economy is dominated by agriculture, although there is a trend towards greater industrialisation. Livestock is one of the chief sources of the country's wealth.

In 1971, GNP at market prices was $680 million and *per capita* GNP was $280. During the period 1965-1971, *per capita* GNP increased at an average annual rate of 1.3 per cent.

In 1972, agriculture accounted for 34 per cent of GDP; mining and quarrying, 0.2 per cent; and manufacturing industries, 16 per cent.

The first comprehensive National Development Plan (1971-1975) drawn up by the Government emphasizes the importance of increasing the rate of economic growth and creating new employment opportunities. At the same time, it provides for a gradual change of emphasis from the basic investment in infrastructure to the expansion of the commodity-producing sector. An average annual increase in GDP of 6 per cent is envisaged.

Agriculture

The distribution of land according to use in 1972 was as follows (thousand hectares):

Total area	40 675
Arable land and land under permanent crops	1 048
Permanent meadows and pastures	15 100
Forests and woodlands	23 577
Other land	950

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Irrigated land in 1972 amounted to 22,000 ha.[1/]

Among Paraguay's most valuable natural resources are its soils, the most productive of which lie in the east. Most soils have a small-to-medium nitrogen content. In the Upper Chaco region the soils appear to contain sizable quantities of phosphorus and potassium and less nitrogen.

Meat products and cattle hides account for 40 per cent of total agricultural production. Most of the cattle population consists of beef animals, but a small dairy industry is developing in the area around Asunción. Small-scale family farming, based on a subsistence level and a few cash crops, is the main activity in the relatively densely populated central zone. Agricultural products include vegetable oil, quebracho, cotton, coffee, timber and sugar. Major cash crops are coffee, cotton (lint) and tobacco. The staple crops are maize, cassava, sweet potatoes, tobacco, cotton, sugar-cane, bananas and citrus fruits.

The Government is devoting a considerable effort to agricultural research.

Some potentially productive areas of the country are now being settled and an attempt is being made to develop them. An increase in mechanized farming is expected to lead to a growth in production. A project to assess and develop forest potential is currently being carried out. Forests cover about half the total land area. Quebracho extract is obtained from the Chaco and cedar from the Upper Paraná forests.

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Production figures for 1974 for the main products are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Bananas	8F	33 000	264F
Cassava (Manico)	80	13 918	1 108
Sugar-cane	40	32 500	1 300F
Sweet potatoes	12F	7 342	88F
Oranges	...	...	119F
Wheat	40	900	36*
Maize	215*	1 163	250*
Cereals, total	281	1 179	332
Rice, paddy	22	1 818	40
Coffee, green	7.5F	800	6F
Cotton (lint)	...	...	21.8*
Cottonseed	...	...	42*
Seed cotton	81F	815	66*
Tobacco leaves	20	1 300	26
Sorghum	4F	1 310	6F
Pineapples	...	...	32F
Grapefruit	...	...	20F
Soybeans	81	2 099	170

Source: FAO, Production Yearbook, 1974 (Rome, 1975), pp. 41, 44, 46, 50, 56, 65, 67, 86, 119, 122, 157, 164, 166, 168, 170, 176, 181 and 189.

Natural resources and industry

No significant mineral deposits or domestic fuel resources are known in Paraguay. Exploration for oil has been conducted, especially in the Chaco region, and test drilling started in 1967. Some deposits of iron and other ores exist, but not in a sufficient quantity to warrant commercial exploitation.

Paraguay has one refinery, the Refinería Paraguaya SA, situated near Asunción. Crude capacity is 5,000 bbl/d. The refinery, which uses imported crude oil, has been operating since the end of 1966.

Deposits of limestone are processed into lime and Portland cement. Local sandstone and igneous rock are are used in construction. Talc, mica, bauxite, kaolin, copper and lead are present in small amounts. Gravel is extracted and crushed. Deposits of manganese probably exist. Production of minerals in Paraguay is limited. Salt mining is expected to begin soon near Lambre.

The country's rivers offer hydroelectric potential. In December 1968, a hydroelectric plant producing 45,000 kW/a was inaugurated at Acaray, near Puerto Presidente Stroessner. Electricity projects currently planned include a joint one with Argentina (Yacireta - Apipe Falls) and another joint one with Brazil (Guirá Falls).

Geographically, industry is distributed irregularly. Operations are mostly small and methods and equipment simple: Larger operations include meat-packing plants near Asunción, a brewery, a cement plant, a textile factory at Pilár, various sugar mills and an edible-oil plant. Leather goods are also produced. Most industrial production consists of basic consumer items; foodstuffs and beverages form 55 per cent of the total; chemical products, 9.6 per cent; and textiles, 6.5 per cent.

It is expected that the tourist industry, after a recent recession, will continue to expand.

Fertilizer production

Nitroquímica Paraguaya SA brought its 15,000 t/a blending plant on stream at Asunción in 1972. It provides a cheaper and more convenient source of supply of fertilizers for the country. The company was set up by Adola SA and Trans-ammonia Ltd.

Fertilizer consumption

In 1972/73 and 1973/74, fertilizer consumption was as follows (tons):

Nutrient	1972/73	1973/74
N	1 452	1 000*
P_2O_5	1 955	200*
K_2O	1 707	1 800*

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

Fertilizer use on arable and on agricultural land in 1973/74 was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	1.0	0.1
P_2O_5	0.2	0.0
K_2O	1.7	0.1
Total	2.9	0.2

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Fertilizer use is low, and in some rural areas virtually nil. Per capita fertilizer consumption in 1973/74 was 1.1 kg nutrients.[2/] It was estimated recently that 10-15 per cent of the farmers in Paraguay now use some fertilizer, but small quantities of organic matter are preferred to chemical fertilizers.

The Government has introduced its National Wheat Programme to ensure the country's self-sufficiency in wheat. The increased production planned should bring about increased demand for plant nutrients.

2/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Capacity: Product	Capacity: Thousand tons per annum	Capacity: Nutrient	Capacity: Thousand tons per annum	Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
Asunción	1972	Nitroquímica Paraguaya SA	Mixed fertilizers	15	NPK	...	...	...

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PERU

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	57 600*	64 157	66 300*	121 100	151 700
	Production	49 800*	60 000*	19 700*	...	149 100
	Deficit	7 800*	4 157*	46 600*	...	2 600
	Surplus	-	-	-	...	-
P_2O_5	Consumption	20 600*	16 000*	13 000*	25 600	47 400
	Production	53 600*	19 408	6 500*	...	176 000
	Deficit	-	-	6 500	...	-
	Surplus	33 000*	3 408	-	...	128 600
K_2O	Consumption	4 869	6 223	5 000*	15 500	25 000
	Production	2 716*	3 358*	600*	...	30 000
	Deficit	2 153	2 865	4 400*	...	-
	Surplus	-	-	-	...	5 000

Sources:

1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150;

1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151;

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Note: 1960/61 to 1970/71 FAO fertilizer production figures include guano. FAO Annual Fertilizer Review, 1972 (Rome, 1973), p. 164.

