OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

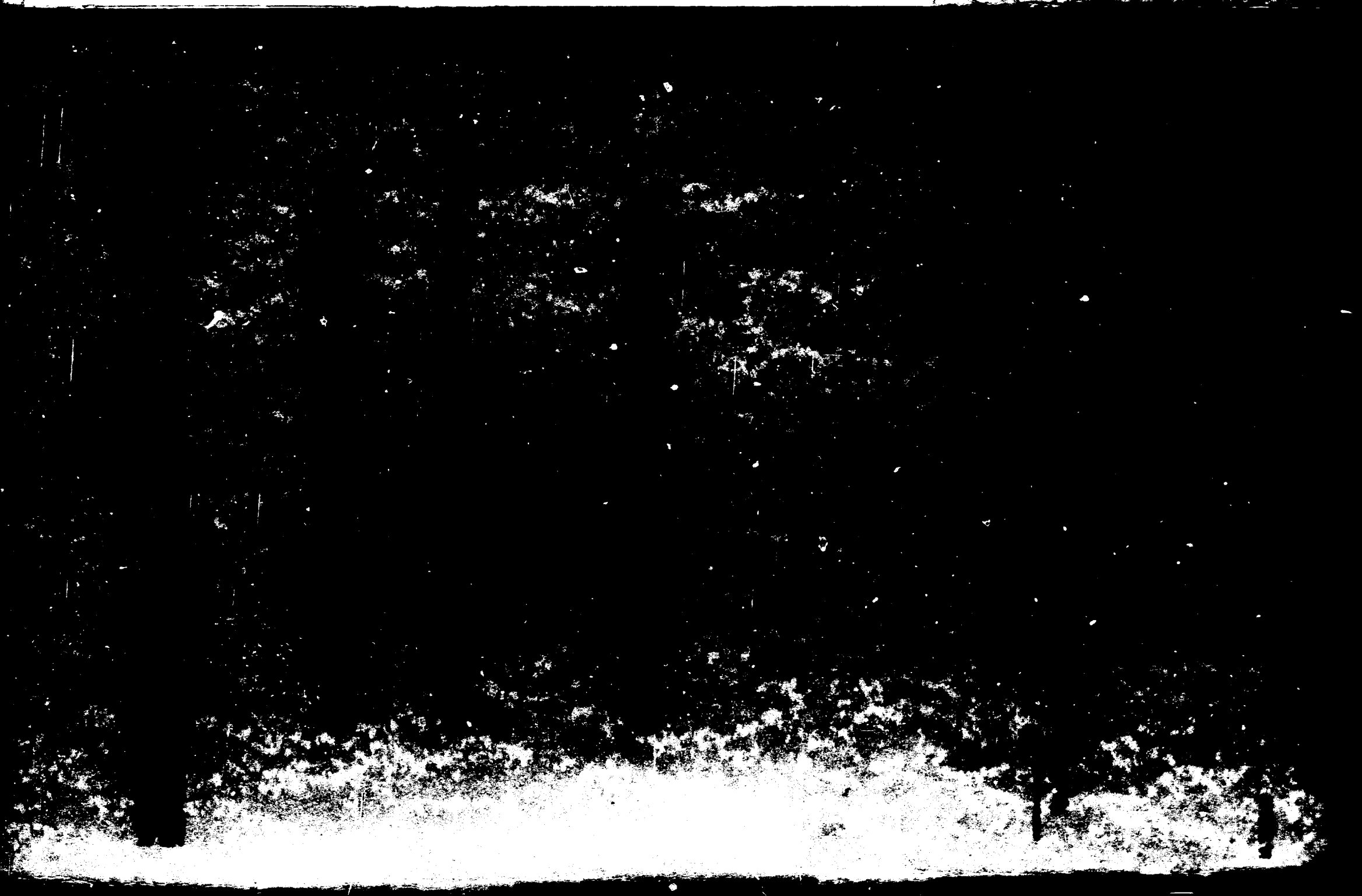
FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org



PREFACE

This directory is one of a series designed to provide developing and developed countries with a concise and factual source of information in the field of 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 Asia and the Far East (ECAFE),[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. Further directories are being prepared; these cover the regions of the Economic Commission for Europe (ECE), the Economic Commission for Latin America (ECLA) and the Economic Commission for Western Asia (ECWA).

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), ECAFE, 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 Asian countries. The data have been verified, as far as possible, with the valuable assistance of ECAFE, FAO and a number of Governments. Data on China were not available in time to be included in this volume.

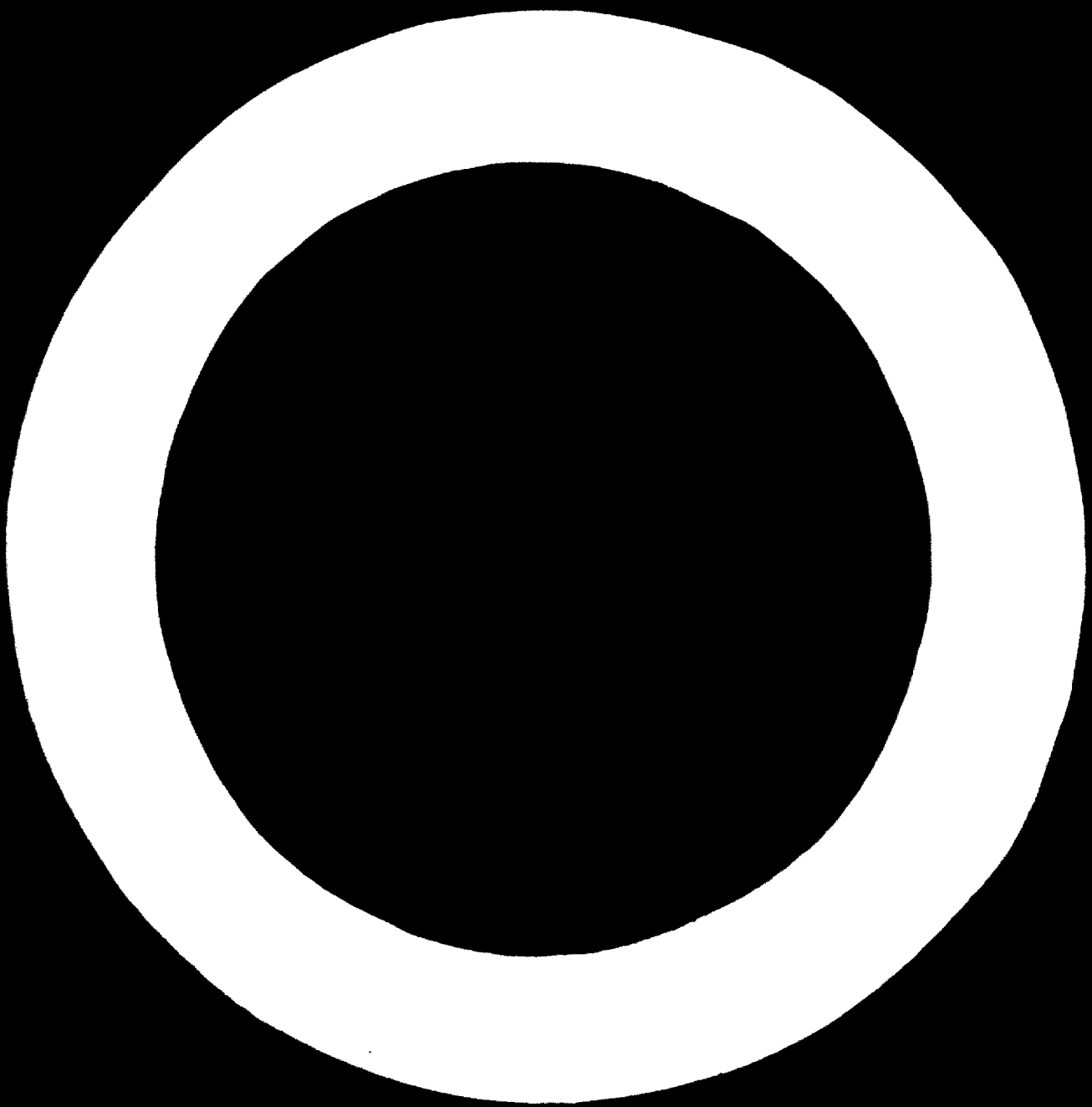
For analysis and comparison, the countries considered in this volume are grouped into the two subregions of East Asia and South Asia, as follows:

East Asia. Burma, Democratic People's Republic of Korea, Indonesia, Khmer Republic, Laos, Malaysia, Philippines, Republic of Korea, Republic of Viet-Nam, Thailand

South Asia. Afghanistan, Bangladesh, India, Iran, Pakistan, Sri Lanka

---

1/ A directory dealing with Africa was issued in 1970, under the symbol ID/44.



CONTENTS

	Page
EXPLANATORY NOTES	vii
SUMMARY OF REGIONAL DATA	1
COUNTRY DATA, EAST ASIA AND SOUTH ASIA	17
EAST ASIA	19
Burma	19
Democratic People's Republic of Korea	25
Indonesia	28
Khmer Republic	35
Laos	40
Malaysia	44
Philippines	50
Republic of Korea	57
Republic of Viet-Nam	62
Thailand	67
SOUTH ASIA	73
Afghanistan	73
Bangladesh	79
India	83
Iran	94
Pakistan	100
Sri Lanka	105

LIST OF FIGURES

I.	Annual consumption and production of fertiliser nutrients in East Asia, 1960-1980	5
II.	Annual consumption and production of fertilizer nutrients in South Asia, 1960-1980	6
III.	Annual consumption and production of fertiliser nutrients in Asia, 1960-1980	7

LIST OF TABLES

1.	Areas and population of Asia, by region and country	1
2.	Gross domestic product of Asia, by region and country	2
3.	Cultivated land area and main crops in Asia, by region and country	3
4.	Annual consumption and production of fertiliser nutrients in East Asia, 1960-1980	4
5.	Annual consumption and production of fertiliser nutrients in South Asia, 1960-1980	4

Page

6. Annual consumption and production of fertilizer nutrients in Asia, 1960-1980 8

7. Availability of fertilizer feedstocks in Asia, by region and country . . . 10

(a) Natural gas, coal and lignite 10

(b) Crude oil and refineries 11

(c) Phosphate rock and potash 12

(d) Elemental sulphur and pyrites 13

8. Ground rock phosphate used for direct application in Asia, by region and country 15

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.

Nm^3 refers to a normal cubic metre of gas.

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

Per cent BPL refers to the percentage content of tricalcium phosphate contained in phosphate rock.

Per cent N refers to the percentage content of nitrogen in fertilizers.

Per cent P_2O_5 refers to the content of:

(a) Total phosphorus in case of phosphate rock;

(b) Available phosphorus content in case of phosphate fertilizers;
both 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.

Cultivated area refers to the area of arable land and land under permanent crops and excludes areas under permanent meadows and pastures.

Three dots (...) indicate that data are not available or are not separately reported.

A dash (-) indicates that the amount is nil.

A blank in a table indicates that the item is not applicable.

Dates divided by a slash (e.g. 1970/71) indicate a crop, or financial year, or the calendar year corresponding to the first part (1970 in the example).

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

* Unofficial FAO figure, except in population, where * indicates United Nations estimate.

F = FAO estimate.

The following abbreviations are used in this publication:

bbl/d	barrels per day
c.i.f.	cost, insurance, freight
DAP	diammonium phosphate
EIU	Economist Intelligence Unit
GDP	gross domestic product
GNP	gross national product
GWh	gigawatt hour
ha	hectare
kVA	kilovolt-ampere
kWh	kilowatt-hour
LNG	liquefied natural gas
LPG	liquefied petroleum gas
MW	megawatt
NP	nitrogen-phosphate
NPK	nitrogen-phosphate-potassium
n.s.	not specified
oz	ounces

SSP	single superphosphate
TSP	triple superphosphate
USAID	Agency for International Development, United States Department of State

United Nations bodies and specialised agencies

ECAFE	Economic Commission for Asia and the Far East
UNIDO	United Nations Industrial Development Organisation
UNDP	United Nations Development Programme
FAO	Food and Agriculture Organisation of the United Nations
IBRD	International Bank for Reconstruction and Development

SUMMARY OF REGIONAL DATA

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

Areas, population and national income

Table 1 shows the areas and population of the countries and the average rates of growth of population over the last few years, which exceed 2 per cent per annum. These figures illustrate the problems facing the developing countries of Asia caused by the rapid increase in population and underline the need for modernization of the agricultural sectors in these countries.

Table 1. Sizes of Asian countries

	Area (thousands of square kilometres)	Population (millions)	Average annual growth rate of population (percentage)
East Asia			
Burma	678.0	27.58 (1970)	2.3
Democratic People's Republic of Korea	120.5	14.28 (1971)	2.4
Indonesia	1 900	124.89 (1971)	2.6
Khmer Republic	181.0	6.70 (1971)	2.2
Laos	235.7	3.03 (1971)	2.4
Malaysia	331	10.67 (1971)	3
Philippines	300	42 (1972)	3
Republic of Korea	98.5	31.92 (1971)	2
Republic of Viet-Nam	173.8	18.81 (1971)	2.6
Thailand	515	35.34 (1971)	3.3
South Asia			
Afghanistan	647	17.48 (1970)	2.3
Bangladesh	143	76 (1972)	3
India	3 170	559.6 (1971)	2.4
Iran	1 645	29.78 (1971)	3.2
Pakistan	801.4	52.28 (1970)	3
Sri Lanka	65.6	12.76 (1971)	2.1

Table 2 illustrates the state of economic development of the two subregions. The data presented show the gross national product (GNP) at factor cost for the countries for

which reliable information was available, and the contribution of the main sectors of the economy, where available. In most of the countries considered, the per capita GNP is less than $200, and in several countries less than $100.

Table 2. Economic status of Asian countries

Country	GNP		Approximate distribution of GDP in relevant sectors (percentage)		
	Total (millions of dollars)	Per capita (dollars)	Agriculture	Manufacturing	Mining
East Asia					
Burma	1 883 (1969)	71	36	...	...
Democratic People's Republic of Korea	2 900 (1968)	203	...	...	...
Indonesia	13 912 (1969)	115	52	11	4
Khmer Republic	983 (1969)	140	40	...	...
Laos	202 (1968)	72	50	...	...
Malaysia	3 838 (1970)	352	32	13	7
Philippines	7 735 (1969)	208	36	17	2
Republic of Korea	5 600 (1969)	180	30	26	(incl. mining)
Republic of Viet-Nam	4 156 (1969)	233	38	42	(all industry)
Thailand	6 291 (1969)	166	32	...	2
South Asia					
Afghanistan	1 470 (1969)	75	60	2	...
Bangladesh	4 300 (1970)	60	56	...	...
India	47 700 (1969)	88	48	15	(incl. mining)
Iran	10 181 (1970)	355	...	...	...
Pakistan	...	...	...	...	...
Sri Lanka	2 117 (1970)	169	34	...	...

The agricultural sector - traditional and modern - dominates the economy, with a few exceptions, notably in the Persian Gulf region, where an export-oriented industry, based on natural gas and oil, has been built up.

Table 3 illustrates the production of some of the more important subsistence and cash crops.

Although this survey deals primarily with fertiliser production facilities, the above data have been included to illustrate the problems that have to be faced by most of the Asian countries in order to develop and modernise their agriculture and to promote the use and local manufacture of fertilisers. These factors are discussed later in more detail in the sections dealing with individual countries.

Consumption and production of fertilisers

The past and estimated projected consumption and production of the primary fertiliser nutrients (N, P_2O_5 and K_2O) from 1960 to 1980 for East Asia and South Asia are shown in tables 4 and 5, and for Asia as a whole in table 6. These data are also illustrated graphically in figures I, II and III. The bases for the projections are discussed later in the sections dealing with individual countries.