General

Peru is situated on the Pacific coast of South America, its northernmost tip lying on the equator adjacent to both Colombia and Ecuador. It shares an irregular frontier on the east with Brasil and Bolivia and has a short frontier in the south with Chile. The Andes Mountains stretch from the narrow coastal belt inland for approximately 350-500 km. Much of this region is over 3,000 m high, with some of the peaks higher than 5,000 m. A low-lying plain in the north drains into the Amazon basin; to the east lies the Madre de Dios plateau with an average elevation of 300-500 m. Peru has an area of 1,285,220 km^2.

In the Andes, the elevation alleviates the effects of the tropical, equatorial climate common to lower-lying areas. Rainfall is light, averaging less than 50 cm per annum.

Population in mid-1972 was 14.4 million, with an average annual growth rate of 3.1 per cent. In 1972, some 44.4 per cent of the labour force was engaged in agriculture, while only 19.8 per cent was engaged in industry.

Agriculture is an important sector of the economy. Sugar and cotton are Peru's main agricultural exports. The manufacturing industry, however, is considered to be the mainstay of economic growth.

GNP at market prices in 1972 was $7,692 million, and per capita GNP $476. During the period 1969-1972, GNP grew at an average annual rate of 6.2 per cent.

In 1969, agriculture accounted for 14.8 per cent of GDP; manufacturing, 20.3 per cent; and mining and quarrying, 7.5 per cent.

Peru is a member of LAFTA and of its subdivision, the Andean Group.

One of the targets of the National Development Plan, published in 1971 and covering a five-year period, is an average annual growth rate for the economy of 7.5 per cent. It foresees a redistribution of land to make the farmer the landowner; bringing new land into production; and increasing productivity by means of new irrigation systems, improved seeds etc. Its overall aim is to make the country self-sufficient in foodstuffs.

Agriculture

The distribution of land according to use in 1971 was as follows (thousand hectares):

Total area	128 522
Arable land	2 558
Land under permanent crops	264
Permanent meadows and pastures	27 465
Forests and woodlands	87 000
Other land	11 235

Source: FAO, Production Yearbook, 1974, vol. 28-1, (Rome, 1975), p. 4.

In the same year, about 1.1 million ha of land were irrigated.[1/]

Many types of soils are found. Coastal soils vary from neutral to alkaline. They are deficient in nitrogen, and assimilable phosphorus content varies between low and medium. The Sierra soils (1,800-3,600 m above sea level) are, agriculturally, the most important in Peru. Many soils are calcareous and contain less than 2 per cent of organic matter. They do not contain adequate quantities of nitrogen, and the content of phosphorus and potassium ranges from low to medium. In the region over 3,600 m above sea level, the soils contain more organic matter and are moderately to strongly acid. The soils of the Selva are acid and deficient in plant nutrients.

In the Costa, or coastal area, most of Peru's cash crops, such as sugar, cotton, rice, corn and other cereals, fruit and potatoes are grown. The larger part of the country's domestic dairy requirements are met from dairy farming in this area. At lower elevations of the Selva, cereals, potatoes and fruit are grown. In the upland Selva, coffee, tea, cacao, mangos, citrus fruits, bananas, local fruits and some tobacco are grown.

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Production figures for 1974 for the principal crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Cottonseed	...	...	144.4*
Seed cotton	142*	1 634	232*
Cotton (lint)	...	...	87*
Sugar-cane	55*	167 436	9 215*
Rice, paddy	89	4 070	361
Coffee, green	128	333	42.6
Cereals, total	777	1 465	1 139
Tea	3F	733	2.2*
Cocoa beans	4F	500	2*
Tobacco leaves	5.4*	963	5.2*
Potatoes	231	5 010	1 155
Wheat	154	755	117
Maize	320	1 474	472

Source: FAO, Production Yearbook, 1974 (Rome, 1975), pp. 41, 44, 46, 50, 63, 119, 122, 157, 176, 178, 179, 181 and 189.

Natural resources and industry

The centre of Peruvian oil production is at present on the Pacific coast, near Talara. Reserves of crude oil in 1972 were 400 million bbl (or 53 million tons), and production in 1971 was at a rate of 62,000 bbl/d (or 3.19 million t/a). Recent discoveries of oil in the eastern jungle area will probably change the entire petroleum situation in Peru completely by the 1980s.

Total crude oil refining capacity in Peru is 106,800 bbl/d from the five refineries operating:

	Crude capacity (bbl/d)
Cía. de Petróleo Ganso Azul Ltd, Pucallpa	2 500
Petróleos del Perú Iquitos	1 300
Petróleos del Perú, La Pampilla	35 000
Petróleos del Perú, Talara	60 000
Petróleos del Perú, Conchán	8 000
Total	106 800

Source: International Petroleum Encyclopedia, 1974 (Tulsa, Oklahoma, Petroleum Publishing Co., 1974), p. 358.

An extension to the La Pampilla refinery should be completed by 1976. Its crude refining capacity will then total 65,000 bbl/d.

Reserves of natural gas in 1972 were 71 billion m^3. Production in 1971 was 17 million m^3. Deposits of natural gas (grade 70-80 per cent CH_4) are found in the areas of Nor-Oeste, Brea, Parinas, Lima and Los Organos.

Production of natural guano (which has a varying content of N and P_2O_5) from islands off the coast has been seriously affected by intensive fishing, which has deprived the sea birds of food. In the Sechura Desert, confirmed and economically available reserves of phosphate total 2,762,000,000 tons of 9.08 per cent P_2O_5 and 514,453,000 tons of 30.5 per cent P_2O_5. A project

is under consideration to exploit the phosphate rock deposits in the Puerto Bayovar region of the Sechura Desert under the aegis of the State agency, MINEROPERU. The project would involve facilities for producing the following (t/a): apatite concentrates, 2 million; industrial salt, 2 million; potash, 200,000; DAP, 200,000; TSP, 200,000; and phosphoric acid, 485,000.

Several million tons of potash reserves exist in the Sechura Desert. Estimated reserves are 6.4 million tons of 60-62 per cent K_2O. By 1976, it is estimated, some 200,000 tons of potash will be produced annually.

Some pyrites deposits exist, but no information is available on their extent or quality. Volcanic sulphur exists at Nosqueguatacna, Isla Cocha. Reserves are estimated at 20 million tons of 55 per cent sulphur, while production averages 400 t/a. Sulphur is also available as a by-product of the mining industry.

Production of coal, deposits of which are estimated at 180 million tons, was 92,400 tons in 1971. Ample deposits exist of limestone. Copper, lead, zinc, antimony, bismuth, silver and gold are also present.

Installed electric capacity at the end of 1970 was 1,685 MW. It has since been considerably increased by the completion of the Mantaro Dam. The Olmos project, at present the subject of feasibility studies carried out by technicians from the Union of Soviet Socialist Republics, is a combined hydroelectric and irrigation scheme to bring water across the Andes from the Amazon to irrigate up to 250,000 ha of coastal land. It will have an electricity-generating capacity of 520,000 kW.

Fishing is an important industry. Other industries include processing of agricultural products, chemical manufacturing and motor vehicle assembly. Rubber manufacturing is expected to begin soon. The traditional emphasis on the processing of local materials (minerals and fibres) has been changed by a large-scale programme of industrialization. New basic industries such as chemicals, paper, steel and engineering are to be established by State or mixed State and private capital under the new State Industrial Development Agency, INDUPERU. Expansion of the iron and steel industry, motor and shipbuilding industries is foreseen.

Fertilizer production

In 1973/74, fertilizer production was as follows (tons): N, 21,120; and P_2O_5, 2,961.[2/]

Chemical nitrogen was introduced at the end of the 1950s as fertilizer to replace the then traditional guano. At first the nitrogen was imported, but later manufactured locally.

Peru has great potential for producing fertilizers. Sufficient reserves of natural gas exist in the north, near Talara, and in the Selva, in Pucallpa, to satisfy the ammonia requirements. Ample deposits of phosphate rock and potassium brine exist in the Sechura Desert. Sulphur is obtained as a by-product from mining and is also found in the south as well as in the Sechura Desert.

In the phosphate sector, Peru is at present neither an important producer nor consumer. Production is currently carried out by two large concerns, the Servicio Nacional de Fertilizantes (SENAFER) and Industrias Químicas SA (INDUS).

2/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 251.

SENAFER sells guano from off-shore islands and imports and distributes chemical fertilizers. Production of guano is subject to fluctuations that are hard to control. SENAFER has two processing plants where the guano is screened, crushed and blended with AS or potassium chloride before being sold as "guano balanceado" or "guano compuesto". The content of plant nutrients varies: 12.0-9.5-1.5; 12-12-12 and 10-8-18, plus other micro-nutrients. A small amount of pure guano is sold.

INDUS, whose plant capacity is approximately 33,000 t/a of superphosphate (20 per cent P_2O_5) and 79,000 t/a of granular mixed fertilizer, is operating at present well below rated capacity. The plant uses phosphate rock imported from Florida, United States of America, and potassium chloride, imported from Europe, and its own by-product sulphuric acid and local AN and AS.

Two ammonia plants exist in Peru - the plant of Fertilizantes Sintéticos SA (FERTISA), in El Callao, and that of Fábrica de Fertilizantes Nitrogenados del Cuzco (CACHIMAYO), in Cuzco.

The FERTISA plant is an older, private-sector plant, with a capacity of 18,000 t/a of N in the form of AN (33.5 per cent N), 45,000 t/a and AS (21 per cent N), 15,000 t/a. Its raw materials are fuel oil (17 API) and sulphuric acid as a by-product from copper smelting. The plant can also produce 72,600 t/a of nitric acid (53 per cent). Its nominal capacity for fertilizers is, however, 15,000 t/a of N, because a small part of the AN (technical grade, 35 per cent N) is intended for production of explosives.

The CACHIMAYO plant is a public-sector plant producing ammonia, nitric acid and AN. It uses the "electrolysis of water" process. Capacity is 13,000 t/a of N in the form of 33.5 per cent AN (39,000 t/a AN). Owing to irregularities in the supply of electric energy, its effective capacity in 1971 was estimated at 31,000 t/a of AN (or 9,300 t/a of N). It also has a capacity of some 33,000 t/a of SSP (18-20 per cent). Production has been rather irregular, with a maximum of 12,600 tons in 1970 (or 2,400 tons of P_2O_5). The low production is due to the high cost of the primary materials, which have to be imported, i.e. sulphur and rock phosphate. The plant is at present operating below rated capacity.

In 1972, work started on construction of the PETROPERU fertilizer complex at Talara, comprising an ammonia unit of 300 t/d of ammonia (100,000 t/a of ammonia) capacity, and a urea plant of 510 t/d of urea capacity (i.e. 168,000 t/a of urea or 77,300 t/a of N). The plant will use 10 million m^3/d of natural gas from the north-west, which is rich in methane.

The Talara complex is scheduled to operate at first at 40-50 per cent of design capacity and increase as the domestic demand rises. The plant is being financed and constructed by Japansse interests.

In the Sechura Desert, projects for TSP production and, eventually, for phosphoric acid production, are being considered. The recovery of potassium chloride from the Sechura is also planned (at first 50,000 t/a of potassium chloride, or 30,000 t/a of K_2O). These projects will eventually render the country self-sufficient in potassium salts and may make it possible to export potassium and salt to the Andean region.

Fertilizer production in 1973/74 was as follows (tons of nutrients):

Nitrogen fertilizers	
AS	1 978
AN	19 142
Other nitrogen fertilizers	-
Other complex fertilizers	-
Total	21 120
Phosphate fertilizers	
SSP	2 961
Other phosphate fertilizers	-
Other complex fertilizers	-
Total	2 961
Potash fertilizers	-

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 87, 124 and 153.

At Cuzco, CACHIMAYO is planning an ammonia/urea complex (capacity 100,000 t/a of ammonia - 82,000 t/a of N) based on natural gas.

Negotiations are proceeding between the Governments of Mexico and Peru on the joint production of phosphate fertilizers. Mexico would supply the sulphur raw material and Peru the phosphate from the Sechura Desert.

Fertilizer consumption

In 1972/73 and 1973/74, fertilizer consumption was as follows (tons):

Nutrient	1972/73	1973/74
N	100 237	80 492
P_2O_5	10 098	9 208
K_2O	11 510	7 871

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

Fertilizer use on arable and on agricultural land in 1973/74 was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	28.5	2.7
P_2O_5	3.3	0.3
K_2O	2.8	0.3
NPK	34.6	3.2

Source: FAO, Annual Fertilizer Revisw, 1974 (Rome, 1975), p. 49.

Per capita consumption was 6.5 kg nutrients in the same year.[3/]

Between 1960 and 1970, the traditional direct application of island guano as fertilizer almost disappsared. Production of guano was at its peak in 1963/64, when guano represented 43 per cent of the total N used as fertilizer. By 1972, only 5-7 per cent of the total N used as fertilizer was derived from guano mixed with AS, and potassium sulphate; the remainder came from chemical fertilizers.