Table 3. Cultivated land area and main crops in Asia, by region and country

	Cultivated land area as percentage of total area	Main crops (thousands of tons)									
		Cereals	Paddy rice	Tea	Coffee	Natural rubber	Cotton	Sugar-beet	Sugar-cane	Tobacco	Ground-nuts (in shell)
East Asia											
Burma	27	8 622	8 413	...	...	7.5F	15F	...	1 800F	41.4	520F
Democratic People's Republic of Korea	15	5 432	...	...	...	...	...	...	...	40.0F	...
Indonesia	9	21 485	18 585	70.0	180.0F	820.0F	1F	...	9 709F	70.0F	480F
Khmer Republic	16	2 854	2 732	...	...	63.0	2F	...	326F	8.6	15*
Laos	4	925	900F	...	3.5F	...	3F	...	...	4.0*	1F
Malaysia	10	1 797	1 786F	3.5F	4.1F*	1 331.4*F	...	...	...	2.1F	5F
Philippines	29	7 447	5 437	...	49.0F	19.6F	-	...	18 655F	53.7	18*
Republic of Korea	23	8 003	5 500F	...	...	...	5F	...	...	72.4*	8F
Republic of Viet-Nam	16	5 747	5 716F	5.5F	4.0F	29.0*	-	...	300F	8.4F	32F
Thailand	22	15 270	13 270F	...	...	326.3*	21F	...	7 700F	95.0F	190F
South Asia											
Afghanistan	12	3 255	300*	...	...	...	33*	80F	60F	...	...
Bangladesh	...	...	...	...	...	...	...	...	...	...	...
India	50	119 362	66 500F	425*	108.6	100*	...	...	128 769	349.9	5 800*
Iran	10	5 516	1 100F	20.6F	...	...	156*	3 800	600F	19.7*	...
Pakistan	...	...	...	...	...	...	...	...	...	...	...
Sri Lanka	30	1 650	1 616F	217*	...	138*	1F	...	500	9.2*	5F

Table 4. Annual consumption and production of fertiliser nutrients in West Asia, 1960-1980
(Tons)

Nutrient		Actual			Projected	
		1960	1965	1970	1975	1980
N	Consumption	416 194	554 094	1 116 775	1 827 150	2 629 200
	Production	93 545	236 371	742 855	910 307	1 400 000
	Deficit	322 649	317 723	373 920	916 843	1 229 200
	Surplus	-	-	-	-	-
P_2O_5	Consumption	116 196	293 778	440 045	780 000	1 347 300
	Production	25 950	69 000	280 945	356 740	440 000
	Deficit	90 246	224 778	159 100	423 260	907 300
	Surplus	-	-	-	-	-
K_2O	Consumption	50 391	118 402	278 657	567 200	763 900
	Production	-	-	49 746	43 334	...
	Deficit	50 391	118 402	228 911	523 866	763 900
	Surplus	-	-	-	-	-

Table 5. Annual consumption and production of fertiliser nutrients in South Asia, 1960-1980
(Tons)

Nutrient		Actual			Projected	
		1960	1965	1970	1975	1980
N	Consumption	297 481	746 449	1 864 000	4 479 000	7 873 000
	Production	98 000	248 800	858 200	2 793 000	4 801 000
	Deficit	199 481	497 649	1 005 800	1 686 000	3 072 000
	Surplus	-	-	-	-	-
P_2O_5	Consumption	80 417	165 539	556 000	1 535 000	3 478 000
	Production	52 000	111 000	229 000	880 000	1 196 000
	Deficit	28 417	54 539	327 000	655 000	2 282 000
	Surplus	-	-	-	-	-
K_2O	Consumption	55 501	167 622	270 200	800 000	1 291 000
	Production	-	-	-	-	-
	Deficit	55 501	167 622	270 200	800 000	1 291 000
	Surplus	-	-	-	-	-

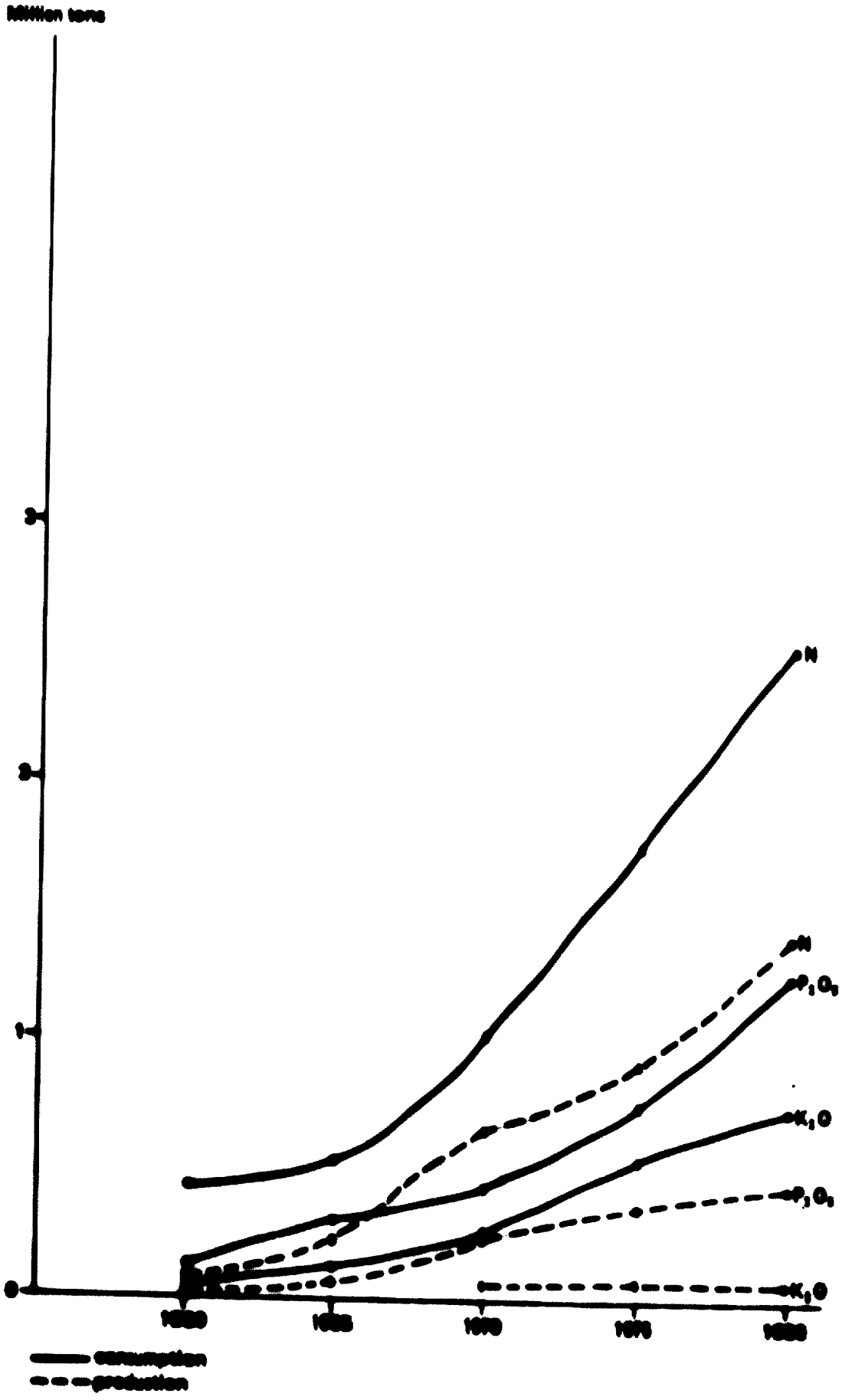


Figure I. Annual consumption and production of fertiliser nutrients in Near Asia, 1960-1980

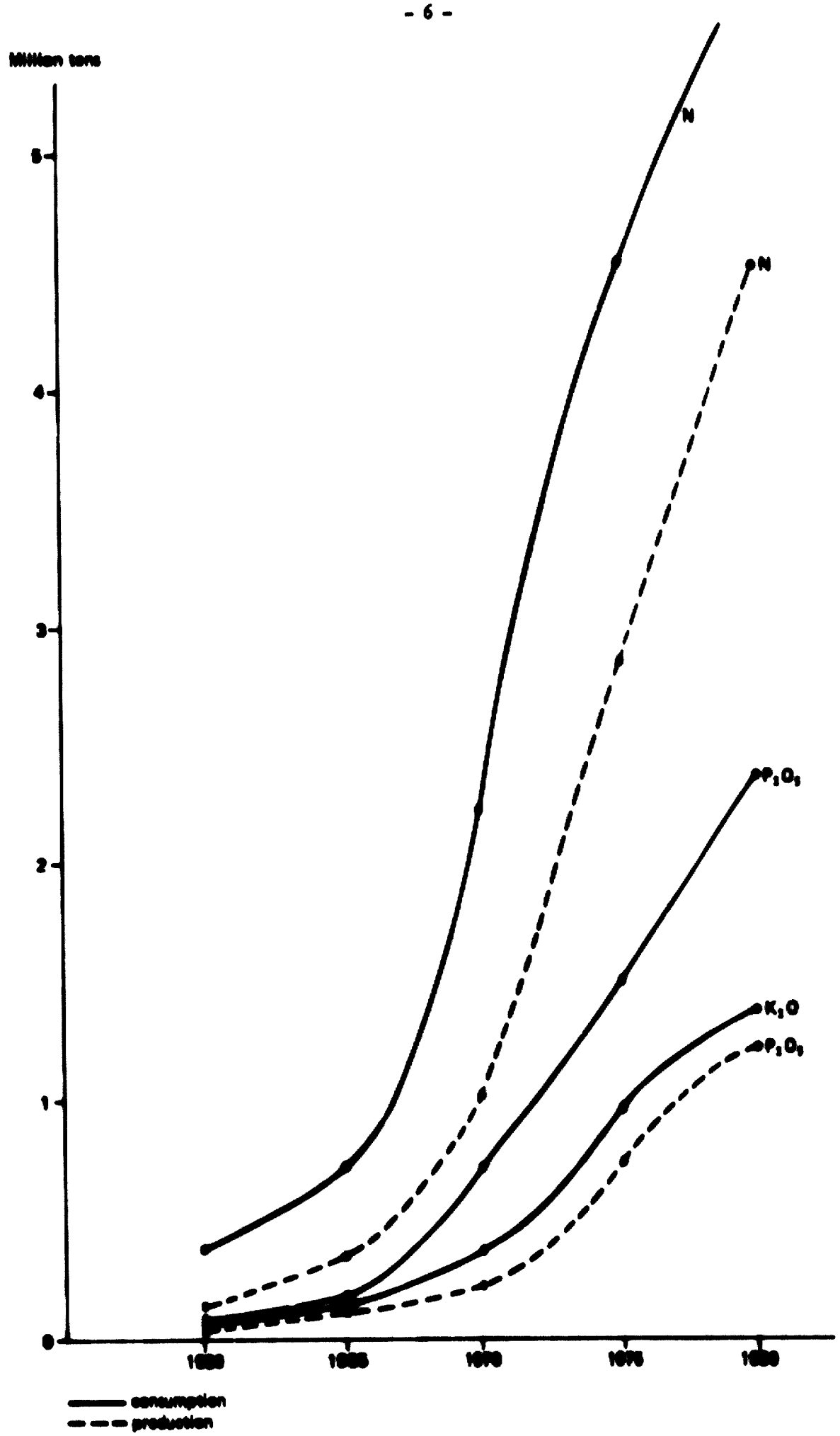


Figure II. Annual consumption and production of fertiliser nutrients in South Asia, 1960-1980

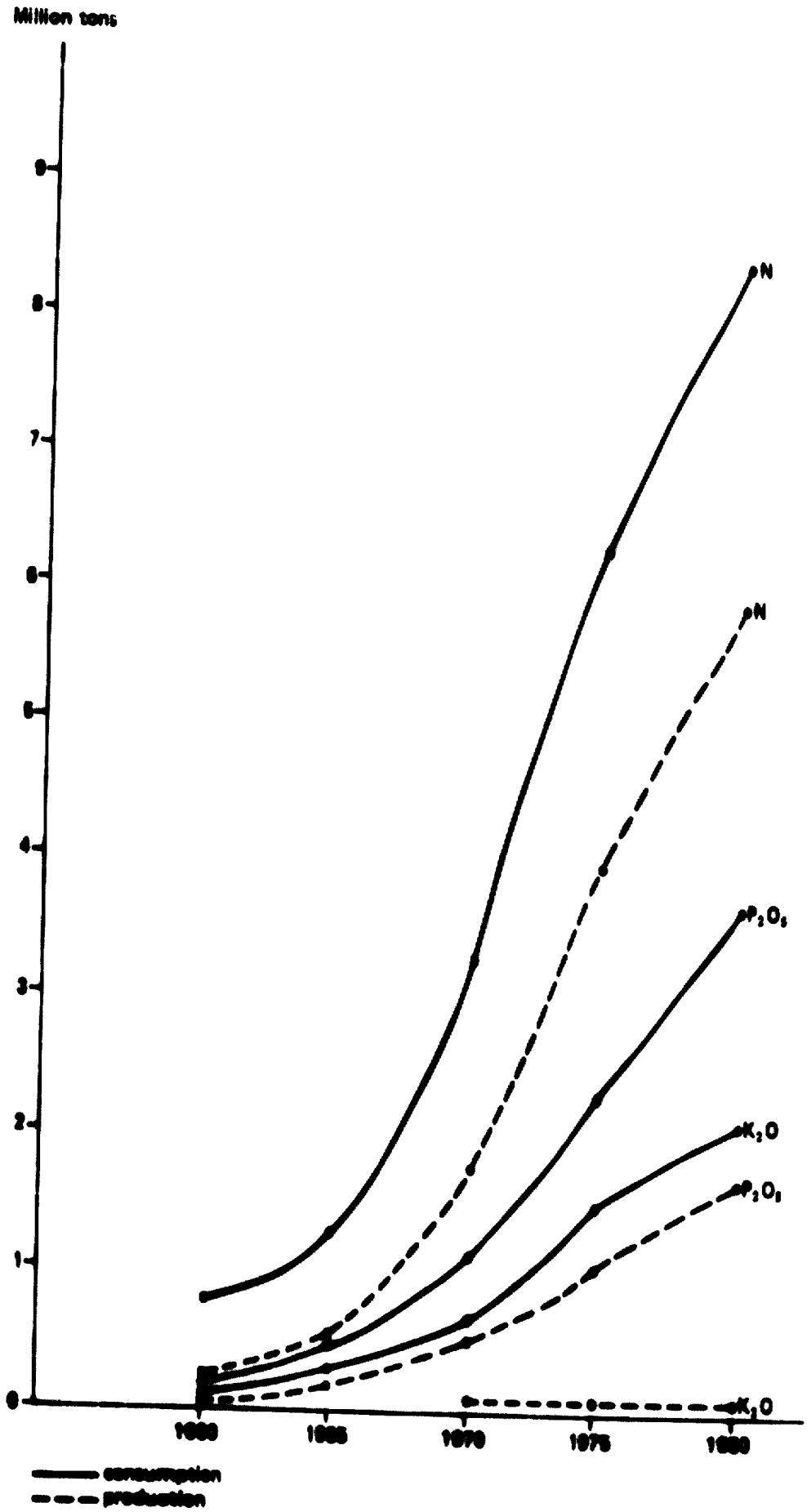


Figure III. Annual consumption and production of fertiliser nutrients in Asia, 1960-1980

Table 6. Annual consumption and production of fertilizer nutrients in Asia, 1960-1980 (total)
(Tons)

Nutrient		Actual			Projected	
		1960	1965	1970	1975	1980
N	Consumption	713 675	1 300 543	2 980 775	6 306 150	10 502 200
	Production	191 545	485 171	1 601 055	3 703 307	6 201 000
	Deficit	522 130	815 372	1 379 720	2 602 843	4 301 200
	Surplus	-	-	-	-	-
P_2O_5	Consumption	196 613	459 317	996 045	2 315 000	4 825 300
	Production	77 950	180 000	509 945	1 236 740	1 636 000
	Deficit	118 663	279 317	486 100	1 078 260	3 189 300
	Surplus	-	-	-	-	-
K_2O	Consumption	105 892	286 024	548 857	1 367 200	2 054 900
	Production	-	-	49 746	43 334	...
	Deficit	105 892	286 024	499 111	1 323 866	2 054 900
	Surplus	-	-	-	-	-

Considering the whole of the Asian region, it would appear that in the foreseeable future fertilizer production will not meet demand. By 1980/81 the production of nitrogen is expected to show a deficit of 4.25 million tons per annum, even though there is an increase in the annual production capacity of almost 60 per cent. The annual deficit of phosphate fertilizers is likely to increase from about 513,000 tons of P_2O_5 in 1970 to about 3,189,300 tons of P_2O_5 in 1980/81. The potash deficit will increase from 499,111 tons of K_2O per annum in 1970 to an estimated 2 million tons in 1980/81. The situation in future is likely to be far less satisfactory, when considered on a regional basis, than it is at present (see tables 4 and 5).

Nitrogen fertilizers

With the advent of large ammonia plants producing nitrogen, using low-cost indigenous natural gas as feedstock, the pattern of marketing the product has changed in many areas of the world from the local captive markets to shipments to considerable distances, at competitive export prices, to areas where the demand cannot be met from local production. This trend started in the 1960s and was particularly intensified during the past decade for nitrogen. The Asian region is not the only area where this has occurred. In Latin America, Venezuela has made large investments in nitrogen-producing facilities, far outstripping the production of Trinidad and Tobago, operations that could today be called forerunners of the development of export markets for anhydrous ammonia in the early 1960s. Ammonia is being supplied from the Persian Gulf region to India, Turkey and a few African countries.

In the Persian Gulf region, large export-oriented nitrogen-producing plants have been built, utilising their indigenous resources of natural gas. By 1980 Iran and Kuwait are expected to produce an estimated 1,370,000 tons of nitrogen, with local consumption of the order of 200,000 tons of nitrogen per annum. These exports are primarily to supply the needs of the countries in the region of the Indian Ocean where the demand has already outstripped supply from local production.

With the exoeption of Bangladesh and Pakistan, where indigenous natural gas resources will lead to the construction of new ammonia plants, the South-Asia region will continue to be an importer of nitrogen fertilizers. While for India alone the deficit in nitrogen fertilizers was 650,000 tons per annum in 1970/71, the forecasted deficit, with increased consumption at 6.4 million tons per annum is 2.4 million tons by 1980/81. The trend in India to utilize locally available feedstocks, such as coal and heavy-fuel oil, for the production of nitrogen is becoming clearer. (See table 7.)

The East-Asian region, including countries such as Burma, Indonesia, Malaysia and the Republic of Viet-Nam, is planning to develop or expand its own nitrogen industry to the point of self-sufficiency. Among these countries, Indonesia has its own reserves of natural gas and crude oil, and explorations are being undertaken, especially for new crude-oil reserves in the off-shore region. Concurrent with these developments, the nitrogen industry is also being expanded; however, estimates for 1980/81 still indicate a deficit between local production and demand of some 100,000 tons. Nitrogen fertilizers are particularly important for Indonesia as the country uses this product on rice and other food crops in the fertile central and eastern Java soils. The adoption of "high-yielding varieties" has intensified the use of fertilizers for this crop.

According to the report prepared by the United Nations mission completed in July 1972, the Asian nitrogen deficit, covering oountries such as Indonesia, Malaysia, the Philippines and Thailand, will amount to 595,000 tons in 1980/81, with a demand of 1,038,000 tons. Japan, having installed an export-oriented industry, will probably be able to satisfy part of the needs of this area; possibly, other imports will come from Europe and the United States of Amerioa. The Persian Gulf countries are also expected to play a leading role in meeting the requirements of the region as a whole.