3/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

The main chemical fertilizers recently used have been superphosphates, ammonium and calcium ammonium nitrates, and relatively large percentages of AS, which is now declining in favour of urea imported from Japan and Europe.

In 1973, Peru contracted for record purchases of urea, namely, 54,000 tons from Central America, 57,000 tons from Western Europe, and 40,000 tons from Eastern Europe. Large-scale imports were started recently as a "market seeding" programme for the Talara ammonia/urea plant. The urea requirement is expected to reach 170,000 t/a. With the start-up of the Talara plant, the urea import requirement is expected to fall, and build up again as domestic demand increases. Peru is likely to remain a ursa importer until the end of the decade.

Fertilizer imports in 1971/72, 1972/73 and 1973/74 were as follows (tons of nutrient):

Nitrogen fertilizers	1971/72	1972/73	1973/74
AS	4 067	16 839	13 742
Sodium nitrate	44	-	-
Calcium nitrate	18	-	-
Urea	42 529	58 742	38 755
Ammonium phosphate	369	1 768	1 768
Other complex fertilizers	-	630	630
Total	47 027	77 979	54 895
Phosphate fertilizers			
Total	1 150	5 895	5 896
Potash fertilizers			
Potassium sulphate	2 225	3 595	2 295
Muriat over 45% K_2O	1 650	5 754	4 824
Other potash fertilizers	-	850	220
Complex fertilizers	1 264	1 311	630
Total	5 139	11 510	7 969

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 115, 147 and 170.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Product	Capacity: Thousand tons per annum	Capacity: Nutrient	Capacity: Thousand tons per annum	Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
El Callao	Approxi-mately 1960	FERTISA	AN (33.5% N)	45	N	15	18	-
			AS (21% N)	15	N	3		
			Nitric acid	72.6	N	39		
			Ammonia	26.5	N	22		
El Callao	...	INDUS	SSP (20% P_2O_5)	33	P	6	...	...
			Granular mixed fertilizer	79	...	...		
Cusco	1964	CACHIMAYO	AN (33.5% N)	39	N	13	...	...
			Ammonia	15	N	13		
			Nitric acid	...	N	...		
			SSP (18-20% P)	33	P	6		
			CAN	...	N	...		
Near Lima	1959	CACHIMAYO	AN	40	N	14	17	-
			AS	15	N	3		
...	...	SINAFER (Two fertilizer processing plants)	Mixed fertilizers					
			12.0-9.5-1.5	...	NPK	...	...	...
			12-12-12	...	NPK	...		
			10-8-18	...	NPK	...		
Lima	...	INDUS	SSP	...	P	...	-	...
...	...	Abonos Completos	Mixed fertilizers	15	...	...	...	...
...	...	Rayon y Celanese Peruana	SSP	15	P	3	-	3
Plants planned or under construction								
Talara	1975	PETROPERU	Ammonia	100	N	82	...	...
			Urea	168	N	77.3		
			AN	...	N	...		
			AS	...	N	...		
Cusco	Planning	CACHIMAYO	Urea	...	N	...	-	...
			Ammonia	100	N	82		

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SURINAM

Consumption and production of fertilizers [a/]
(Tons)

Nutrient		Actual			Estimated	
		1960/61	1965/66	1970/71	1975/76	1980/81
N	Consumption	474	1 159	1 970	...	...
	Production	-	-	-	...	...
	Deficit	474	1 159	1 970	...	...
	Surplus	-	-	-	...	...
P_2O_5	Consumption	25	58	110	...	...
	Production	-	-	-	...	...
	Deficit	25	58	110	...	...
	Surplus	-	-	-	...	...
K_2O	Consumption	37	64	60	...	...
	Production	-	-	-	-	-
	Deficit	37	64	60	...	...
	Surplus	-	-	-	-	-

Sources:

1960/61: FAO, Fertilizers: An Annual Review of World Production, Consumption, Trade and Prices, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150.

1965/66: FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1967 (Rome, 1968), pp. 100, 104, 124, 129, 149 and 151.

1970/71: FAO, Production Yearbook, 1973, vol. 27 (Rome, 1974), pp. 259 and 257.

a/ (FAO note): calendar year referring to the first part of the split year.

General

A tropical country located on the north-east coast of South America, Surinam received its independence from the Netherlands in 1975. Surinam is bordered on the north by the Atlantic Ocean, on the south by Brazil, on the east by French Guiana and on the west by Guyana.

Most of the country is of low elevation, although there are hills rising to 300-500 m in the south and south-east. Parts of the fertile coastal plain, which varies from 16 to 80 km in width, are at or below sea level, and a system of dykes has been constructed. Bordering on the coastal plain is a 65-km-wide belt of savannah. Above the savannah is the isolated interior comprising approximately 80 per cent of Surinam's land area and consisting of a dense tropical rain forest, which is at present of little economic significance. Many rivers traverse the country. Surinam's area is approximately 163,270 km^2.

The climate is tropical, humid and rainy. Rainfall averages approximately 100-150 cm/a and relative humidity is generally around 80 per cent. Ocean breezes moderate the temperature, which by day ranges from 23° to 31°C (averaging 27°C), and by night from 17° to 28°C (averaging 21°C). There is little seasonal variation in temperature, the seasons being marked primarily by changes in rainfall. The rainy seasons are from April to July and from November to February.

In 1972, population was 419,000, with an average annual growth rate of 3.1 per cent.

In 1971, GNP was $310 million at market prices, and per capita GNP was $760. During the period 1965-1971, per capita GNP grew at an average annual rate of 5.2 per cent.

Agriculture is an important sector of the economy, employing some 26.8 per cent of the total working population in 1970. It is, however, still hampered by low productivity and accounted for only 10 per cent of GDP in 1970. The largest contributor to GDP is still mining, although the contribution of the manufacturing industries - 13.4 per cent in 1970 - is rapidly increasing. The tourist industry is still small.

Agriculture

The distribution of land according to use in 1969 was as follows (thousand hectares):

Total area	16 327
Arable land	30
Land under permanent crops	8
Permanent meadows and pastures	9
Forest land	14 800*
Other land	1 480

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In the same year, 27,000 ha were irrigated.[1/] The major drainage system is that associated with the Surinam River.

The Government has embarked on a series of plans to modernize facilities and methods of agriculture. Research projects are being undertaken to uncover methods of improving production and distribution. Educational programmes are under way to promote the use of fertilizers and improve marketing practices. The Government is also pursuing projects to reclaim more land and improve transport facilities.

The most important crop is rice. It is both the main staple of the domestic diet and the principal export crop. It occupies some 75 per cent of all cultivated land. Bananas are the second most important crop. Citrus culture is at present being encouraged by the Government. Sugar-cane, coffee and cocoa were once important crops for the country. Now, however, their significance has greatly diminished.

Agriculture is characterized by many small farms and lack of modern techniques. For example, most farming is still carried out by hand.

Production figures for 1974 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Rice, paddy	42F	3 571	150*
Bananas	2F	23 067	35*
Citrus fruits	...	...	...
Sugar-cane	3F	76 000	190F
Coffee, green	1F	400	0.4F
Cocoa beans	0.2F	500	0.1*
Cereals, total	42F	3 568	150
Sweet potatoes	...	5 172	...
Tomatoes	...	6 613	...

Source: FAO, Production Yearbook, 1974 (Rome, 1975), pp. 41, 46, 65, 136, 157, 166, 170, 176 and 178.

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Natural resources and industry

Reserves of oil and gas are present in the coastal plain and the off-shore continental shelf. However, geophysical prospecting and drilling by the Shell Oil Company have not yet revealed exploitable reserves. Prospecting is continuing.

Surinam possesses some of the world's richest bauxite deposits and is the world's second-largest supplisr, surpassed only by Jamaica. Bauxite mining, together with alumina and aluminium production, comprises the most important single factor in the economy of the country. Massive new reserves of bauxite have been discoversd recently in the west.

Occurrencss of bsryllium, tungsten, manganese and diamonds have been reported, but these minerals are not exploited commercially. Small amounts of gold are mined.

The country has grsat hydroelectric potential. Current instalIed capacity is approximately 200,000 MW (1971).

The manufacturing industries have been the fastest growing sector of the economy since 1965.

Fertilizer production

No fertilizers are produced in Surinam.

Fertilizer consumption

In 1973/74, fertilizer consumption was as follows (tons): N, 2,300*; P_2O_5, 400*; and K_2O, 400*.[2] Per capita consumption was 7.2 kg nutrients.[3]

Fertilizer use on arable land and on agricultural land in 1973/74 was as follows:

Nutrient	Arable land	Agricultural land
N	60.5	48.9
P_2O_5	10.5	8.5
K_2O	10.5	8.5
Total	81.6	66.0

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Fertilizer imports in 1972/73 and 1973/74 were as follows (tons):

Nutrient	1972/73	1973/74
N	3 100*	2 300*
P_2O_5	300*	400*
K_2O	200*	400*

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 116, 147 and 170.

2/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

3/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

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URUGUAY

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	4 500	8 310	13 346	19 600	24 900
	Production	-	-	-	-	-
	Deficit	4 500	8 310	13 346	19 600	24 900
	Surplus	-	-	-	-	-
P_2O_5	Consumption	19 600	32 900	46 000	70 500	91 150
	Production	1 610 a/	2 776	4 261	5 278	6 666
	Deficit	17 990	30 124	41 739	65 222	84 484
	Surplus	...	-	-	-	-
K_2O	Consumption	3 200	4 642	6 600	7 200	8 500
	Production	-	-	-	-	-
	Deficit	3 200	4 642	6 600	7 200	8 500
	Surplus	-	-	-	-	-

Source: Ministry of Livestock and Agriculture, Honorary Commission for the Agricultural Development Plan, Montevideo, December 1972.

a/ From bone phosphate.

General

Uruguay is the smallest South American republic, with an area of 176,215 km^2. It lies on the east coast of South America. Brazil is its neighour on the north-east, and the rest of its frontier is shared with Argentina. The main geographical features are the well-irrigated, undulating plains, especially in the south and west, and some hills in the north and south-east, which do not rise above 600 m.

The climate is temperate, and rainfall is moderate and regular, averaging 100-125 cm a year. Occasional short droughts occur. Average humidity is high, and average annual temperatures in the north and south are 19°C and 16°C, respectively.

The population in 1972 was just under 3 million, with an average annual rate of growth of 1.2 per cent, which represents the lowest growth rate in Latin America. Approximately 17.9 per cent of the working population was engaged in agriculture in 1970.

Uruguay is essentially an agricultural country. Its traditional exports are meat, wool and hides. The livestock industry is the most important aspect of Uruguayan agriculture.

In 1971, agriculture accounted for 11.3 per cent of GDP; the manufacturing industries, 25.9 per cent; and mining and quarrying, 2.9 per cent.

Uruguay is a founder member of LAFTA and is also a member of the Basin of the River Plate Association. Uruguay's major trading partners are Western Europe, Argentina, Brazil and the United States of America.

The National Development Plan (1973-1977) has as a basic objective to increase foreign currency reserves. It is calculated that GDP should grow at an average annual rate of 4 per cent, and per capita production at an average annual rate of 2.8 per cent.

In 1971, GNP was $2,200 million at market prices, and per capita GNP was $750. During the period 1965-1971, per capita GNP grew at an average annual rate of 0.7 per cent.

Agriculture

The distribution of land according to use in 1970 was as follows (thousand hectares):

Total area	17 751
Arable land	1 803
Land under permanent crops	48
Permanent meadows and pastures	13 629
Forests and woodlands	614
Other land	1 657

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Irrigated land in the same year amounted to 52,000 ha.[1/]

The principal agricultural activities are cattle breeding and sheep farming. The cultivation of cereals, oilseed crops, rice and fruit is also important.

Production figures for 1974 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Wheat	430	1 225	526
Cereals, total	873	1 366	1 192
Sunflower seed	91	532	48
Cottonseed	...	...	0.39*
Seed cotton	1	1 200	1*
Linseed	42.4	619	26.3
Rice, paddy	42	3 571	150
Sugar-beets	14	31 186	434
Sugar-cane	7	41 231	268

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 41, 44, 46, 108, 119 and 157.

Natural resources and industry

No significant amounts of fertilizer raw materials or domestic fuel resources have yet been found in Uruguay.

Off-shore exploration for oil may start soon, following a French survey indicating the possible existence of oil in commercial quantities on the Uruguayan continental shelf. Uruguay plans to intensify exploration for natural resources in general.

A State-owned refinery operates in Montevideo. Its capacity in 1972 was 45,000 bbl/d crude oil.

1/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Other resources include marble, coal, manganese and lead. Some iron ore deposits are currently the subject of a government-promoted feasibility study.

Several hydroelectric schemes have been proposed. The largest is the 300,000-kW El Palmar complex on the Rio Negro. Construction has begun on the Salte Grando complex, a joint Uruguay-Argentina hydroelectric project on the River Uruguay. The country's installed electric power capacity in 1973 was 546,000 kW, over 30 per cent of which came from the Rincón del Bonete hydroelectric plant.