Some substantial increases in fertilizer demand have been recorded over the past decade in Asia, and forecasts for the 1970s are 12.3 per cent per annum, reaching 8.7 million tons in 1975 and 13 million tons by 1980.

The consumption pattern shows that nitrogen outstrips the consumption of other nutrients. While the average global ratio of N : P_2O_5 : K_2O nutrients is 1.8 : 1.2 : 1.0, during 1969/70, in the region covered by ECAFE, the ratio was 5.0 : 1.5 : 1.0. Demand for urea has increased, replacing ammonium sulphate, formerly the most popular nitrogen carrier. In Asia, urea accounts for 48 per oent of the looal consumption and 45 per cent of the installed nitrogen capacities. Significance oan also be attached to the rise in oonsumption of complex fertilisers, which, in 1973, accounted for 20 per cent of world trade.

In oountries where insufficient indigenous resources of feedstocks, such as natural gas, are available, development of the nitrogen fertiliser industry is expected to rely on local or imported naphtha or fuel oil. This applies to such countries as the Republic of Viet-Nam, Sri Lanka and Thailand.

Table 7. Availability of fertilizer feedstocks in Asia by region and country

(a) Natural gas, coal and lignite

	Natural gas				Coal and lignite			
	Year	Total proved and probable reserves (billion cubic metres)	Year	Annual production (million cubic metres)	Total proved and probable reserves (million tons)	Year	Annual production (thousand tons)
East Asia							
Burma	1972	3	1971	62	128.0	1970	12.0
Democratic People's Republic of Korea	...	...	...	...	...	...	...
Indonesia	1972	127	1971	3 205	2 845.0	1970	170.0
Khmer Republic	1972	negligible	...	...	negligible	...	...
Laos	1972	-	...	...	2.5	-	-
Malaysia (+ Brunei)	1972	212	1971	...	...	...	...
Philippines	1968	0.7	...	...	88.0	1970	48.0
Republic of Korea	1972	...	...	...	1 190.0	1970	12 394.0
Republic of Viet-Nam	...	...	...	...	1 000.0	1964	6.0
Thailand	...	...	...	...	235.0	1970	400.0
South Asia							
Afghanistan	1972	139	1971	2 591	85.0	1969	136.0
Bangladesh	1972	113	1971	170	750.0	...	...
India	1972	42	1971	453	126 883.3	1970	76 669.0
Iran	1972	5 660	1971	35 257	1 000.0	1970	323.0
Pakistan	1972	439	1971	3 259	335.0	...	...
Sri Lanka	...	...	...	...	...	...	...

Table 7 (continued)

(b) Crude oil and refineries

	Crude oil				Capacity of refineries
	Year	Total proved and probable reserves (million tons)	Year	Annual production (thousand tons)	(thousand tons per annum crude oil)
East Asia					
Burma	1972	1	1971	800	1 320
Democratic People's Republic of Korea	1972	...	...	...	...
Indonesia	1972	1 415	1971	44 100	14 660
Khmer Republic	1972	...	...	...	600
Laos	1972	...	...	...	...
Malaysia (+ Brunei)	1972	130	1971	9 200	6 250
Philippines	1972	...	...	...	9 550
Republic of Korea	1972	...	...	...	10 750
Republic of Viet-Nam	1972	...	...	...	...
Thailand	1972	-	-	-	4 960
South Asia					
Afghanistan	1972	2 492	...	...	...
Bangladesh	...	...	...	...	...
India	1972	128	1971	8 700	23 290
Iran	1972	7 463	1971	224 600	30 010
Pakistan	1972	5	1971	500	...
Sri Lanka	...	...	...	...	1 500

Table 7 (continued)

(c) Phosphate rock and potash

	Phosphate rock			Potash		
	Total proved and probable reserves (million tons)	Average grade (per cent P_2O_5)	Annual production (thousand tons)	Total proved and probable reserves (million tons)	Average grade or composition	Annual production (thousand tons)
East Asia						
Burma	small	...	...	...	...	...
Democratic People's Republic of Korea	...	...	...	...	...	...
Democratic Republic of Viet-Nam	9	11	457	...	...	...
Indonesia	1	15.5	30	some	9.4	
Khmer Republic	approximately 0.6	15-25	3			
Laos	...	...	...	...	...	...
Malaysia	approximately 0.09	10-30	...	...	...	...
Philippines	approximately 0.77	17-31	1	...	...	...
Republic of Korea	...	...	...	...	...	...
Republic of Viet-Nam	4.5	over 20	...	...	...	...
Thailand	small	16-18	...	...	...	...
South Asia						
Afghanistan	...	...	...	...	...	...
Bangladesh						
India	several millions	15-30	67	...	...	...
Iran	approximately 0.09	11-22	...	some	...	...
Pakistan	limited	...	...	some potash-bearing brine	...	...
Sri Lanka	...	...	...	...	...	...

Table 7 (continued)

(d) Elemental sulphur and pyrites

	Elemental sulphur			Pyrites		
	Total proved and probable reserves (million tons)	Grade (per cent S)	Annual production (thousand tons)	Total proved and probable reserves (million tons)	Grade (per cent S)	Annual production (thousand tons)
East Asia						
Burma	...	...	...	...	...	...
Democratic People's Republic of Korea	...	...	...	...	...	...
Indonesia	1.5	...	1.0	...	...	...
Khmer Republic	...	...	...	...	...	...
Laos	...	...	...	...	...	...
Malaysia	...	...	1.0	...	...	...
Republic of Korea	...	...	...	some	...	3
Republic of Viet-Nam	...	...	...	some	...	...
Thailand	...	...	...	...	...	...
South Asia						
Afghanistan	...	...	...	...	...	...
Bangladesh						
India	some		26	iron pyrites 385	40	26
Iran			1	...	...	...
Pakistan	...	...	...	...	...	...
Sri Lanka						

Phoephate fertilizers

Produotion capacity in the phoephate industry in 1969/70 was nearly 55 per oent of oneumption in the Aeian region. Production capacities soheduled to go into operation would inorease the volume to 1,111,740 tons of P_2O_5 by 1975, whioh is equal to 60 per cent of the forecasted demand for the region. The Asian region does not possess high-grade indigenous phosphate deposits and most of the phosphate rock has to be imported from Afrioa, Christmas Island, the Middle East or the United Statee. Other deficits in P_2O_5 are met by the importation of finished products of phosphate and TSP, NP or NPK fertilizers. The pattern in the phosphate or ammoniated phosphate fertilizers is following the general trend and demand for high-analysis fertilizers is increasing.

In South Asia reserves of phoephate rock are available in India, Iran and Sri Lanka (see aleo table 7 (c)).

Some phosphate deposits have been located in the East-Asia region in the Paracel Islands, between the Republic of Viet-Nam and the Philippines. Significant quantities of apatite have been found in the area of the Demooratic Republic of Viet-Nam. Little informa-tion ie available on these deposits; however, they may have economic potential for the fertilizer industry (see also table 7 (c)). The deposits of the Paracel Islande have been exploited occasionally in the past. The estimated remaining reeerves are oonsidered to be of the order of 20 million tons, from which, after beneficiation, 1 million tone of P_2O_5 could be extracted from deposits containing up to 30-40 per oent P_2O_5 (or 65-87 per oent BPL).[1/] The lime content of these apatites is relatively high and requires more sulphurio acid when processed in the 'wet phosphoric' acid production facilities.

Table 8 shows the amount of ground-rock phoephate used for direct applioation in Asia, by region and country.

Sulphur

Sulphur is not considered as a primary nutrient but is used in making sulphurio acid for the acidulation of phosphate rock, wherever the 'wet phosphorio' acid process is ueed. Sulphur deposits, of voloanic origin, exist in Indonesia and the Philippines. In the Philippines about 10 million tons of reserves, with a minimum 20 per oent S content, ooald become economically valuable. Similar deposits have been disoovered in Negros Orientales with reserves of up to 25 million tons; exploitation of these deposits was abandoned when world market prioes for sulphur fell. Apart from these deposite of elemental sulphur, pyrites depoeits are found in India, Indonesia, Malaysia, the Philippines and the Republic of Viet-Nam. The ohoice of this raw material would only appear economio in special cases, according to a regional feasibility study completed by UNIDO. Sulphur has been recovered from natural gas in Iran (in Bandar Shahpur and on Kharg Island), as well as in other Persian Gulf countriee, and this has oome onto the market in the last few years.

1/ BPL is the percentage content of tricalcium phosphate in the phosphate contained in phosphate rock.

Table 8. Ground-rock phosphate used for direct application in Asia, by region and country

	Consumption 1970/71 (tons of P_2O_5)
East Asia	
Burma	-
Democratic People's Republic of Korea	5 000
Indonesia	3 000
Khmer Republic	4 600
Laos	-
Malaysia	33 300
Philippines	-
Republic of Korea	-
Republic of Viet-Nam	25 000
Thailand	-
Total	70 900
South Asia	
Afghanistan	-
Bangladesh	-
India	25 000
Iran	-
Pakistan	-
Sri Lanka	15 900
Total	40 900
Total of East and South Asia	111 800

With the current low prices of sulphur (delivered to the Asian area at prices between $23 and $29 per ton) this raw material will be imported from Canada or the Near East. The consumption of sulphur has been estimated to be approximately 332,000 tons per annum.

Potash fertilisers

There are no known potash deposits of commercial value in the Asian region. The consumption of potash during 1970/71 for East Asia was 278,657 tons, and for South Asia 270,200 tons. The estimated demand for East Asia and South Asia by 1980/81 is 768,900 and 1,291,000 tons per annum, respectively.

Availability of fertiliser feedstocks and fuels

Table 7 shows the availability of fertiliser feedstocks and fuels and indicates the known or probable reserves.

Future trends

The significant indigenous feedstocks are natural gas and oil and availability of these will lead to more rapid expansion in the nitrogen industry. To obtain a balanced nutrient input in the Asian region nitrogen fertilisers produced could be traded for

imports of phosphate, potash and sulphur. This, in turn, is expected to lead to expansion in the production of NPK or NP fertilisers with high-analysis formulations, following trends elsewhere in the world.

Factors limiting the extension of fertiliser use in Asia

The deficit in the supply of fertilizers in the Asian region is most likely to increase from 2 million tons in 1969/70 to 3.7 million tons in 1975/76, and to 5 million tons by 1980/81. The contributary factors may be summarized as follows:

Lack of indigenous resources and adequate reserves (this applies to phosphates, potash and sulphur)

Lack of foreign exchange to import fertilizers and capital equipment

Lack of an adequate marketing structure in many of these countries

Lack of available extension services

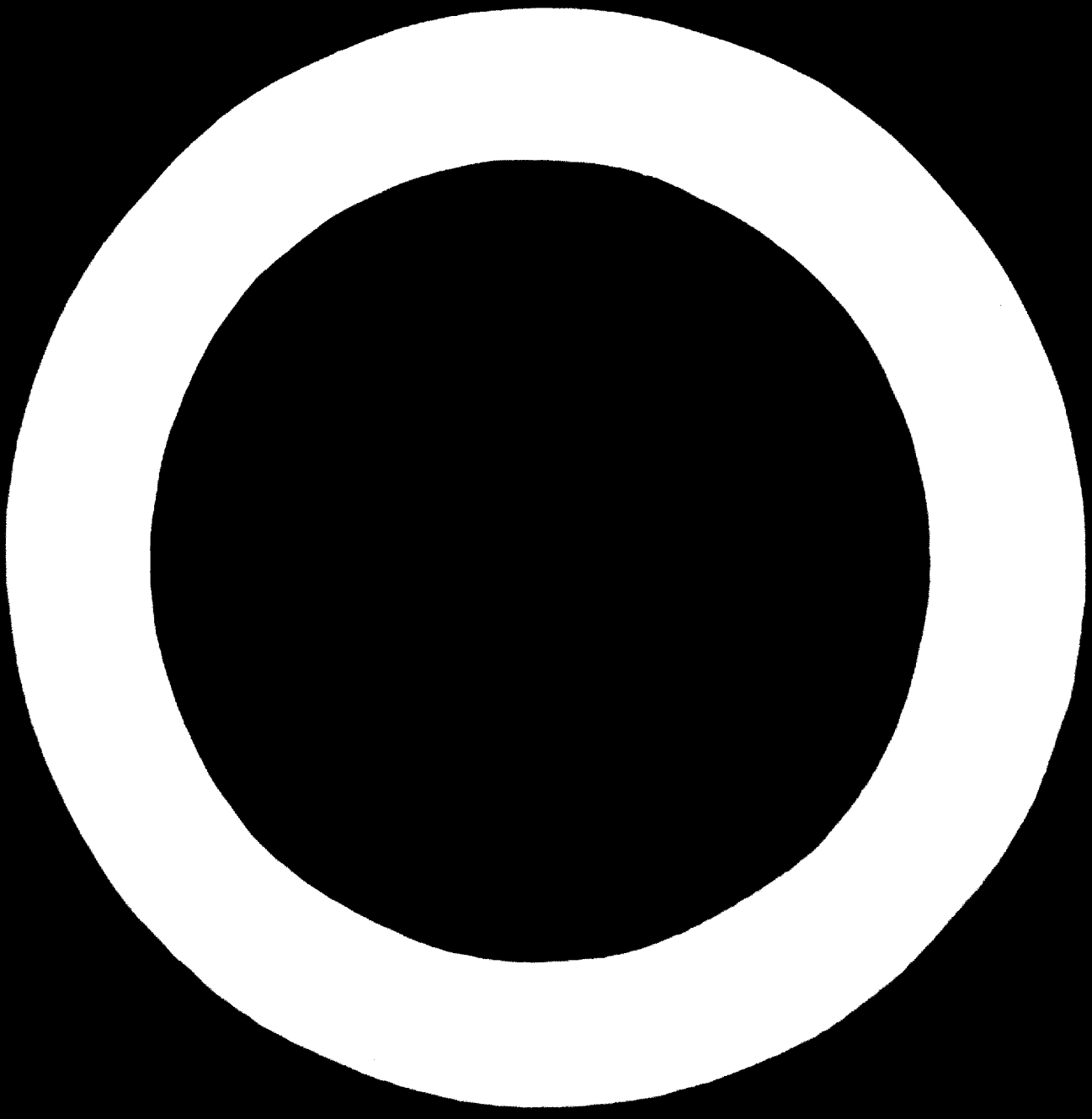
Lack of credit to the farmers

In some areas difficulties in inland transportation and distribution of fertiliser to the farmers

These limiting factors are general to the Asian region. Other limitations are cited in connexion with the countries surveyed. To overcome these, and further promote fertiliser use, action must be taken by both government and industry in a concerted manner. The cost of fertilisers to the farmer must also be reduced by means of effective pricing and a system of farm credits and government subsidies.

C O U N T R Y   D A T A

EAST ASIA AND SOUTH ASIA



EAST ASIA

BURMA

Consumption and production of fertilizers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61[a]	1965/66[b]	1970/71[c]	1975/76[d]	1980/81[e]
N	Consumption	3 808	5 100*	15 000*	50 000	75 000
	Production	-	-	15 700	...	...
	Deficit	3 808	5 100*	-	...	...
	Surplus	-	-	700	-	-
P_2O_5*	Consumption	800	1 000*	5 000*	12 500	20 000
	Production	-	-	-	-	-
	Deficit	800	1 000*	5 000*	12 500	20 000
	Surplus	-	-	-	-	-
K_2O	Consumption	-	3 000	1 400	7 000	10 000
	Production	-	-	-	-	-
	Deficit	-	3 000	1 400	7 000	10 000
	Surplus	-	-	-	-	-

Sources: a/ FAO, Fertilizers. An Annual Review of World Production, Consumption and Trade, 1964 (Rome, 1965), pp. 102 and 125.

b/ FAO, Annual Fertilizer Review 1970 (Rome, 1971), pp. 70, 79, 114 and 141.

c/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 469 and 476; and other information from FAO.

d/ FAO.

e/ FAO and the UNIDO/FAO/World Bank Group Ad Hoc Working Group on the Financing of Fertilizer Projects (1972).

General

Burma became an independent republic, outside the British Commonwealth, in 1948. The country covers an area of 678,000 km^2, borders the Bay of Bengal and the Andaman Sea on the west and south, Thailand and Laos on the east, China on the north-east and India and Pakistan on the north-west.

The estimated population of 27.6 million (1970) is concentrated mainly in the river valleys. The population is increasing at an annual rate of 2.3 per cent. Population density is 38 persons per square kilometre.

Burma is essentially an agricultural country. Some 67 per cent of the labour force is engaged in this sector, which provides 80 per cent of the total exported goods. Ample rainfall and fertile soil in the Irrawaddy Delta and lower valleys of the Sittang and Salween rivers make Burma one of the world's largest rice producers and exporters. (Rice exports alone account for 70 per cent of the total exported agricultural goods.) Other agricultural products include ground-nuts, cotton, beans, millet, maize, sugar-cane and rubber.

The Gross National Product (GNP) for 1969 at 1968 dollar prices was $1,883 million; the *per capita* income amounted to $71.

The country receives substantial amounts of foreign aid from Japan, and, to a lesser extent, from the United Kingdom of Great Britain and Northern Ireland, the United States of America, the Union of Soviet Socialist Republics and the World Bank.

Agriculture

The distribution of land in the country (1968) was as follows:

	Thousand hectares
Total area	67 803
Arable land	18 488
Permanent meadows and pastures	375
Land under permanent crops	453
Forests	45 274
Other land	3 213

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 5.