Production of textiles, beverages, plastics, glass, electrical appliances, motor vehicle assembly, domestic hardware, petroleum products, chemicals and cement is important, and all these industries are well established. The most important single industry, however, is meat processing. Tourism is also one of the most significant industrial sectors of the economy.

Fertilizer production

In 1973/74, fertilizer production was 10,000* tons of P_2O_5.[2/]

The country has no domestic raw materials or intermediates for the production of nitrogen fertilizers. The size of the market does not make production of synthetic nitrogen economically feasible.

All chemical fertilizers are currently based on imported materials. Nitrogen and potash fertilizers are granulated to the required formulation for the customers. Imported rock phosphate is processed to obtain ordinary superphosphate. Uruguay's total capacity is 20,000 t/a of superphosphate expressed in P_2O_5. In 1969, the chemical fertilizer industry in Uruguay was operating at full capacity.

Five companies producing phosphate fertilizers operate in the country: Ancap, Hiperfosfata SA, Industria Sulfúrica and Quimur SA. A new phosphate fertilizer unit is to be built at Montevideo for Fosfatos Tomás. Planned capacity is 60,000 t/a of phosphate fertilizers in grades such as 17-17-17 and 12-24-8. An increase in Uruguay's production of phosphoric acid is also planned.

Fertilizer consumption

Consumption of fertilizers in 1973/74 was as follows (tons): N, 11,600; P_2O_5, 29,400*; and K_2O, 7,122.[3/] Per capita consumption in the same year was 16.1 kg nutrients.[4/]

Fertilizer use on arable and on agricultural land in 1973/74 was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	6.3	0.7
P_2O_5	15.9	1.9
K_2O	3.8	0.5
Total	26.0	3.1

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

2/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 251.

3/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

4/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

The use of chemical fertilizer has grown appreciably in recent years. Fertilizers are applied chiefly to sugar-beets, sugar-cane, vegetables and fruits. The principal fertilizers used are phosphates. A trend towards the use of more concentrated chemical fertilizers, e.g. urea (46 per cent), DAP (18-46-0) and TSP (46 per cent), is becoming apparent.

By 1980, demand is expected to increase to 24,360 tons of N (including 32,000 tons of urea, or 14,700 tons of N). By 1985, the demand should be 29,500 tons of N (including 38,800 tons of urea, or 17,500 tons of N).[5/]

Imports of fertilizers in 1972/73 and 1973/74 were as follows (tons of nutrients):

	1972/73	1973/74
Nitrogen fertilizers		
AS	1 018	...
AN	-	...
Ammonium sulphate nitrate	207	...
Sodium nitrate	25	...
Urea	6 022	...
Ammonium phosphate	6 082	...
Other N fertilizers	-	
Other complex fertilizers	4 027	...
Total	17 381	11 600
Phosphate fertilizers - total	20 000*	19 000*
Potash fertilizers		
Potassium sulphate	12	...
Muriate over 45% K_2O	2 880	...
Complex fertilizers	4 072	...
Total	6 964	7 122

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 116, 147 and 170.

5/ Data supplied by the Ministry of Livestock and Agriculture, Honorary Commission for the Agricultural Development Plan, Montevideo, December 1972.

Status and capacity of fertilizer plants

Location	Start-up	Ownership	Product	Capacity: Thousand tons per annum	Nutrient	Capacity: Thousand tons per annum	Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
Montevideo	...	Fosfatos Tomás	...					
Montevideo	...	Hyperfosfato SA	SSP	...	P	...	-	...
Montevideo	...	Industria Sulfírica SA	SSP	...	P	...	-	...
Montevideo	...	Cía. Química Uruguaya SA	SSP	...	P	...	-	...
Montevideo	Planned	Fosfatos Tomás	Phosphate fertilizers (17-17-17) (12-24-8)	60	P	...	-	...

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VENEZUELA

Consumption and production of fertilizers
(Tons)

Nutrient		Actual 1960/61	Actual 1965/66	Actual 1970/71	Estimated 1975/76	Estimated 1980/81
N	Consumption	2 636	26 000*	25 416	50 000 1/ 50 600 2/	100 000 1/ 89 100 2/
	Production	-	24 200*	9 554	400 000 1/	750 000 1/
	Deficit	2 636	1 800*	15 862	-	-
	Surplus	-	-	-	350 000 1/ 349 400	650 000 1/ 660 000
P_2O_5	Consumption	4 879	8 000*	14 963	30 000 1/ 26 100 2/	50 000 1/ 47 000 2/
	Production	1 954	8 000*	8 122	35 000 1/	50 000 1/
	Deficit	2 925	-	6 841	-	-
	Surplus				5 000 1/ 8 900	- 1/ 2 800
K_2O	Consumption	3 713	10 000*	19 091	35 000 1/ 28 000 2/	50 000 1/ 50 800 2/
	Production	-	-	-	-	-
	Deficit	3 713	10 000*	19 091	35 000 1/ 28 000 2/	50 000 1/ 50 800 2/
	Surplus	-	-	-	-	-

Sources:

1960/61: FAO, Annual Fertilizer Review, 1964 (Rome, 1965), pp. 93, 97, 119, 125, 148 and 150.

1965/66: From FAO unofficial figures.

1970/71: FAO, Production Yearbook, 1973 (Rome, 1974), pp. 259 and 257.

1975/76 and 1980/81: 1/ UNIDO, "Review of World Production, Consumption and International Trade in Fertilizers, with Projections to 1975 and 1980", paper prepared for the Second Interregional Fertilizer Symposium held at Kiev, USSR (21 September - 1 October 1971).

2/ Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), Análisis del Mercado de Fertilizantes en la Región Andina y Países de la Cuenca del Plata (La Paz, May 1974), p. 22.

General

Venezuela, seventh largest country in Latin America, with an area of 912,050 km^2, lies on the north coast of South America. Guyana is its neighbour to the east, Brazil to the south and south-east and Colombia to the west and south-west. There are four main geographical regions: (a) the Cordillera Ridge and adjacent hill country in the north and north-west; (b) the coastal area to the north of the mountains; (c) the plains (llanos) south and east of the mountains up to the Orinoco River; and (d) the Guyana Highlands to the south and east of the Orinoco River.

Temperatures vary with altitude: the lowlands and inland river valleys are hot and humid; the highlands are warm during the day and cool at night. Most of the country has a rainy season from May to November. Rain varies from 50 cm in the north-west to 250 cm in the south and south-east.

Population was 11.5 million in 1972. In 1970, 26.2 per cent of the working population was engaged in agriculture. Population increased between 1963-1972 at an average annual rate of 3.4 per cent.

From the standpoint of the domestic economy, Venezuela is still predominantly an agricultural country. The main export industry is petroleum. The principal products are petroleum, followed by iron ore, coffee and cocoa. Venezuela is now one of the world's leading oil-exporting countries. Oil alone accounts for 93 per cent of Venezuela's foreign exchange earnings. Though mining and petroleum together account for 98 per cent of the country's exports, they employ less than 2 per cent of the labour force.

GNP in 1971 at current market prices was $ 46.6 billion; per capita GNP was $ 963. It increased from 1963 at an average annual rate of 3.7 per cent.[1/]

In 1971, agriculture accounted for 6 per cent of GDP; mining and quarrying, 15 per cent; and the manufacturing industries, 21 per cent.

The main aim of the development plan covering the period 1970-1974 was to pursue industrial development and diversify the economy using the revenue from the oil industry.

Agriculture

The distribution of land according to use in 1961 was as follows (thousand hectares):

Total area	91 205
Arable land	4 562
Land under permanent crops	652
Permanent meadows and pastures	13 847
Forests and woodlands	47 970
Other land	24 174

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

In the same year, 218,000 ha were under irrigation.[2/]

The principal crops grown are: coffee, cocoa, sugar-cane, corn, rice, bananas and vegetables. Crops account for 57 per cent of agricultural production, while livestock and livestock products account for 36 per cent. Venezuela's traditional export crops are coffee and cocoa.

1/ Statistical Yearbook, 1973 (United Nations publication, Sales No. 74.XVII.1), table 182.

2/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Production figures for 1972 for the main crops are given below:

Crop	Area harvested (thousand hectares)	Yield (kg/ha)	Production (thousand tons)
Coffee, green	272F	221	60*
Sugar-cane	75F	76 538	5 748F
Cereals, total	588	1 421	836
Rice, paddy	102	2 865	293
Cocoa beans	72F	292	21*
Tobacco leaves	9.5F	1 520	14.4*
Cotton (lint)	28*	...	...
Cottonseed	...	...	48*
Seed cotton	70F	1 086	76*
Sisal	11.6F	1 293	15*
Bananas	48F	20 964	1 000*

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), pp. 41, 46, 117, 122, 157, 170, 176, 178, 181, 187 and 189.

Natural resources and industry

Crude oil is found in the States of Zulia, Falcón, Apure, Monagás and Guárico. Reserves in 1972 were estimated at 13,900 million bbl (or 1,984 million tons). Production in 1973 was at the rate of 3.3 million bbl/d.

Reserves of natural gas in 1972 were 719 billion m^3. Production in 1971 was 52,030 million m^3. Natural gas exists in the States of Zulia, Anzoátegui, Monagas and Barinas.

Some commercially sized deposits of phosphate rock are located in the west and north-west. Production in 1973 was 25,000 tons.

Some sulphur exists in the State of Sucre. Production averages 300 t/a. A sulphur-recovery unit came on stream at Amuay in 1971. Its capacity is 100,000 t/a of sulphur.

There are no large reserves of potash.

Total refining capacity in Venezuela is 1,531,615 bbl/d. The 12 refineries are listed below:

Company and refinery location	Crude capacity (bbl/d)
Chevron Oil Co. of Venezuela, Bajo Grande	61 500
Cía. Shell de Venezuela Ltd., Cardón	348 000
San Lorenzo	32 000
Creole Petroleum Corp., Amuay	630 000
Corporación Venezolana del Petróleo, Morón Estado Carabobo	30 000
Mobil Oil de Venezuela, El Palito	102 000
Phillips Petroleum Co., San Roque	5 000
Sinclair Oil and Refining Co., Barinas	5 400
Sinclair Venezuelan Oil Co., El Chaure	40 000
Sinclair Venezuelan Oil Co., El Toreño	5 400
Texas Petroleum Company, Tucupita	10 000
Venezuelan Gulf Refining Co., Puerto la Cruz	157 715
Total	1 531 615
Venezolano del Petróleo, Lake Maracaibo	100 000 (planned)

Source: International Petroleum Encyclopedia, 1974 (Tulsa, Oklahoma, Petroleum Publishing Co., 1974), p. 364.

Coal reserves exist in the States of Zulia, Tachira and Anzoátegui, as follows (million tons): 100, 2, and 50, respectively. Production in 1971 was 41,040 tons. Vast deposits of iron ore exist. Significant reserves of lateritic bauxite exist. Other resources include copper, nickel, limestone, gold, silver, diamonds, tin, uranium and thorium.

Electricity production in 1971 was 13,584 million kWh. In 1969, the installed capacity of the electrical industry was over 3 million kW, of which 30.2 per cent related to hydroelectricity. There is large hydroelectric power potential in Venezuela. By 1977, the production of electricity at the Guri Dam in east Venezuela will increase to 1,750,000 kW and, later, to 6 million kW of electricity.

Industries include rubber, steel, petroleum products, chemicals, wood, paper products, aluminium and cement. Fishing is a major industry. Tourism is now becoming a valuable supplier of foreign exchange.

Fertilizer production

In 1973/74, fertilizer production was as follows (tons): N, 4,600*; and P_2O_5, 14,600*.[3/]

The first nitrogen fertilizer complex in Venezuela, based on natural gas feedstock, was the Puerto Morón plant of the Instituto Venezolano de Petroquímica (IVP), which started up in 1963. Data on production capacity are given below:

Product	Capacity (thousand tons per annum)
Ammonia	33
Sulphuric acid	280
Phosphoric acid (50% P_2O_5)	33
Nitric acid (53%)	61
Nitric acid (98%)	9
Agricultural AN	49
Technical AN	3
Urea	16
AS	79
SSP	99
TSP	39
NPK mixtures	79

In 1974, a facility was commissioned at Morón for ammonia (210,000 t/a) and urea (220,000 t/a) production. The 90 per cent owned subsidiary of IVP, Venezolano del Nitrogeno CA (NITROVEN), has fertilizer-producing facilities at El Tablazo comprising two ammonia lines with a total capacity of 594,000 t/a and two urea lines with a capacity of 792,000 t/a.

Projects scheduled to be completed by 1980 are as follows:

El Tablazo (NITROVEN): 2 ammonia lines - total, 590,000 t/a

Guyana: Ammonia - 300,000 t/a

Puerto La Cruz (NITROVEN): 4 ammonia plants to utilize natural gas from petroleum production; capacity totals 2 million t/a of ammonia; (to be completed by 1977)

Morón (IVP): Phosphoric acid 300,000 t/a (also later stage)

Morón (IVP): DAP, 146,000 t/a

3/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 251.

NITROVEN has contracted sales to neighbouring countries, the United States of America and China.

Fertiliser consumption

In 1973/74, fertilizer consumption was as follows (tons): N, 40,775; P_2O_5, 23,484; and K_2O, 20,884.[4/] All K_2O fertilizers consumed were imported.