Agriculture, forestry and fisheries account for 36 per cent of the Gross Domestic Product (GDP).

Humidity is high and rainfall varies according to location; the average annual rainfall in Rangoon is 100 in., in some areas of the Arakan Coast 200 in., and in the dry zone in Mandalay it is only 33 in.

Rice is the chief determinant of the GNP and accounts for half of the total agriculture output. Three quarters of the sown acreage is under rice. Despite a programme of land reform and the introduction of high-yielding varieties of rice seed, such as Yagyaw 1 and 2 - IR8 and IR5, rice production has remained virtually static in recent years.

Details of the main crops produced in 1971 are as follows:

Crop	Area (thousand hectares)	Production (thousand tons)	Yield (kg/ha)
Rice (paddy)	4 979	8 413	1 690
Ground-nuts in shell	650 F	520 F	800 F
Sugar-cane a/	46 F	1 800 F	39 100 F
Wheat	80 F	50 F	630 F
Sesame seed	700 F	132 F	1 900 F
Cotton (lint)	142 F	15 F	110 F
Tobacco	40 F	41.4	1 040 F
Natural rubber	...	7.5 F	...

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972) p. 76, 233, 91, 39, 251, 282, 277, 299.

a/ Figures for 1970/71.

Burma possesses over three quarters of the world's supply of teak. In 1969/70 teak log production amounted to 340,000 cubic tons.

Investigations into irrigation in the Sittang River Valley are being conducted with the assistance of the United Nations Development Programme (UNDP) and Soviet technical experts. This would entail a three-year project covering irrigation, drainage, flood control and hydro-electricity. In 1968 some 816,000 ha were irrigated.[1/]

By further promoting the cultivation of crops, other than rice, and adding 775,000 acres to cropland, the Government hopes to achieve a 16 per cent increase in agricultural production in the period 1971-1975.

The average fertilizer recommendations by FAO for main crops (in kg/ha plant nutrients) are:

	N	P_2O_5	K_2O
Rice	30-50	40-60	-
Ground-nuts	20	45	0-20
Millet/sorghum	40	40	0-20
Cotton	40-80	40-80	0-20
Tobacco	50-60	40-50	70-90

Natural resources and industry

Burma is rich in natural resources and new discoveries of oil and natural gas look especially promising. Reserves of crude oil were estimated in 1972 to be about 1 million tons. The State-owned People's Oil Industry (POI) is drilling at the Chauk/Lanywa field and at the Yenangyaung and Yenangyat fields. Three refineries are also active at Chauk, Rangoon and Syriam, with a capacity of 1.3 million tons per annum crude oil throughput. The production of crude oil in 1971 was about 800,000 tons per annum but a considerable amount has to be imported to meet local requirements.

Long-term petroleum and natural gas prospecting programmes have been set up with Japanese and Romanian aid. There are also plans to exploit the extensive oil-shale reserves estimated at 280 million tons. Burmese oil-shale has approximately 26 per cent oil content. Two new oilfields have recently been opened, one in Pyalo, on the east bank of the Irrawaddy River and one in the Man Chaung area, producing 40,000 gal/d crude oil.

Reserves of natural gas are estimated at 3 billion cubic metres (1972). The reserves located in the Chauk area are being exploited at present. The production of natural gas in 1971 was 62 million cubic metres.

Coal deposits amounting to 128 million tons are located at the Kalwa mine and mining operations recently began there on a trial basis. Further reserves are located in the Theindaw-Kammets area. In 1970 coal production reached the amount of 12,000 tons, which is sufficient for Burma's domestic requirements.

Burma's mineral resources would appear to be more useful for the iron and steel industry than for the fertilizer industry. Deposits of lead, copper, zinc, tin and wolfram are mined. In 1968 some 300 tons of tin concentrates, 267 tons of tungsten concentrates, 11,000 tons of lead ores and 4,500 tons of zinc ores were produced.

1/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 9.

Salt is mined in small quantities; gold and silver are also mined. The production of zinc, lead and antimony declined in recent years but the tin and wolfram mine at Mawchi reopened in 1970 after being closed for 11 years.

Sulphur[2/]

Near Monywa (Lower Chindwin District) are some pyrite and chalcopyrite deposits. The deposits are understood to be economically workable as a copper deposit with pyrite as a by-product. Mineral springs containing sulphuretted hydrogen are reported from several localities in the country. Pyrite has been identified in the ore from the Bawdwin-Namtu, northern Shan states Ag-Pb-Zn mine. The spent sulphurous gases of the smelter may be used for producing sulphuric acid.

Proved reserves are not yet known. Some gypsum deposits occur in the Pegu series in the Districts of Thayetmyo, Minbu, Pakokku, Magwe and Myingyan. A remotely located deposit exists in Mawkmai State (near Namlawt village). It is believed that an economically workable deposit exists near Hsipaw (northern Shan states).

Phosphate[2/]

Small deposits of guano are found in the limestone caves of the Shan states and in the Amherst District, east of Moulmein.

Other fertilizer raw materials, e.g. serpentine rocks and limestone rocks, are widespread throughout the country.

Industry

Industrial development has been slow in Burma. Traditional handicraft and cottage industries exist, such as cotton and silk textiles, lacquerware, jewellery, pottery and metal casting; the most important industries are, however, rice-milling, saw-milling, cotton-spinning and weaving, extraction of mineral ores, sugar-cane refining and match production.

Emphasis is laid on import-substitute and agricultural-input industries. All major industrial undertakings have now been taken over by the Government.

Plants operating in Burma since 1970 include a glass factory at Syriam, a fertiliser plant at Sale, and a paper-mill at Thaton. Plants under construction include a fertiliser plant at Kyunchaung, a textile mill at Paleik, a paper mill at Ela, a distillery at Zeyawaddy, a solar-energy salt plant at Bassein, a waste-cotton yarn mill and brick factory, and a teak mill.

Exports for 1969/70 totalled $58.3 million and imports totalled $44.3 million. The main destinations for exports are rice-importing countries. Burma exported, in order of quantity, to: Singapore, the United Kingdom, Indonesia, Sri Lanka, Hong-Kong, Japan, India and Denmark. The main sources of imports, in order, are: Japan, India, the Federal Republic of Germany, the United Kingdom, the United States, Czechoslovakia and the USSR.

2/ Mineral Raw Material Resources for the Fertiliser Industry in Asia and the Far East; Mineral Resources Development Series No. 28 (United Nations publication, Sales No. 68.II.F.3) pp. 32-33.

Fertilizer manufacture

An ammonia plant producing 40,000 tons of ammonia per annum with an associated urea unit producing 67,000 tons of urea per annum is operating at Pagan on the east bank of the Irrawaddy River.

At Kyunchaung, near Sale, on the opposite bank of the river, a similar complex with identical capacities is scheduled to go on stream in 1972. Both plants are based on local supplies of natural gas.

The discovery of natural gas in central Burma will eventually contribute greatly to reducing the cost of nitrogen products and further encourage the use of domestically produced fertilisers. The output of the two ammonia/urea plants mentioned above (estimated at 50,000 tons of nitrogen per annum) should almost satisfy domestic requirements for straight nitrogen until 1975/76, and imported nitrogen used in Burma will be increasingly in complex form.

The market will orientate itself more towards urea, which has the advantage of being domestically available and more economical as regards storage and application than its chief rival, ammonium sulphate, which was widely used in the 1960s.

Complex fertilisers are becoming more popular, especially the formulation 15-15-6-4 MgO. The Government has advocated applications of 16-20-0 material for use on crops other than paddy.

Although the new urea production facilities should make Burma virtually self-sufficient in straight nitrogen products, various types of phosphate fertiliser and complex formulations still have to be imported to achieve balance in fertiliser application.

The demand for ammonium sulphate will decline in the next few years proportionally as more urea becomes available.

Per capita fertiliser consumption in Burma is very low: in the crop year 1969/70 the consumption of $N+P_2O_5+K_2O$ amounted to 2.3 kg per capita. The consumption per hectare is also extremely low at only 3.9 kg/ha for the same period.

General references

Burma, Business Outlook, July 1971, p. 230.

FAO, Annual Fertiliser Review, 1970 (Rome, 1971).

FAO, Production Yearbook, 1970, vol. 24 (Rome, 1971).

International Petroleum Encyclopedia, 1971 (Tulsa, Oklahoma, Petroleum Publishing Co., 1972).

Lloyd's Bank Ltd., Economic Report: Burma (London, June 1971).

Mineral Raw Material Resources for the Fertiliser Industry in Asia and the Far East, Mineral Resources Development Series No. 26 (United Nations publication, Sales No. 68.II.F.3).

Nitrogen, No. 64 (London, March/April 1970).

Nitrogen, No. 67 (London, September/October 1970).

UNDP, Annual report for 1970 for Inter-Agency Consultative Board, Office of the Resident Representative, Burma (March 1971).

UNIDO, "Review of world production, consumption and international trade in fertilisers with projections to 1975 and 1980", Paper presented to the Second Interregional Fertiliser Symposium, Kiev, USSR, 21 September-1 October 1971 and New Dehli, India, 2-13 October 1971 (ID/WG.99/4/Rev.1).

UNIDO/FAO/World Bank Ad Hoc Working Group on the Financing of Fertiliser Projects (1972). Information supplied.

DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA

Consumption and production of fertilizers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61[a]	1965/66[b]	1970/71[c]	1975/76[a]	1980/81[a]
N	Consumption	90 000	105 000	205 000*	300 000	400 000
	Production	80 000	105 000*	205 000*	300 000	400 000
	Deficit	10 000	-	-	...	...
	Surplus	...	...	...	...	...
P_2O_5	Consumption	20 000	60 000F	100 000*	150 000	200 000
	Production	20 000	60 000F	100 000*	150 000	200 000
	Deficit	...	...	...	...	...
	Surplus	...	...	...	...	...
K_2O	Consumption	...	-	28 500*	75 000	100 000
	Production	...	...	...	...	...
	Deficit	...	-	28 500*	75 000	100 000
	Surplus	...	...	...	...	...

Sources: a/ "Review of world production, consumption and international trade in fertilizers with projections to 1975 and 1980", Second Interregional Fertilizer Symposium, Kiev, USSR, 21 September-1 October and New Delhi, India, 2-13 October 1971 (ID/WG.99/4.Rev.1), pp. 51, 53 and 55.

b/ FAO - Annual Fertilizer Review 1971 (Rome, 1972), pp. 70, 80, 106, 115 and 141.

c/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 466, 469, 473, 476 and 481.

General

The Democratic People's Republic of Korea borders China and the USSR, covering an area of 120,540 km^2. The population numbers 14,280,000 (mid 1971) and is increasing at the rate of 2.4 per cent per annum.

The GNP for 1968 was $2.9 billion (in 1964 dollars) and the per capita GNP amounted to $203. The growth rate in GDP was 7.8 per cent in 1965.

The present National Development Plan runs from 1971 to 1976 and its basic goals are: consolidation of industrialisation accomplished during the last Plan (1964-1970); promotion of the technical revolution to a higher level; and improvement of the quality of manufactured goods. The target for the annual rate of growth is 14 per cent.

Agriculture

The distribution of land in the country (1960) was as follows:

	Thousands of hectares
Total area	12 054
Arable land and land under permanent crops	1 894
Permanent meadows and pastures	...
Forest land	8 970

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 5.

In 1968, 759,000 ha were under irrigation.3/

The main farming activity in the Democratic People's Republic of Korea takes the form of growing grain crops, in particular rice and corn and foodstuffs are produced in sufficient quantity to satisfy domestic requirements. The collectivization of agriculture was completed in 1958. Details of the main crops produced are given below:

Crop	Area (thousand hectares)	Production (thousand tons)	Yield (kg/ha)	Year
Maize	860F	1 800F	2 090F	1971
Potatoes	160F	1 000F	6 300F	1971
Rice (paddy)	723F	2 463*	3 410F	1961-1965a/
Soybeans	385F	215F	560F	1961-1965a/
All cereals	2 566	5 432		1971

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 60, 76, 84, 87, 106 and 230.

a/ No later data available.

Natural resources and industry

The northern part of the Korean Peninsula contains most of the known natural resources and about two-thirds of the heavy industry in the Peninsula.

Anthracite is the main coal produced in the Democratic People's Republic of Korea. The present national development plan aims at increasing coal output by 180 per cent, iron-ore output by 180 per cent, copper output by 170 per cent, lead and zinc by 280 per cent and tungsten by 190 per cent by 1976.

Iron-ore deposits are being exploited at Toksong, Soho-ri. New coal-mines are to be opened at Tokoh'on, Kangso and Anju and output is expected to be between 50 and 53 million tons per annum by 1976. The output of phosphate iron ore is to be increased to between 1 and 2 million tons per annum by 1976.

Prospecting is being carried out for manganese and bauxite.

Under the plan power generating capacity is also to be increased to a total of over 5 million kW. Large power stations are planned for Pukch'ong (capacity 700,000 kWh), Unggi, Ch'ongjin and Hamhung.

Organic and inorganic chemical industries are also scheduled for expansion and a petrochemical industry is to be created to produce fertilisers, herbicides, chemical fibres and plastics. An oil refinery (capacity 2 million tons) is under construction in the Hamhung area, as well as a petrochemical complex.

Fertiliser production

The national development plan provides for the manufacture of urea, ammonium fertilisers, phosphorous fertilisers and compounds. Existing nitro-lime fertiliser plants will be stabilized and processes for ammonium production through coal gasification augmented.

3/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 9.

The following plants are in operation:[4/]

Plant	Producing
Aoji	ammonia
Ch'ongsu	calcium cyanamide
Pungnang	ammonia, producing ammonium sulphate
Hungnam	ammonium nitrates, urea and single superphosphate
Nampo	producing single superphosphate
Pongung	producing ammonium chloride and calcium cyanamide
Sunch'on	urea, calcium cyanamide
NA	producing single superphosphate

The total nitrogen capacity of the fertiliser plants in the Democratic People's Republic of Korea is 185,000 tons ammonia per annum.

Fertiliser consumption

In 1970 the Democratic People's Republic of Korea consumed 182 kg/ha of fertilizers ($N + P_2O_5 + K_2O$), which can be considered to be high.

4/ World Fertiliser Atlas, 3rd ed. (London, The British Sulphur Corporation Ltd., 1969).

General references

Afro-Asian Economic Review, vol. XII, Nos. 144-145 (September/October 1971).

FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972).

IBRD, Economics Dept., Comparative Data Unit, World Tables, July 1968.

World Fertiliser Atlas, 3rd ed. (London, British Sulphur Corp., Ltd., 1969).

INDONESIA

Consumption and production of fertilisers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61[a]	1965/66[b]	1970/71[c]	1975/76[d]	1980/81[d]
N	Consumption	21 097	83 872	183 100*	300 000	500 000
	Production	-	46 000	45 100*	200 000	400 000
	Deficit	21 097	37 872	138 000	100 000	100 000
	Surplus	...	-	-	-	-
P_2O_5	Consumption	9 945	8 399	50 000*	45 000	100 000
	Production	-	-	-	75 000	100 000
	Deficit	9 945	8 399	50 000	-	-
	Surplus	-	-	-	30 000	-
K_2O	Consumption	10 362	2 227	18 300*	35 000	50 000
	Production	-	-	-	-	-
	Deficit	10 362	2 227	18 300	35 000	50 000
	Surplus	-	-	-	-	-

Sources: a/ FAO, Fertilisers. An Annual Review of World Production Consumption and Trade, 1964 (Rome, 1965), pp. 102, 126 and 150.

b/ FAO, Annual Fertiliser Review 1971 (Rome, 1972), pp. 70, 80, 114 and 141.

c/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 466, 469, 476 and 481.

d/ "Review of world production, consumption and international trade in fertilisers with projections to 1975 and 1980", Second Interregional Fertiliser Symposium, Kiev, USSR, 21 September-1 October and New Delhi, India, 2-13 October 1971 (ID/WG.99/4/Rev.1), pp. 51, 53 and 55.

General

The Republic of Indonesia consists of four large islands, fifteen smaller ones and about 3,000 tiny ones; it is surrounded by the South China Sea and the Indian and Pacific Oceans and stretches almost 6,000 km along the equator.

In 1971 the estimated population was 124.9 million; the rate of population growth has averaged 2.6 per cent over the past decade. Population pressure is highest in Java and Madura (592 persons per square kilometre) and lowest in West Irian (2 persons per square kilometre); the average for the total area is 65 persons per square kilometre.

Agriculture is the most important economic activity, contributing 52 per cent to the national income and earning 70 per cent of foreign exchange. Seventy per cent of the labour force is employed in agriculture, forestry and fishing.

Indonesia is the world's most volcanic region and volcanic ashes and alluvium enrich the soils in certain areas. A tropical country, the heat is tempered by mountain elevations and ocean winds. Minimum and maximum temperatures are 24°C and 36°C, respectively. The mean humidity averages 82 per cent. The wet season is November to March and the dry season June to October. Rainfall is heavy and increases with altitude. No season is completely free of rain.

The country is rich in minerals, especially bauxite and tin ores, and extensive reserves of crude oil also exist.

The GNP in 1969 was estimated at $13.9 billion and the per capita income at $115. In the same year the contributions of the main sectors of the economy to the total GDP were: agriculture - 52 per cent, mining and quarrying - 4 per cent and manufacturing - 11 per cent.

There is considerable potential for economic advancement. Progress at present will depend largely upon the success of the first Five-Year Development Plan (April 1969 - March 1974), which aims primarily at development of agriculture, a per capita growth rate of 2.5 per cent, and an economic growth rate of 5 per cent.