Fertilizer application rates are below recommended levels in several Latin American countries. Present total requirements are still small, and it is planned to satisfy these and future requirements by developing domestic fertilizer industries. Venezuela will then have exportable surpluses of urea and ammonia.

In 1973/74, fertilizer use on arable and on agricultural land was as follows (kg/ha):

Nutrient	Arable land	Agricultural land
N	7.8	2.1
P_2O_5	4.5	1.2
K_2O	4.0	1.1
Total	16.3	4.5

Source: FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 4.

Per capita consumption was 7.2 kg in the same year.[5/] Mixed formulae account for about 40 per cent of the total material consumed, while AS accounts for another 40 per cent. The remainder is composed of urea, TSP and potash salts.

Imports of fertilizers in 1971/72, 1972/73 and 1973/74 were as follows (tons):

Nutrient	1971/72	1972/73	1973/74
N	19 862	35 000*	32 000*
P_2O_5	8 703	12 000*	14 700*
K_2O	18 187	18 179	20 884

Source: FAO, Annual Fertilizer Review, 1974 (Rome, 1975), pp. 116, 147 and 171.

4/ FAO, Production Yearbook, 1974, vol. 28-1 (Rome, 1975), p. 253.

5/ FAO, Annual Fertilizer Review, 1974 (Rome, 1975), p. 49.

Status and capacity of fertiliser plants

Location	Start-up	Ownership	Capacity: Product	Capacity: Thousand tons per annum	Capacity: Nutrient	Capacity: Thousand tons per annum	Estimated total N (thousand tons per annum)	Estimated total P_2O_5 (thousand tons per annum)
Puerto Morón	1963	Instituto Venezolano de Petroquímica (IVP)	Ammonia	33	N	27		
			Sulphuric acid	280	...			
			Phosphoric acid (50% P_2O_5)	33	P	17		
			Nitric acid (53%)	61	...			
			Nitric acid (98%)	9	...			
			Agricultural AN	49	N			
			Technical AN	3	N			
			Urea	16.5	N	7		
			AS	79	N	16		
			SSP	99	P	20		
			TSP	39.6	P	18		
			NPK mixtures	79.2	NPK	...		
El Tablazo	...	Venezolano del Nitrogeno CA (NITROVEN)	Ammonia (2 lines)	594	N	488		
			Urea (2 lines)	792	N	344		
Morón	1974	IVP	Ammonia	210	N	172		
			Urea	220	N	101		
El Tablazo	...	NITROVEN	Ammonia	590	N	484		
Guyana	...	...	Ammonia	300	N	246		
Puerto la Cruz	1977	NITROVEN	Ammonia (4 plants)	2 000	N	1 644		
Morón	1974 later	IVP	Phosphoric acid		P	300		
			Phosphoric acid		P	300		
Morón	...	IVP	DAP	146	N	26		
					P	67		

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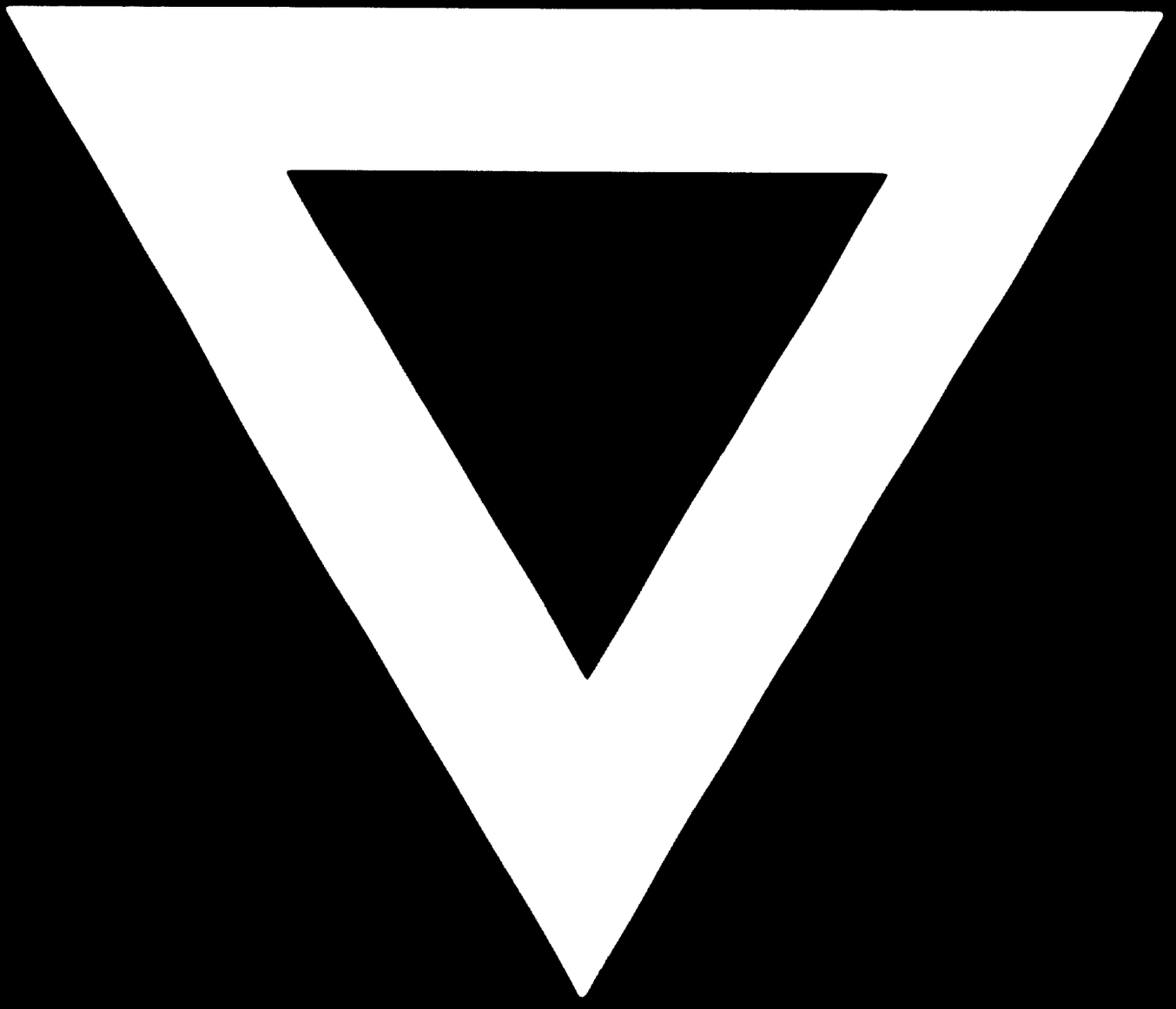

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