The net exports for 1970/71 were $896 million and the total imports amounted to $1,264 million. The traditional major exports are: coffee, copra, palm-oil and kernels, pepper, rubber, tin and tobacco. These provided 75 per cent of non-petroleum exports.

Agriculture

The distribution of land in the country in 1969 was as follows:

	Thousand hectares
Total area (including West Irian)	190 435
Arable land	18 000
Land under permanent crops	...
Permanent meadows and pastures	121 800
Forest land	...
Other land	

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 5.

In 1969 6,800,000 ha were irrigated.5/

Indonesian agriculture is a mixture of export-oriented estate production and subsistence-type small holdings. The main estate crops are rubber, palm-oil, tobacco, sugar-cane, tea and coffee; the small-scale farms produce rice, corn, cassava, sweet potatoes, peanuts, soybeans, vegetables and fruit. Copra, kapok and spices are also of commercial importance.

Over 50 per cent of the total farm acreage is devoted to rice, the main food crop. The present Five-Year Plan aims for self-sufficiency in rice by 1974 (the target production is 15.4 million tons per annum by then) and full irrigation of 5.2 million acres of rice land. It is intended to use high-yielding rice varieties, fertilizers, pesticides and modern equipment.

To combat the food shortage situation the Bimbingan Masjarahat Scheme (BIMAS - or Community Guidance) was inaugurated in 1963. It was designed to help farmers adopt more modern and productive methods of cultivation. In 1967 the scheme was extended to allow foreign firms to provide fertilizers, seeds and equipment on credit (Bimas Gotong Rojong).

5/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 9. Two huge irrigation projects are expected to be financed by the IBRD and the Asian Development Bank in the near future.

Great potential exists for forest exploitation. Only 7 per cent of the total forest area (mainly tropical and broadleaf) is now exploited. Log and sawn timber production is expected to expand to 7.5 million cubic metres per annum by 1973/74.

The fishing and livestock-breeding industries will also be expanded under the development plan.

Details of the main crops produced in 1971 are given below:

Crop	Area (thousand hectares)	Production (thousand tons)	Yield (kg/ha)
Rice (paddy)	8 466	18 585	2 200
Maize	3 000F	2 900F	970F
Cassava[a/]	1 434	10 451	7 300
Sweet potatoes/yams[a/]	356	3 029	8 500
Soybeans	559*	391*	700*
Natural rubber	...	820F	...
Palm-oil	...	225*	...
Palm kernels		50*	
Coffee	...	180F	...
Tea	122F	70	...
Sugar-cane[a/]	134F	9 709F	72 500F
Copra	...	730*	...
Tobacco	140F	70F	500F

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 60, 77, 92, 111, 117, 227, 228, 229, 263, 266, 271, 277 and 299.

a/ Crop year 1970.

Natural resources and industry

Indonesia has substantial reserves of oil and natural gas and therefore the production of nitrogenous fertilizers will not become a problem. Extensive exploration for oil is being carried out in the country and off-shore and new reserves have been discovered. The petroleum and natural-gas fields of Indonesia are located in the islands of Borneo, Java and Sumatra and in January 1972 the reserves were as follows:[6/]

Crude oil:	1,415 million tons
Natural gas:	127 billion cubic metres

In the ECAFE region Indonesia ranks second to Iran in reserves of crude oil and third in reserves of natural gas.

All sulphur deposits in Indonesia are of volcanic origin, occurring as native sulphur deposited by solfataric action in craters or on the slopes of volcanoes or as sulphurous mud and sulphur-bearing gravels in craters. The total reserves of sulphur in the country are estimated at 1.5 million tons, most of which are in Java, as is also the greater part of the gypsum deposits. Celebes Island also shows promise in this respect. The high cost to date of exploitation of the known deposits in the country has made Indonesia rely mostly on imports for its sulphur requirements.

6/ International Petroleum Encyclopedia, 1972 (Tulsa, Oklahoma, The Petroleum Publishing Co. 1972), pp. 286-287.

A large number of phosphate deposits, probably of bat guano origin, in limestone caves are found in the mountains of east, central and western Java. Detailed exploration in central Java indicated reserves of at least 0.5 million tons of phosphate (28 per cent P_2O_5 content). Phosphate was discovered in 1918 on the northern slopes of the Kromong Mountains in western Java and has been exploited since 1919. The most important reserves appear to be those of Kromong, Karangbolong and Djapara Rembang. In 1969, 30,000 tons were produced. As regards phosphate raw materials, however, no deposits of real commercial importance have so far been discovered.

No significant potassium deposits have been commercially exploited in Indonesia. However, rocks exist containing minerals with a relatively high content of potassium, such as jarosite, alunite (an isomorphous form of jarosite), leucite and nephelite. Jarosite is particularly interesting as a future source of potassium, phosphate and sulphuric acid. Two occurrences of jarosite are located near Tijater and Kantjoh. The average content of K_2O, P_2O_5 and SO_3 in the core sample analyses was 5.21, 2.91 and 19.49 per cent, respectively.

The present oil-refining capacity of the plants is 396,000 bbl/d, equivalent to 20,778, 120 kilolitres per annum. Major plants can be found at Pladju and Sungai Gerong. Two new plants were scheduled for completion in 1971, one at Pakning (capacity 50,000 bbl/d) and the other at Dumai (capacity 100,000 bbl/d). The production of crude oil in 1971 was 887,100 bbl/d. Approximately 58 per cent of the crude oil production was exported to Japan in 1969.

The country is the third largest tin producer in the world, the main deposits of which are found on the three islands north of Sumatra, namely, Bangko, Billiton and Singkep. Total tin reserves are estimated to amount to 0.8 million tons (0.55 million tons are considered proved and probable). Other important minerals produced are bauxite, nickel and some copper. (See end of section a/.)

The present electricity generating facilities operate far below the rated capacity. The National Development Plan aims to raise the total production of electricity from 659,000 kW (1969-1970) to 1,084,000 kW by 1974.

Indonesia produces textiles, food and beverages, paper, fertilizers, chemicals, cement, machinery and equipment. In the chemicals industry current products include fertilisers, caustic soda, sulphuric acid, pharmaceuticals, paints, cosmetics, pesticides, soaps and matches. The development plan will concentrate on the production of pharmaceuticals, fertilisers, pesticides, plastics and soda ash.

Fertilizer manufacture

The following fertiliser plants are in operation or under construction:

PUSRI I complex

The PUSRI I ammonia/urea complex, which cost $38.5 million, lies on the Muri River, near Palembang, South Sumatra. It is operated by the State-owned company, PT Pupuk Sriwidjaja (PUSRI) and consists of a plant producing 180 tons of ammonia per day and a urea unit of 100,000 tons per annum rated capacity, based on natural gas obtained locally. This complex came on stream in 1963. The actual output in 1969 was 86,000 tons urea per annum.

PUSRI II expansion

PUSRI II comprises an ammonia unit of 660 tons-per-day capacity, a urea plant of 1,150 tons-per-day capacity, a gas-scrubbing plant and a power plant. Facilities for the conservation and transmission of natural gas are also planned. It will use 42 million cubic feet per day of natural gas, available locally, as feedstock and plant fuel. The start-up date is 1974. The expansion is being financed from a loan given by the Asian Development Bank, the Japanese Government, the United States Agency for International Development (USAID) and the World Bank.

GRESIK (Petrokemia) complex, Surabaya

GRESIK is a government complex situated in East Java. It comprises a unit producing 220 tons of ammonia per day, a plant producing 113,000 tons sulphuric acid per annum and facilities for the manufacture of 36,000 tons of urea per annum and 90,000 tons of ammonium sulphate per annum. The sulphuric-acid plant was brought on stream in January 1972 by the State directorate of mining, Perindustrian Dasar. The sulphuric-acid plant is brimstone-based. (See end of section[b/].)

Proposed new plants

The production of TSP will be started in 1976 in a new plant with a capacity of 50,000 tons per annum, which will increase to 200,000 tons per annum by 1978.

In East Kalimantan a urea plant with an initial capacity of 144,000 tons per annum will begin operation and by 1979 it will have a final capacity of 575,000 tons per annum.

Project proposals for the establishment of fertilizer blending units have been submitted recently to the Government for consideration. In the meantime two fertilizer bulk handling facilities have been built at Tandjung Priok and Tjilatjap harbours, with capacities of 300,000 tons per annum and 60,000 tons per annum, respectively.

The National Fertilizer Study initiated by the Government in June 1970 examines both potentials and problems facing the development of the fertilizer industry in Indonesia. The establishment of a compound fertilizer plant at Djatibarang, west Java, will depend on the results of this fertilizer study, both as to location and type of fertilizer to be produced. So far, it is thought that a urea/ammonium phosphate complex will be established based on a production capacity of 1,000 tons of ammonia per day.

Fertilizer use

Little fertilizer is used in Indonesia. In 1969/70 1.9 kg per capita ($N + P_2O_5 + K_2O$) was used (18 kg/ha). However, fertiliser use virtually doubled in a very short time. Most of this expansion took place in the 1968/69 season when Indonesia made its first large-scale purchases. Nitrogen imports amounted to 181,000 tons, i.e. 17,300 tons of ammonium sulphate, 148,300 tons of urea and 15,400 tons of compound fertilizers, during that season.

The Government has set the fertilizer consumption targets for 1973/74 as: N - 571,000 tons per annum; P_2O_5 - 168,000 tons per annum; and K_2O - 20,000 tons per annum.

The domestic production of nitrogen by 1973/74 has also been estimated; this amounts to 403,000 tons of nitrogen per annum, but only if PUSRI I and II and the GRESIK complex average 80 per cent capacity by this time. A realistic assessment of capacity shows that a maximum of 290,000 tons of nitrogen per annum will probably then exist; output will be unlikely to exceed 250,000 tons of nitrogen per annum by this time. To meet these given target figures for nitrogen production the Government will have to depend on imports to a greater extent than was originally planned.

In the future it is expected that compound fertilizers will play a larger part, with grades such as 13-13-21, 12-12-17, 17-17-17, 15-15-15 and 16-20-0 finding wide acceptance.

Soils in central and eastern Java are fertile and, in the main, only require nitrogen but phosphate appears to be gaining importance, especially for high-yielding varieties. In western Java, and most of the outer islands, N, P and K are necessary. The plantation industry of northern Sumatra, for example, needs heavy application of potash for the rehabilitation of oil-palm plantations. Most of the nitrogen and phosphate is used for food crops, particularly rice.

Notes (added in Press):

a/ NP The following sulphuric acid capacities are now in operation:

		(tons per annum)
PT Petrokemia Gresik, Surabaja	...	113,000
PT Makahata, Indonesia	...	20,000
PT Indonesia Acid Industry Ltd.	...	5,000
Pertamina	...	(unknown)

NP Naphtha is produced by Pertamina, which has a capacity of approximately 1,300 tons per day.

NP Total sulphuric acid production (1972) was 120,000 tons.

b/ By 1975 the capacities will be increased to 40,000 tons per annum urea and 135,000 tons per annum ammonium sulphate.

General references

FAO, Annual Fertilizer Review 1971 (Rome, 1972).

FAO, Crop statistics for Indonesia (1955-1969), (Rome, November 1970).

FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972).

IBRD, The Indonesian economy: Recent developments and prospects for 1972-1973, EAP-271 (Washington, D.C., 30 November 1971).

Lloyd's Bank Ltd., Economic Report: Indonesia (London, September 1970).

Mineral Raw Material Resources for the Fertilizer Industry in Asia and the Far East, Mineral Resources Development Series No. 28 (United Nations publication, Sales No. 68.II.F.3).

Popa, C., FAO/UNIDO Pre-Feasibility Survey of Pesticide Use and Production in Certain Countries in the ECAFE Region, Preliminary Report on Indonesia (22 December, 1973, IS/RAS/71/984/11 - 01/05).

Proceedings of the Seminar on Mineral Raw Materials for the Fertilizer Industry in Asia and the Far East, Mineral Resources Development Series No. 32 (United Nations publication, Sales No. 69.II.F.2).

Monthly Bulletin of Statistics, vol. XXVII, No. 1 (January 1973).

Non-ferrous Metals: A Survey of Their Production and Potential in the Developing Countries (United Nations publication, Sales No. 72.II.B.18).

Sulphur, No. 99 (March/April 1972).

UNDP, Living conditions in Indonesia, Annual Review 1972 (10 March 1971 - DP/POST/INS/REV.6 and 7 February 1972 - DP/POST/INS).

UNIDO, "Development of the petrochemical industry in Indonesia", paper presented to the Interregional Petrochemical Symposium on the Development of the Petrochemical Industries in Developing Countries, Baku, USSR, 21-31 October 1969 (ID/WG.34/76).

UNIDO, "Review of world production, consumption and international trade in fertilizers with projections to 1975 and 1980", paper presented to the Second Interregional Fertilizer Symposium, Kiev, USSR, 21 September-1 October and New Dehli, India, 2-13 October 1971 (ID/WG.99/4/Rev.1).

UNIDO, "The fertilizer industry of Indonesia", paper presented to the Second Interregional Fertilizer Symposium, Kiev, USSR, 21 September-1 October and New Dehli, India, 2-13 October 1971 (ID/WG.99/97).

UNIDO/FAO/World Bank Ad Hoc Working Group, "Conclusions and recommendations" (Rome, 21-23 February 1972).

United States Department of Commerce, Basic Data on the Economy of Indonesia, Overseas Business Reports, OBR 71-023 (Washington, D.C., United States Government Printing Office, 1971).

USAID, Indonesia (PPC/SRD).

KHMER REPUBLIC

Consumption and production of fertilisers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61 a/	1965/66 b/	1970/71 c/	1975/76	1980/81
N	Consumption	144	300*	1 000*	...	...
	Production	-	-	-	-	-
	Deficit	144	300*	1 000	...	...
	Surplus	-	-	-	...	...
P_2O_5	Consumption	19	1 000*	900*	...	...
	Production	-	-	400*	...	...
	Deficit	19	1 000*	500	...	...
	Surplus	-	-	-	...	...
K_2O	Consumption	3	300*	700*	...	...
	Production	-	-	-	...	...
	Deficit	3	300*	700*	...	...
	Surplus	-	-	-	...	...

Sources: a/ FAO, Fertilisers. An Annual Review of World Production, Consumption and Trade, 1964 (Rome, 1965), pp. 98, 125 and 151.

b/ FAO, Annual Fertilizer Review 1970 (Rome, 1971), pp. 79, 109 and 133.

c/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 469, 473, 476 and 481.

General

The Khmer Republic (formerly Cambodia) lies between Thailand and the Republic of Viet-Nam and covers an area of approximately 181,000 km^2. Formerly a constitutional monarchy, the country achieved full independence in 1953.

The population numbered 7.3 million in the middle of 1971; the annual rate of growth is estimated at 2.2 per cent.

The economy is still in a developing stage, agriculture forming the mainstay of the economy and employing 85 per cent of the working population. Before 1970 it accounted for 40 per cent of the GNP. The principal crops are, traditionally, rice, maize and natural rubber.

Before 1970 industry was developing slowly and was restricted to light industries and the manufacturing and processing of agricultural goods. Many installations have been destroyed through war.

The total GNP, at current prices, was estimated at $983 million in 1969 and the per capita GNP was then $140. Real GNP growth between 1963-1969 averaged about 3 per cent per annum in normal times, but this figure is certainly much lower now.

A Five-Year National Development Plan was embarked upon in 1968. However, this was abandoned in 1970.

Agriculture

The distribution of land in the country (1967) was as follows:

	Thousand hectares
Total area	18 104
Arable land	2 832
Land under permanent crops	152
Permanent meadows and pastures	580
Forest land	13 372
Other	1 168

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 5.

The country has a tropical, monsoon climate, the rainy season lasting from June to October. This climate is suited to the cultivation of diverse crops.

Details of the main food crops produced in 1971 are given below:

Crop	Area (thousand hectares)	Production (thousand tons)	Yield (kg/ha)
Rice (paddy)	1 880	2 732	1 450
Maize	94	122	1 290
Sweet potatoes/yams[a/]	3	23	8 400

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 60, 76 and 111.

a/ Crop year 1970.

Production of the main cash crops is as follows:

Crop	Production (tons per annum)	Year
Copra	7 900	1971
Tobacco	8 600	1971
Natural rubber	63 000	1970

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 263, 277; and information from the Government of the Khmer Republic.

Some cassava, beans, ground-nuts, cotton, sesame seed and jute are also grown.

Rubber plantations form 2.3 per cent of the total cultivated area, natural rubber accounting for 25-30 per cent of the country's total exports.

Irrigation must be increased to improve crop yields, especially of rice. In 1967, 100,000 ha were irrigated[7/] although not with complete water control. To date, only three per cent of the land under paddy cultivation is irrigated. Other crops requiring more intensive irrigation in the country are maize, tobacco and jute.

Two irrigation programmes are being implemented: one is the Prek Thnot Project, to effect irrigation of 70,000 ha throughout the year, and the second is the Battambang Project to irrigate 68,000 ha.

7/ FAO, Production Yearbook, 1971, vol. 25 (Rome 1972), p. 9.

Forest land is mainly of hardwood. There is great potential in this sector and it is planned to increase production in the future.

Chemical fertilizer is used in limited areas only. The land under rice cultivation and the rice yields have been practically stagnant since 1964/65.

Natural resources and industry

The Khmer Republic has negligible coal and crude-oil resources, almost all crude oil being imported. One refinery exists near Kompong Som (formerly Sihanoukville), which has an annual capacity for processing 600,000 tons of imported crude oil.

Great hydro-electric potential exists in the country, but on a long-term basis. The only completed plant, Kirirom I, is not operating at present. The status of all the hydro-electric power-station projects is as follows:

Kamchay

Installed capacity: 65,000 kVA; estimated production: 22 million kWh. This station is not yet completed.

Prek Thnot

Installed capacity: 18,000 kVA; estimated production: 30 million kWh. This station is not yet completed.

Kirirom I

The first hydro-electric project. It came on stream in 1968. Installed capacity: 10,000 kVA; estimated production: 49 million kWh. This station is not yet operational.

Kirirom II

Installed capacity: 20,000 kVA; estimated production: 100 million kWh. This project has not yet started.

Occurrences of phosphate rock exist in fractures of the limestone formations in the low, hilly area of the Battambang and Kampot Provinces. Reserves have been estimated at 400,000 to 1 million tons of ore, assaying 20 to 30 per cent P_2O_5 in Battambang Province, and 350,000 tons of rock (1960), containing 15-25 per cent P_2O_5, in Kampot Province - 83,000 tons proved, 125,000 tons probable and 142,000 tons possible.

In a survey carried out in 1967 by geologists from China, France and the United Nations some deposits of bauxite were discovered. Copper-bearing minerals are also present, although their commercial potential has not been evaluated. Deposits containing lead and zinc minerals also exist but no details are yet available. There is iron ore in the north but it is not being exploited.

Some gold, zircon, sapphires and rubies have been found.

Although the country is predominantly agricultural, light industry is developing, including a motor-vehicle-assembly plant, cigarette factories, a match factory and light engineering, as well as pressed metal parts, pottery, glassware, cement, textiles and foodstuffs processing. Phosphates are mined. Industry is heavily concentrated in Phnom Penh; it is planned to diversify some of the industry to Kompong Som.

Fertiliser manufacture

A phosphate-rock grinding and bagging plant, with a capacity of about 12,000 tons per annum ground phosphate rock containing 15-16 per cent P_2O_5 for direct application operates at Tavk Near in Kampot Province. There is no other fertilizer production. Under the Five-Year National Development Plan it was hoped to develop the industry but these plans have been abandoned for the time being. One of the plans was for the construction of a superphosphate plant which would use indigenous phosphate rock. Another proposal was for the establishment of a semi-public corporation to construct and operate an ammonia plant with a capacity of 25,000 tons per annum and a unit to produce 35,000 tons per annum of urea adjacent to the existing oil refinery in Kompong Som. These would use residual gases and light products from refinery distillation. Another plant, with an estimated capacity of 150,000 tons per annum, was proposed for mixed urea and phosphate fertilizers and for their marketing ready for use.

Fertiliser consumption

The consumption of fertilisers remains low. In 1969/70 fertilizer consumption in relation to population was 0.77 kg per capita and consumption in relation to arable land was as follows:

	(kg/ha)
N	1.34
P_2O_5	0.17
K_2O	0.32
Total	1.83

Future plans for the development of the fertiliser industry are uncertain.

Imports of fertilisers for 1969 were estimated as follows:

	Tons
Urea	2 100
Mixed nitrogenous fertilisers	4 200
Tri-calcium phosphate	3 500
Superphosphate	14 000
Mixed phosphatic fertilisers	170

Source: Government of the Khmer Republic (1972).

General references

Asian Development Bank, Asian Agricultural Survey (Pasay City, Philippines, 1969).

Chemical Industry and Developing Countries: Vol. II, Asia and the Far East, (Frankfurt/Main, Verband d. chem. Industrie e.V. 1966).

ECAFE, "Country Study on Cambodia", paper prepared for the Asian Conference on Industrialization (Manila, 1965).

Economist Intelligence Unit, "Continental South East Asia", Quarterly Economic Review, No. 2 (London, 1969).

FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972).

Industrial Development in Asia and the Far East, vol. II (United Nations publication, Sales No. 66.II.B.20).

Lloyd's Bank, Economic Report: Cambodia (London, 1968).

Mineral Raw Material Resources for the Fertiliser Industry in Asia and the Far East, Mineral Resources Development Series No. 28 (United Nations publication, sales No. 68.II.F.3).

Monthly Bulletin of Statistics, vol. XXVII, No. 1 (January 1973).

Nitrogen, No. 57 (London, January/February 1969).

Non-ferrous Metals: A Survey of their Production and Potential in the Developing Countries (United Nations publication, Sales No. 72.II.B.18).

UNIDO, "Industrial development possibilities in the Lower Mekong Basin", Preliminary report (id/68-054) (1968).

UNIDO, "Review of world production, consumption and international trade in fertilizers with projections to 1975 and 1980", paper presented to the Second Interregional Fertilizer Symposium, Kiev, USSR, 21 September-1 October and New Dehli, India, 2-13 October 1971 (ID/WG.99/4/Rev.1).

USAID, "Cambodia", Economic Data Book, June 1970.

LAOS

Consumption and production of fertilizers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61[a]	1965/66[a]	1970/71[b]	1975/76	1980/81
N	Consumption	...	100*	106	...	...
	Production	-	-	-	...	...
	Deficit	...	100*	106	...	...
	Surplus	-	-	-	...	...
P_2O_5	Consumption	-	160	73	...	...
	Production	-	-	-	...	...
	Deficit	-	160	73	...	...
	Surplus	-	-	-	...	...
K_2O	Consumption	-	-	23	...	...
	Production	-	-	-	...	...
	Deficit	-	-	23	...	...
	Surplus	-	-	-	...	...

Source: a/ FAO, Annual Fertilizer Review 1970 (Rome, 1971), p. 79.
b/ FAO, Annual Fertilizer Review 1971, vol. 25 (Rome, 1972), pp. 81, 115 and 142.

General

The kingdom of Laos became independent in 1954. The country, which covers an area of 235,700 km^2, and which forms part of the peninsula of Indo-China, is completely land-locked, being bordered on the north by China, on the south by the Khmer Republic, on the east by the Democratic Republic of Viet-Nam and the Republic of Viet-Nam and on the west by Burma and Thailand. The climate is that of the tropical monsoon zone of South-East Asia.

Except in the south, the country is mountainous, some mountains rising to over 2,000 metres. The terrain is broken by a number of river valleys, the most important of which are those of the various tributaries to the Mekong River.

The population of 3,030,000 is concentrated mostly in the river valleys and in the southern part of the country. The annual population growth is estimated to be 2.4 per cent. Population density is extremely low - approximately ten persons per square kilometre.

As there are no railways and the roads are poor, the country has substantial communications problems.

Agriculture, which employs 80 per cent of the working population, is the main economic activity and accounts for over 50 per cent of the GDP. Most of the population is engaged in subsistence agriculture. Crop yields are generally low because of the methods of cultivation, poor irrigation and insufficient use of high-yielding seed varieties.

The staple foods are rice, corn, fruit and vegetables and the main cash crops are cotton, silk, tobacco, coffee and opium. Tin ore, coffee and rubber are the main exports.

The GNP in 1968 was $202 million and the per capita income $72.

The Five-Year National Development Plan (1969-1974) does not attempt to set over-all growth-rate targets. It clearly defines projects designed to meet some of the immediate and long-term needs of the country and is meant as a guideline to incite greater development in the productive sector to improve living conditions, develop the manufacturing sector and decrease the budget and trade deficits.

Agriculture

The distribution of land in the country is as follows:

	Thousand hectares
Total area	23 680
Arable land and land under permanent crops	950
Permanent meadows and pastures	800
Forest land (mainly brush and grassland)	15 000
Other land	6 930

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 5.

The soil is difficult to cultivate and irrigation is still insufficient. In 1970 only 17,000 ha were irrigated.[8/] Cultivated land is found along the Mekong River and its tributaries, on parts of high plateaux and on hill slopes. Three-quarters of the cultivated land is under paddy and the rest produces corn, cotton, tobacco and upland rice. Rice is the most important staple crop but Laos still depends largely on imports to satisfy domestic demand. The country should, however, soon become self-sufficient in rice supply. The following table shows the projection of trends:

	Average (1961-1963)	1975		Rates of increase (per cent per annum compound)	
		Extrapolation of past trend (1960-1965)	Projection under low-income assumption	Past (1950-1965)	Projected (1975)
Area (thousands of hectares)	620	587	620	2.3	0.0
Yield (hundreds of kilograms per hectare)	8.5	8.6	9.5	1.7	0.9
Production (thousands of tons)	530		589		0.8

Source: Committee for the Co-ordination of Investigations of the Lower Mekong Basin, Report on indicative basin plan: a proposed framework for the development of water and related resources of the Lower Mekong Basin (E/CN.11/WRD/MKG/L.340) (1970).

Experiments are being conducted with new high-yielding varieties of rice and irrigation is being extended. Under the Nam Ngum Plan (Stage I), which was completed in 1971, an additional 5,000 ha have been irrigated and upon completion of the Plan in 1980 a further 35,000 ha should have been irrigated.

8/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 9.

Details of the main crops produced in 1971 are given below:

Crop	Area (thousand hectares)	Production (thousand tons)	Yield (kg/ha)
Rice	665F	900F	1 350F
Tobacco	7*	4*	580*
Coffee	...	3 500F	...
Maize	40F	25F	630F
Sweet potatoes/yams a/	2F	15F	6 800F
Cassava a/	1F	12F	10 000F

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 60, 76, 111, 117, 266 and 277.

a/ Figure for 1970.

Other crops produced are: citrus fruits, sticklac, benjohn tea, potatoes, cardamon, cinchona and opium, the latter being worth about $2 million per annum to the producers. Cattle, buffalo and pigs are numerous.

In 1965 about 7,500 kg of pesticides were used in the country.

Natural resources and industry

Tin is the most promising of known minerals with development potential. It was the only important mineral commodity produced in the country in 1970. The present estimates are 60,000 tons of cassiterite (tin stone), proved and probable, with an average tin content of approximately 0.5 per cent and rarely exceeding 1 per cent. Limited surveying is being carried out and the real reserves may well be much larger.

Laos also possesses a variety of other minerals, such as coal and iron, but detailed studies have not yet been completed. Four coal occurrences are known, which include one anthracite deposit in the Nam Lik Valley. Reserves have been very tentatively estimated at 2.5 million tons. No oil or natural gas reserves have been found in the country.

Despite a wealth of hydro-electric power resources in the Lower Mekong Basin, Laos is confronted with power shortages, which impede economic growth. The theoretical potential of the country is shown below:

	Catchment area (km^2)	Runoff year (million m^3)	Hydro-electric energy (million kWh)	Potential capacity (thousand kW)
Major tributary areas	160 745	180 835	325 466	37 195
Areas along the mainstream and other small tributaries	41 655	31 915	40 829	4 662
Total	(202 400)	(212 750)	(366 295)	(41 857)

Source: Committee for Co-ordination of Investigations of the Lower Mekong Basin, Report on indicative basin plan: a proposed framework for the development of water and related resources of the Lower Mekong Basin (E/CN.11/WRD/MKG/L.340) (1970).

The projected requirements for electrical power and energy in 1975 are 268 GWh and 40 MW, and in 1985, 455 GWh and 96 MW. The Nam Ngum Plan (Stage I) provides 30 MW at present and when it is completed it should provide 135 MW. In 1969 the installed capacity for electric energy amounted to 18,600 kW and electric energy production (1970) totalled 12.4 million kWh.

There are several small factories for the production of cigarettes, matches, soft drinks, sauces, rubber shoes and furniture. In 1971 a wood-processing plant, a detergent soap factory, a new textile factory and a tire-recapping factory began production. A cement factory and a brewery are under construction.

Fertilizer manufacture

There is no fertilizer industry in the country.

Fertilizer consumption

Fertilizers are imported; the total used since 1968 are shown below:

Year	Annual consumption (tons)
1968	200
1969	2 550
1970	776
1971	875
1972	920

Source: Ministère du Plan et de la Co-opération, Commissariat général au Plan, Vientiane (November 1972).

General references

Committee for the Co-ordination of Investigations of the Lower Mekong Basin, Report on indicative basin plan: a proposed framework for the development of water and related resources of the Lower Mekong Basin (E/CN.11/MKG/L.340).

ECAFE, Statistical Yearbook for Asia and the Far East, 1970 (United Nations publication, Sales No. 71.II.F.3).

FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972).

IBRD, Trends in Developing Countries (Washington, D.C., 1971), 62 p.

Monthly Bulletin of Statistics, vol. XXVII, No. 1 (January 1973).

Non-ferrous Metals: A Survey of their Production and Potential in the Developing Countries (United Nations publication, Sales No. 72.II.B.18).

Royaume du Laos, Ministère du Plan et de la Co-opération, Service national de la Statistique, Annuaire statistique 1970.

Statistical Yearbook, 1971 (United Nations publication, Sales No. 72.XVII.1).

UNDP, "Annual Report for 1971 for the Inter-Agency Consultative Board", Office of the Resident Representative, Laos (31 January 1972).

UNIDO/FAO/World Bank Ad Hoc Working Group on the Financing of Fertilizer Projects, Working papers (1972).

United States Department of the Interior, Minerals Yearbook, 1968, vol. IV (Washington, D.C., Government Printing Office, 1970).

United States Department of State, Background Notes on Laos (1967).

USAID, "Laos", Economic Data Book, (Washington, D.C., September 1968).

MALAYSIA

Consumption and production of fertilizers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61[a]	1965/66[b]	1970/71[c]	1975/76[d]	1980/81[e]
N	Consumption	21 976	39 500*	60 100*	92 550	125 000
	Production	-	-	26 000*	...	...
	Deficit	21 976	39 500*	34 100*	...	...
	Surplus	-	-	-	...	...
P_2O_5	Consumption	6 319	6 500*	17 800*	28 900	40 000
	Production	-	-	-	...	...
	Deficit	6 319	6 500*	18 800*	...	...
	Surplus	-	-	-	...	...
K_2O	Consumption	10 071	15 300*	68 800*	94 400*	120 000
	Production	-	-	-	...	...
	Deficit	10 071	15 300*	68 800*	...	...
	Surplus	-	-	-	...	...

Sources: a/ FAO, Fertilizers, An Annual Review of World Production, Consumption and Trade, 1964 (Rome, 1965), pp. 98, 126 and 151.

b/ FAO, Annual Fertilizer Review 1970 (Rome, 1971), pp. 79, 110 and 133.

c/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 466, 469, 476 and 481.

d/ Figures based on mean between 1970/71 and 1980/81 on basis of given figures.

e/ Figures from UNIDO/FAO/World Bank Ad Hoc Working Group on Financing of Fertilizer Projects projections (1972).

General

Malaysia came into existence in 1963. In addition to the 'Malay States' at the southern tip of the Malay Peninsula (excluding Singapore, which became independent in 1965), Malaysia includes Sarawak and Sabah in the northern part of the island of Borneo. The total land area is 331,000 km^2.

The country lies entirely in the tropics and has a tropical monsoon climate. Rainfall is heavy; temperatures range from 72-90°F (21-29°C) and humidity averages 75 per cent.

In 1971 the total population was 10,700,000[9/] (1,650,000 in East Malaysia and 9,140,000 in West Malaysia). The population is growing at a rate of 3 per cent per annum.

The economy is based on the production of and trade in primary commodities, particularly rubber, tin and timber. Other exports include palm and coconut oils, pepper and iron ore.

The GDP in 1970 was as follows: agriculture, 32.2 per cent (of which rubber alone accounted for 16.6 per cent); manufacturing, 12.6 per cent and mining, 7.0 per cent.

The GNP for 1970 was $3,838 million at current prices. East Malaysia contributed $628 million and West Malaysia $3,210 million. The per capita GNP for 1970 was $352 and the annual growth of GNP from 1969 to 1970 was 6.3 per cent.

9/ Monthly Bulletin of Statistics, vol. XXVII, No. 1, January 1973 (United Nations publication), p. 3.

The Second Malaysian Five-Year Development Plan (1971-1975) postulates a GNP growth rate of 6.5 per cent annually and a per capita income growth rate of 3.7 per cent. The aim is to restructure society to correct the economic imbalance. It is hoped that by 1975 a per capita income of $422 will be achieved. Productivity and investment in the primary and secondary industries will be encouraged with a view to reducing dependency on rubber and tin. Emphasis will be placed on the diversification of agriculture and promising crops, other than rubber and oil-palm, will be promoted, while considerable reliance on these commodities will be maintained. It is intended to make available 1 million acres of new land, increase the small holder rubber re-planting programme to cover 685,000 acres and establish modern processing factories for Standard Malaysian Rubber.

Agriculture

The distribution of land in the country in 1970 was as follows:

	Thousand hectares
Total area	33 263
Arable land	834
Land under permanent crops	2 690
Permanent meadows and pastures	...
Forest land	24 754
Other land	...

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 5.

In 1970, 9,000 ha were irrigated in Sabah and 231,000 ha in West Malaysia.[10/] Irrigation schemes are being implemented, mainly in the north of the country. With the heavy rainfall the majority of the soils have low fertility and the application of fertilizer is essential, or at least desirable. The recent survey by the Land Capability Classification Programme estimated that, in theory, land under agricultural crops could be doubled.

In 1971 agriculture accounted for over half of the total export earnings. Details of the main crops produced in 1971 are shown below:

Crop	Production (thousand tons)	Area (thousand hectares)	Yield (kg/ha)
Natural rubber	1 331.4*F	...	...
Rice	1 786F	695F	6 320
Palm-oil	537*	...	...
Palm kernels	102.2*F	...	...
Pineapples (West Malaysia)a/	353	...	...
Copra	182*F	...	...
Pepper	27 000	...	...
Coconutsa/	1 026*F million nuts		

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome 1972), p. 76, 222, 227, 228, 261, 263 and 299.

a/ Crop year 1970.

Rubber is the most important industry in Malaysia. In 1970 this accounted for 34 per cent of export receipts and covered two-thirds of farm acreage. A highly successful replanting scheme to introduce high-yielding varieties is being implemerted in West Malaysia.

10/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 9.

Under the Development Plan yields should increase to 650 kg per hectare by 1975 and to 1 ton per hectare by 1980.

Malaysia is the world's largest palm-oil exporter. Canada, Iraq, the Netherlands, Singapore and the United Kingdom are markets for this product.

Timber is also a large foreign-exchange earner. In 1970, 12,470,000 tons of round timber (2,128,000 tons of sawn timber) were produced. Malaysia is the world's major producer of tropical hardwoods, which are exported mainly to Japan.

Natural resources and industry

There are coal, lignite, natural gas and sulphide ores in the country and if economic conditions were favourable they could be used for fertilizer raw materials.

Coal and lignite occur at more than twenty places. Deposits at Batu Arang (Selangor), Enggor (Perak), Sadong (Sarawak) and Labuan and Silimpopon (Sabah) were mined in the past. The best prospects for new production appear to be from the Silantek field in West Sarawak, where substantial reserves of coking coal have been proved.

Oil was first discovered in 1911 at the MIRI field in Sarawak, which now produces only 630 barrels per day (bbl/d). The Brunei Seria field was found in 1928. A high rate of growth exists in the oil industry. Oil production in Sarawak, for example, increased by more than 7,000 bbl/d in 1971 over the previous year's production of 18,000 bbl/d. Many production wells have been installed in the West Lutong field, discovered in 1965, and the Baram field, discovered in 1967. The new Bakau offshore field went into production in 1972 and the Baronia field later in the year. Reserves of crude oil were estimated at 950 million barrels (130 million tons).[11/] The production of crude oil in 1971 was 193,700 bbl/d (9,200,000 tons per annum).

The two refineries are: Esso Standard Malaysia Ltd. at Port Dickson, with a crude capacity of 35,000 bbl/d and 4,000 catalytic reforming capacity; and the Shell Refining Co., also located at Port Dickson, with a crude capacity of 31,000 bbl/d and catalytic reforming capacity of 2,000. Both refineries are based on locally produced and imported crude oil.

Reserves of natural gas in Brunei and Malaysia total 212 billion cubic metres (7,500 billion cubic feet).[12/] A small deposit at West Lutong marine location (8 miles northwest of Miri) was discovered by Sarawak Shell Oilfields Ltd. Further discoveries have been made 75 miles off the northern coast[13/] of Sarawak, where there are gas reserves large enough to support a facility producing 900 million cubic feet of liquefied natural gas per day. Several wells have been drilled in West Malaysia, without success, by Esso and the Continental Oil Company in their respective blocks. Almost all the South China Sea area between East and West Malaysia is under exploration agreements, as well as areas west of Malaysia in the Malacca Strait.

11/ International Petroleum Encyclopedia, 1972, The Petroleum Publishing Co., (Tulsa, Oklahoma, 1972), p. 237. (Figures for Brunei and Malaysia)

12/ Ibid.

13/ Ibid., p. 256. Offshore production Malaysia/Brunei (1971) - 50 million bbl. Estimated reserves remaining: 2,414 million bbl.

Some 1,000 tons of elemental sulphur were produced in Malaysia (1969) and 8,000 tons imported; from this, 17,000 tons of sulphuric acid were produced, of which 16,000 tons were used in the manufacture of fertilizers.

Several limited phosphate deposits of organic origin occur in Sarawak and Sabah, where the P_2O_5 content varies between 10-30 per cent. Niah Cave, Sarawak, has the largest deposits, with total reserves estimated at 28,000 tons with an average P_2O_5 content of 23 per cent. The total Malaysian phosphate reserves have been estimated at over 100,000 tons.

No potash reserves are known.

Dolomite is found in greatest quantity at Batu Caves, Selangor, and in the Melinan Limestone Caves in north Sarawak. It is also produced commercially. Deposits of serpentine have been reported at Kudat, Mostyu and Lahat Datu (Sabah) with an average magnesia content estimated at 36 per cent. Other minerals found in commercial quantities include tin, iron-ore, bauxite, gold, columbite, monazite, wolframite, scheelite, zircon and kaolin.

The electric power capacity installed in 1968 was 814,200 kW and production for the same year was 3,000 million kWh. This amounted to about 3,456 million kWh in 1970.

The manufacturing sector is expanding and industrial production increasing. In 1970 the total manufacturing output amounted to 12 per cent of the GDP. The principal industries are rubber, tin-smelting and the processing of agricultural products. Light industry and handicrafts also occur on a small scale. The chemical industry is being developed. Some small plants exist which produce sulphuric acid (capacity 42,000 tons per annum), hydrochloric acid and nitric acid and sulphonate of imported alkyl aryl compounds for use as detergents and fertilizers.

One of the objects of the Five-Year Plan is to increase the participation of the State in industry. Within 20 years at least 30 per cent of all commercial and industrial activities should be partly owned and managed by Malaysians. Industrial and commercial enterprises are planned for rural areas.

Fertilizer manufacture

Until 1966 virtually all mineral fertilizer requirements were imported in raw or manufactured form; only dolomite was produced locally.

There are two plants producing nitrogen fertilizers: one plant is at Port Dickson, Negri Sembilan, West Malaysia, producing 50,000-100,000 tons per annum of ammonia, and based on petroleum refinery off-gases and naphtha; it is owned and operated by Esso Standard Malaya Berhad Ltd. and started production in 1967. The other, at Padang Jawa, produces nitric acid, ammonium nitrate and compound fertilizers and has a total capacity of 200,000 tons per annum. This is owned and operated by the Chemical Company of Malaysia and utilizes ammonia produced at the Esso Port Dickson plant as feedstock. The Esso Port Dickson plant is not yet used to capacity.

Two fertilizer plants are planned for Sarawak. Hoe Huat Sdn. Bhd and Wee Kheng Chiang Sdn. Bhd., Kuching plan a mixed fertilizers plant with a capacity of 27,600 tons per annum. The second plant will produce complex fertilizers and have a capacity of 60,000 tons per annum.

Several small fertilizer-blending units also exist. There are no facilities for the production of phosphate fertilizer intermediates.

In 1969/70 the following nutrients were imported:

	Tons
N	25 600
P_2O_5	15 700
K_2O	31 700

West Malaysia consumes far more fertilizers than Sabah, as can be seen from the following figures:

	Consumption (1969/70) (kg/ha)			
	N	P_2O_5	K_2O	Total
Sabah	2.63	3.07	3.07	8.77
West Malayasia	19.83	5.51	11.38	36.72

Source: FAO, Annual Fertilizer Review 1970 (Rome, 1971), p. 39.

Present and projected fertilizer consumption

The consumption of fertilizer nutrients in 1970/71, in round numbers, was 60,100*, 51,100[14/] and 68,800* tons of N, P_2O_5 and K_2O, respectively. Using these and FAO forward estimates taken from the Indicative World Plan for Agricultural Development to 1975 and 1985, Provisional Regional Study No. 23, dated 23 April 1969, it was possible to predict that nitrogen consumption would be approximately 100,000 tons by 1980. It was estimated by the UNIDO/FAO/World Bank Ad hoc Working Group on the Financing of Fertilizer Projects (1972) that nitrogen consumption in 1980 would be 125,000 tons of N, phosphate consumption 40,000 tons of P_2O_5 (excluding ground-rock phosphate used for direct application), and potash consumption 120,000 tons K_2O.

14/ Not including P_2O_5 content in ground phosphate rock used for direct application, which in 1970/71 amounted to 33,300* tons P_2O_5.

General references

Annual Bulletin of Statistics (Malaysia, Department of Statistics, 1968).

Asian Development Bank, Asian Agricultural Survey (Pasay City, Philippines, 1969).

Barclays Bank Ltd., Malaysia (London, January 1971).

Barclays Bank Ltd., Malaysia (London, November 1971).

BfA Mitteilungen: Weltwirtschaft am Jahreswechsel, Malaysia, No. 81 (Köln, March 1971).

FAO, Indicative World Plan for Agricultural Development to 1975 and 1985, Provisional Regional Study No. 23 (IWP/68/RS.4) (Rome, 23 April 1969).

FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972).

Federation of Malaysian Manufacturers, Buku Panduan Directory (Persekutuan Pekiland, Malaysia, 1969).

Fouquet, C., L'économie de la Malaysie, Analyse et Prévision (Paris, 1971) t.xi.

Industrial Development in Asia and the Far East, vol. II, (United Nations publication, Sales No. 66.II.B.20).

International Petroleum Encyclopedia, 1972 (Tulsa, Oklahoma, Petroleum Publishing Co., 1972).

Malaysia, Government of, Far East Trade and Development (London, June 1971).

Malaysia, Government of, First Malaysian Plan (1965).

Monthly Bulletin of Statistics, vol. XXVII, No. 1 (January 1973).

Non-Ferrous Metals: A Survey of their Production and Potential in the Developing Countries (United Nations publication, 1972, Sales No. 72.II.B.18) pp. 160-164.

Proceedings of the Seminar on Sources of Mineral Raw Materials for the Fertilizer Industry in Asia and the Far East, Mineral Resources Development Series No. 32 (United Nations publication, Sales No. 69.II.F.2).

The Business Outlook in Malaysia, Business Asia (December 1970), pp. 62 and 302.

UMBC Economic Review, vol. VI, No. 1, United Malayan Banking Corp., Ltd., (KDN 4722 Kuala Lumpur, 1970).

UNCTAD/GATT, International Trade Centre, Malaysia as a Market for Manufactured Products from Developing Countries (Geneva, 1969).

UNDP, Malaysia Country Programme Background Paper for UN Development Assistance 1972-1976.

UNIDO, "Development of the petrochemical industry in Malaysia", paper presented to the Interregional Petrochemical Symposium on the Development of the Petrochemical Industries in Developing Countries, Baku, USSR, 21-31 October 1969 (ID/WG.34/105).

United States Department of Commerce, Basic Data on the Economy of Malaysia, Overseas Business Reports, OBR 67-35 (Washington, D.C., July 1967).

United States Department of Commerce, International Commerce, Malaysia (Washington, D.C., Government Printing Office, 1969).

United States Department of State, Background Notes on Malaysia, No. 7753 (Washington D.C., February 1967).

USAID, Economic Data Sheets, No. 233 (Washington, D.C., 1969).

World Fertilizer Atlas, 3rd ed. (London, British Sulphur Corp., Ltd., 1969).

World Survey of Phosphate Deposits, 3rd ed. (London, British Sulphur Corp., 1971).

PHILIPPINES

Consumption and production of fertilizers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61[a]	1965/66[b]	1970/71[c]	1975/76[d]	1980/81[e]
N	Consumption	42 722	58 000*	119 152	200 000	300 000
	Production	7 400	10 100*	47 715	...	...
	Deficit	35 322	47 900*	71 437	...	...
	Surplus	-	-	-	...	...
P_2O_5	Consumption	22 564	25 000*	44 000*	90 000	150 000
	Production	5 950	9 000*	44 000*	...	...
	Deficit	16 614	16 000*	3 000	...	...
	Surplus	-	-	-	...	...
K_2O	Consumption	19 333	30 200*	38 000*	50 000	75 000
	Production	-	-	-	-	-
	Deficit	19 333	30 200*	38 000*	50 000	75 000
	Surplus	-	-	-	-	-

Sources: a/ FAO, Fertilizers, An Annual Review of World Production, Consumption and Trade 1964 (Rome, 1965), pp. 93, 98, 119, 126 and 151.

b/ FAO, Annual Fertilizer Review 1970 (Rome, 1971), pp. 70, 79, 102, 110 and 133.

c/ FAO, Annual Fertilizer Review 1971 (Rome, 1972), pp. 71, 81, 142, and information supplied by UNIDO expert.

d/ Information supplied by UNIDO expert.

e/ Projected demand, figures of UNIDO/FAO/World Bank Ad Hoc Working Group on the Financing of Fertilizer Projects, and information supplied by UNIDO expert.

General

The Philippine Archipelago lies off the south-east coast of the Asian mainland just above the equator. It consists of over 7,000 islands covering an area of approximately 300,000 km^2. Luzon, the largest island, covers 35 per cent of the land area and contains one-third of the total population.

The population in 1972 numbered 42 million and the annual rate of population growth was 3 per cent. Sixty per cent of the labour force (which numbers 12.3 million) are employed in agriculture, which earns 70 per cent of the total foreign exchange. The population density is 129/km^2.

The Philippines has abundant rainfall, varying from region to region. The climate is tropical, with two seasons - the wet season from May to October and the dry season from November to April.

The growth of the Philippine economy was slow in the 1950s and early 1960s, with the real GNP rising about 5 per cent annually from 1962-1966. Since 1967, however, the real GNP growth rate reached an annual average of over 6 per cent. The output of all sectors of the economy has expanded recently, especially with reference to agriculture and mining. In 1969 the GNP amounted to $7,735 million (in dollars of 1968) and the per capita income was $205. The National Development Plan (1971-1974) forecasts an annual growth rate average of 6.9 per cent.

Agriculture, including forestry and fishing, contributed 36.4 per cent to the net domestic product at current prices (1969); manufacturing contributed 17.4 per cent and mining only 2 per cent. Agricultural commodities still dominate exports, accounting for 70 per cent of the total exports in 1970. Leading exports are coconut products, pineapples, sugar, abaca (manila hemp), and timber.

Agriculture

The distribution of land in the country (1970) was as follows:

	Thousand hectares
Total area	30 000
Arable land	6 574
Land under permanent crops	2 403
Permanent meadows and pastures	1 423
Forest land	15 899
Remaining land	3 701

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 5.

The main crop is rice. Output has increased remarkably since 1966 due mainly to the successful introduction of the new high-yielding varieties produced by the International Rice Research Institute and the Bureau of the Plant Industry. Acreage under high-yielding varieties increased from a negligible amount in 1965 to 30 per cent of the total acreage in 1968/69. The Philippines achieved self-sufficiency in rice production for the first time in 1968. Present rates of application of fertilizers are, however, below the recommended rates of approximately 60 kg N/ha and 40 kg P_2O_5/ha. The effective demand for nitrogen on paddy could rise annually by 6 per cent and for P_2O_5 at a higher rate.

The second most important food crop is maize, where high-yielding varieties have also been introduced; the target for this planting is 500,000 ha. The Rice and Corn Production Co-ordinating Council recommend a fertilizer application of 90 kg N/ha and 45 kg P_2O_5/ha.

Other important crops are: sugar-cane, pineapples, coconuts, bananas, vegetables, abaca fibre and tobacco. The biggest export earners are coconuts, in the form of copra, coconut oil and desiccated coconut, and sugar and bananas. The Bureau of Soils of the Philippines recommends the application of 80 kg N/ha and 60 kg P_2O_5/ha for coconuts.

Timber is the second most important export after coconuts. In 1970 forestry products were as follows:

Item	Production (million board feet)
Logs	4 610
Lumber	568
Plywood	573
Veneer	305

Details of the main crops produced in 1971 are given below:

Crop	Area (thousand hectares)	Production (thousand tons)	Yield (kg/ha)
Sugar-cane[a]	346F	18 655F	53 900F
Paddy rice	3 159	5 437	1 720
Copra	...	1 626*	...
Maize	2 398	2 010	840
Pineapples[a]	...	233	...
Bananas[a]	60F	900F	15 000F
Tobacco	78	53.7	690
Abaca[a]	173	70F	...
Coconuts		7 814 million nuts	

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 61, 76, 92, 219, 222, 261, 263, 277 and 295.

a/ 1970 crop year.

In 1970 about 826,000 ha were irrigated.[15] The development of irrigation systems is being given high priority in the government's programme in order to make the introduction of high-yielding varieties more effective. The Government also desires to expand rural credit, improve the distribution of fertilizers and insecticides and carry out agrarian reform.

The average fertilizer recommendations for main crops, in kg/ha plant nutrients and total area, are as follows:

Crop	N (kg/ha)	P_2O_5 (kg/ha)	K_2O (kg/ha)	Area (thousand hectares)
Rice	50-80	30-50	0-30	3 175
Maize	45-75	30-45	0-45	2 437
Coconuts	80	60	240	1 900
Sugar-cane	100-150	80-120	80-200	320
Abaca	120	80	180	173
Tobacco	80	60	120	88
Ground-nuts	-	30	-	30

Source: FAO figures (UNIDO/FAO/World Bank Ad Hoc Working Group on the Financing of Fertilizer Projects) Country Data Sheet.

Natural resources and industry

There are no known deposits of fertilizer materials of great commercial value. The largest deposits of volcanic sulphur are on Negros Island (25 per cent sulphur content) but they are not commercially attractive at present. A large-scale venture to produce 2,000 tons of sulphur from these ores was abandoned due to the current situation of the sulphur market.

A considerable supply of pyrites exists, e.g. in Kalinga-Apayao, Makahaya and Nabatan Creek. The capital investment required for a plant using either pyrites or volcanic ores would be twice that of a sulphur-burning plant. Reserves have been estimated at 60 million tons and the grade varies between 2.5 and 40 per cent sulphur.

15/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 9.

The estimate of 300,000 tons N for 1980/81, given in the table at the beginning of this section, appears to take adequate account of the past growth of nitrogen consumption; 300,000 tons N in 1980/81 corresponds to a rate of growth of 13 per cent per annum from the consumption in 1973 of 127,000 tons N. The past growth of P_2O_5 and K_2O have been so erratic that a graphical projection is not possible. Therefore, P_2O_5 has been taken as 50 per cent of the N and K_2O as 25 per cent of the N, which gives a ratio for 1980/81 of 4-2-1 for N-P-K, a ratio commonly used in many developing countries.[16/]

16/ UNIDO, Need for more fertilizer plants in the Philippines, November-December 1973 (TS/PHI/73/002).

General references

FAO, Annual Fertilizer Review 1971 (Rome 1972).

FAO, Indicative World Plan for Agricultural Development to 1975 and 1985, vol. I, (IWP/68/RS.4) (Rome, 23 April 1969).

FAO, Production Yearbook, 1971, vol. 25 (Rome 1972).

Monthly Bulletin of Statistics, vol. XXVII, No. 1, January 1973.

National Economic Council of the Philippines, Four-Year Development Plan FY 1971-1974, July 1970.

Nitrogen, No. 75 (London, January/February 1972).

UNIDO, "Development of the petrochemical industry in the Philippines", paper presented to the Interregional Petrochemical Symposium on the Development of the Petrochemical Industries in Developing Countries, Baku, USSR, 21-31 October 1969 (ID/WG.34/108).

UNIDO, "The Fertilizer Industry of the Philippines", paper presented to the Second Interregional Fertilizer Symposium, Kiev, USSR, 21 September-1 October and New Delhi, India, 2-13 October, 1971 (ID/WG.99/104).

UNIDO/FAO/World Bank Group Ad Hoc Working Group on the Financing of Fertilizer Projects, Projections and data sheets (1972).

REPUBLIC OF KOREA

Consumption and production of fertilizers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61[a]	1965/66[b]	1970/71[c]	1975/76[d]	1980/81[e]
N	Consumption	217 128	217 925	355 550	425 000	500 000
	Production	6 145	75 271	292 340	410 307	600 000
	Deficit	210 983	142 654	-	14 693	-
	Surplus	-	-	37 790	-	100 000
P_2O_5	Consumption	55 206	123 489	124 354	178 000	350 000
	Production	-	-	139 545	131 740	140 000
	Deficit	55 206	123 489	-	46 260	210 000
	Surplus	-	-	15 191	-	-
K_2O	Consumption	7 090	51 684	82 998	164 000	200 000
	Production	-	-	49 746	43 334	...
	Deficit	7 090	51 684	33 252	120 666	...
	Surplus	-	-	-	-	...

Sources: a/, b/, c/, d/ Government of the Republic of Korea.

e/ UNIDO, "Review of world production, consumption and international trade in fertilizers with projections to 1975 and 1980", Second Interregional Fertilizer Symposium, Kiev, USSR, 21 Sept.-1 Oct. and New Delhi, India, 2-13 October 1971 (ID/WG.99/4, August 1971) pp. 51, 53 and 55.

Note: Figures for demand in 1975 are equivalent to those of the Third Five-Year Economic Plan; production in 1975 will depend on the capacities of the plants.

General

The Republic of Korea is the southern part of the Korean peninsula, which lies between Japan on the east and China on the west. It covers an area of 98,500 km^2 and has a population of approximately 31.9 million (mid-1971), with an average annual growth rate of 2 per cent and an average population density of 315/km^2.

The climate is moderate with four distinct seasons.

Agriculture, employing 51 per cent of the labour force, accounts for 30 per cent of the GDP and manufacturing and mining 26 per cent. Manufacturing, especially the production of light consumer goods, is a very fast growing sector of the economy. The aim of the government's Five-Year Development Plan (1972-1976) is to increase exports, promote a balance between the development of the agricultural and the industrial sectors and attain a self-sufficient economy by 1976.

In 1969 the GNP totalled $5.6 billion (in dollars of 1964) and the per capita GNP was $180. In the period covered by the Second Development Plan (1967-1971) the GNP growth rate averaged 11.6 per cent.

The main trading partners of the Republic of Korea are the Federal Republic of Germany, Hong Kong, Japan and the United States of America.

Agriculture

The distribution of land in the country in 1969 was as follows:

	Thousand hectares
Total area	9 848
Agricultural land	2 329
Forest land	6 628
Other land	891

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 5.

Details of the main crops produced in 1971 are given below:

Crop	Area (thousand hectares)	Production (thousand tons)	Yield (kg/ha)
Rice (paddy)	1 200F	5 500F	4 580F
Wheat	158F	363F	2 300F
Maize	45F	65F	1 440F
Millet and sorghum	56F	44F	790F
Soybeans	290F	230F	790F
Cotton	16F	5F	300F
Rape-seed	25F	27F	1 080F
Tobacco	41*	724*	1 770*

Sources: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 39, 60, 68, 76, 230, 248, 276, 283 and information received from the Government, Republic of Korea.

The agricultural targets of the Second Development Plan 1967-1971 were to raise the proportion of fully-irrigated paddy fields from 50 to 70 per cent of the total land available for rice cultivation; to increase the available arable land by 279,000 ha; and increase productivity through seed improvement, insect control, increased double cropping and improved soil conditions.

The Government plans to afforest 1,400,000 ha to increase productivity in this sector.

Natural resources and industry

With no reserves of petroleum or bituminous coal, the country is not well favoured with natural resources. Only moderate reserves of anthracite coal and resources for hydro-electric power exist. However, the Republic has developed its power resources and the production of electricity in 1971 was 10,536 million kWh.[17/] The production of coal in 1971 amounted to 12,780,000 tons.[18/] Extensive off-shore exploration for oil is being carried out in the Yellow Sea and in the Sea of Japan.

Known reserves of iron ore total 114.4 million tons (26 per cent high-grade ore). In 1970 production was 571,026 tons with an approximate metal content of 56 per cent, most of which was exported to Japan. Other minerals exploited include copper, tungsten, graphite, fluorspar, lead ore - 170,880 tons in 1970 - and zinc ore - 47,960 tons in 1970.

17/ Monthly Bulletin of Statistics, vol. XXVII, No. 1 (United Nations publication) (January 1973), p. 99.

18/ Ibid., p. 34.

There are three oil refineries in operation, which use imported crude oil, one at Yŏsu, with a capacity of 100,000 bbl/d, owned and operated by the Honam Refining Co., the second at Ulsan, with a capacity of 115,000 bbl/d crude oil, owned and operated by the Korea Oil Corporation and the third at Inchŏn, with a capacity of 2,750,000 tons of crude oil per annum. The capacities of all these plants are being increased.

Construction plans included:

Company	Plant Site	Project	Capacity	Estimated date of completion
			(tons per day)	
Dae Sung Methanol	Ulsan	Naphtha	150	1971
Samkyung Chemical Company	Seoul	Phthalic	24	1972
Tong Suh Petrochemical Ltd.	Ulsan	Acrylonitrile	80	1972
			(thousand bbl/d)	
Honam Oil Refinery	Yosu	Distillation, crude	to 160	1972
Korea Oil Corporation	Ulsan	Distillation, crude	to 175	1972
Kyung-In Energy Company	Inchon	Distillation, crude	to 60	1972
Kyungin Energy	Inchon	Distillation, crude, catalytic reformer Distillation, crude	to 60	1972
			(million tons per annum)	
Korea Oil Corporation	Ulsan	Gasoline hydrotreater:	100	1972
		Butadiene	19	1972
		Cyclohexane	36	1972
		Ethylene	150	1972
		Toluene	37	1972
Korea Pacific Chemical Corporation	Ulsan	Polyethylene	50	1972

Source: Hydrocarbon Processing: World-wide Construction Boxscore, February 1972 (Houston, Texas, Gulf Publishing Co.), p. 39.

The main industries include the manufacture of transport equipment, chemicals, petroleum and coal products, foodstuffs, textiles, electrical machinery, cement, fertilizers and iron and steel products.

Fertilizer manufacture

The development of the fertilizer industry began in the early 1960s; at present the industry concentrates primarily on the production of nitrogenous fertilizers.

The following is a list of the fertilizer plants now in operation or under construction:

Company	Location	Commissioning date	Product	Rated capacity (thousand tons per annum)
Chungju Fertilizer Corporation	Chungju	1960	Urea	85
	Expansion	1968	Urea	30.5
	Expansion	1973	Urea	255.5
				371
Honam Fertilizer Corporation	Naju	1962	Urea	85
	Expansion	1969	Urea	38
				123
Yong Nam Chemical Company	Ulsan	1967	Urea complex fertilizer (22-22-11) (14-37-12) (18-18-18)	84.1
Chinhae Chemical Corporation	Chinhae	1967	Urea	84
			Complex fertilizer	180.6
				264.6
Korea Fertilizer Company	Ulsan	1967	Urea	330
Samchok Chemical Corporation	Samchŏk	1966	Calcium-cyanamide	25
Kyung Ki Fertilizer Company	Pu-chun	1966	Fused phosphate	50
Pung Nong Fertilizer Corporation	Changhang	1967	Fused phosphate	54
	Expansion	1968	Fused phosphate	54
				108
Chungju Fertilizer Corporation Ammonia Centre[a/]	Chungju	1973	Urea	231

a/ The Government plans to make the existing ammonia plant and Expansion at Chungju redundant when the new large-scale ammonia/urea plant, utilizing newly-developed processes, has been constructed.

Another plant to produce 300,000 tons per annum of ammonia and 231,000 tons per annum of urea is scheduled for completion by late 1973.

The expansion of nitrogen fertilizer production since 1966 has been impressive. The increase can be attributed to the three large naphtha-based plants, two of which are virtually identical, one at Chinhae and two at Ulsan (see the list above). The country is already showing interest in the international export market for nitrogenous fertilizers. In 1970 the Republic exported 56,000 tons of nitrogenous fertilizers.

Fertilizer consumption

Towards the end of 1969 the Government set new prices for fertilizers to promote the greater use of phosphatic and potassic nutrients, as well as compounds. The cost of imported nitrogen fertilizers was raised by 17 per cent and that of compound fertilizers reduced by 20 per cent (except for the combination 18-46-0). Fused phosphate and potash salts were reduced by 10 per cent. The purchase price of domestically produced urea, calcium-cyanamide and fused phosphate increased by an average of 5.7 per cent.

The trend today is towards increasing the consumption of P_2O_5 in the form of compounds such as 18-18-18, 22-22-11 and 14-37-12. Various authorities have made recommendations concerning the optimum NPK requirements for food crops in Korea and their assessments are broadly in agreement, embracing the NPK ratios 100-60-60 to 100-70-70; in 1969 the NPK ratio used was 100-41-26.

The consumption of fertilizer per hectare ($N + P_2O_5 + K_2O$) in 1970 for the fertilizer year 1969/70 was 161 kg/ha.

General references

Chungju Fertilizer Corporation, A Guide to Petroleum Industry in Korea (Seoul, Republic of Korea, 1968).

Chungju Fertilizer Corporation, Annual Report 1968 (Seoul, Republic of Korea).

FAO, Annual Fertilizer Review 1971 (Rome, 1972).

Federation of Korean Industries, Korean Economy in Figures, 1968-1969.

Hydrocarbon Processing: World-wide HPI Construction Boxscore, February 1972 (Houston, Texas, Gulf Publishing Co.).

IBRD, Economic Position and Prospects of the Republic of Korea, vols. I and II, EAP-19a (Washington, D.C.).

IBRD, Industrial Development Problems and Programmes in the Republic of Korea, Report No. PI-9a (Washington, D.C., 15 Nov. 1971).

IBRD, Trends in Developing Countries (1971).

Korean Business Review, No. 19 (June 1969).

Korea Oil Corporation, Petroleum Industry of Korea (Seoul, Republic of Korea, March 1967).

FAO, Monthly Bulletin of Agricultural Economics and Statistics, vol. 22 (Rome, March 1973).

Monthly Bulletin of Statistics, vol. XXVII, No. ' (January 1973).

Nitrogen, No. 64 (London, 1970).

Phosphorus and Potassium, No. 46 (London, British Sulphur Corp., June 1970).

Republic of Korea, Economic Planning Board, Summary of the Second Five-Year Economic Development Plan 1967-1971 (Seoul).

Republic of Korea, The Promotion and Development of the Chemical Fertilizer Industry (Seoul, Republic of Korea, October 1969).

UNIDO, "Information sheet on the Republic of Korea", prepared for use in connexion with the Meeting to Promote Specific Projects in Asian Countries held at Manila, Philippines, 23-30 Sept. 1970 (id 70-4563).

World Fertilizer Atlas, 3rd ed. (London, British Sulphur Corp., Ltd., 1969).

Yong-Nam Chemical Co. Ltd., Report on Construction and Management of a Fertilizer Plant at Ulsan (Seoul, 1967).

REPUBLIC OF VIET-NAM

Consumption and production of fertilizers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61 a/	1965/66 b/	1970/71 b/	1975/76 b/	1980/81 b/
N	Consumption	19 319	26 380	135 267	170 000	263 000
	Production	-	-	-	-	-
	Deficit	19 319	26 380	135 267	170 000	263 000
	Surplus	-	-	-	-	-
P_2O_5	Consumption	1 343	56 955	61 918	88 000	143 000
	Production	-	-	-	-	-
	Deficit	1 343	56 955	61 918	88 000	143 000
	Surplus	-	-	-	-	-
K_2O	Consumption	3 532	11 122	24 936	25 000	37 000
	Production	-	-	-	-	-
	Deficit	3 532	11 122	24 936	25 000	37 000
	Surplus	-	-	-	-	-

Sources: a/ FAO, Fertilizers, An Annual Review of World Production, Consumption and Trade, 1964, (Rome, 1965), pp. 96, 98, 119, 126 and 151.

b/ FAO (1973).

General

The Republic of Viet-Nam covers an area of 173,810 km^2 and forms the south-eastern perimeter of the Indochinese peninsula. A demarcation line on the seventeenth parallel separates the Republic of Viet-Nam from the Democratic Republic of Viet-Nam in the north. The country has boundaries with Laos and the Khmer Republic on the west, a coastline with the South China Sea on the south-east and the Gulf of Thailand on the south-west.

The population was estimated to be approximately 18.8 million in 1971, with an estimated growth rate of 2.6 per cent. About 75 per cent of the labour force is engaged in agriculture, while only 2.7 per cent is employed in industry.

There are three major geographical regions: the flat, fertile alluvial plain of the Mekong Delta, the forested and sparsely populated Central Highlands and the relatively fertile coastal plains of the Central Lowlands in the north. The Republic is essentially a tropical country but the climate varies considerably from region to region. The average annual rainfall is 59 inches and the humidity ranges from 72 to 87 per cent.

The Republic of Viet-Nam has no national development plan but the President of the Republic gave instructions that such a plan should be prepared and submitted by August 1972. The National Economic Development Plan covers the period from 1972 to 1975. It proposes a growth rate of between 6-7 per cent in GNP.

The GNP in 1969 was $4,156 million and the *per capita* income $233. It has increased at an annual compound rate of over 5 per cent annually during the period 1962-1970. However, this increase is merely superficial because it has not been caused by a corresponding increase in national production. The economy of the country, which is basically agricultural, has been severely disrupted by unsettled conditions.

Agriculture

Agriculture accounts for 38 per cent of the GDP at current factor cost (1969) and provides 90 per cent of the exports, mainly in the form of rubber, spices, fish products, tea, coffee and wood products.

The distribution of land in the country in 1970 was as follows:

	Thousand hectares
Total area	17 381
Arable land	3 000
Land under permanent crops	216
Land under permanent meadows and pastures	2 870
Tropical forests	5 949
Other land	5 346

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 6 and information supplied by the Government of the Republic of Viet-Nam (1972).

There are 580,000 ha of land irrigated.19/

There was a long period of decline in agriculture. However, there was an increase in activity in 1971.

Rice is the staple diet and is grown mainly in West Cochin China and in the area south of the Mekong Delta, which is the most productive area in the country. Some 85 per cent of cultivated land is devoted to paddy. Production fell dramatically due to unsettled conditions and imports were necessary. In 1971 Viet-Nam was still obliged to import about 160,000 tons of rice to satisfy its consumer needs, but due mainly to the introduction of the 'miracle rice' IR-8, and later IR-21, the high-yielding varieties, rice production increased in the same year by 11 per cent over production in 1970.

Rubber is the main export commodity. Production fell from 77,000 tons per annum in 1960 to 27,700 tons per annum in 1969. Replanting has been disrupted since 1962. In 1971, however, rubber production rose again and reached 29,000* tons per annum.

The Government has placed emphasis on the diversification of crops, and ground-nuts, soybeans, peas, tea and rubber production rose in 1971. Fish and livestock production also showed improvement.

The land-reform programme, currently referred to as the 'land to the tiller' programme, envisages one million hectares of land owned by landlords being turned over to the farmers who cultivate the land, the owners being compensated by the Government. To date, about 620,000 ha have been handed over.

19/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 9.

Details of the main crops produced in 1971 are given below:

Crop	Area (thousand hectares)	Production (thousand tons)	Yield (kg/ha)
Rice (paddy)	2 511F	5 716F	2 280F
Maize	29F	31F	1 070F
Sugar-cane[a]	11F	300F	27 300F
Sweet potatoes/yams[b]	33F	220	6 700
Cassava[b]	30	216	7 100
Soybeans	7F	7F	1 060F
Ground-nuts (in shell)	30F	32F	1 070F
Copra	...	22.5F	...
Coffee	...	4F	...
Tea	8F	5.5F	...
Tobacco	9F	8.4F	990F
Coconuts[b]	...	118 million nuts	...

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 61, 77, 92, 113, 117, 230, 233, 261, 263, 266, 271 and 278.

a/ Crop year 1970/71.

b/ Crop year 1970.

Natural resources and industry

No petroleum or natural gas reserves have been located and no detailed country or regional geographical surveys have been conducted. Off-shore oil exploration is being carried out.

There are indications of mining possibilities in the Central Highlands. The major coal-field, near Da Nang, has an annual potential production of approximately 150,000 tons of coal. In 1964, 6,000 tons were produced. Iron-ore deposits have been found at Mo Duc and molybdenum at Chau Duc but the sizes of the reserves remain uncertain. Phosphate is also mined. However, mining activity is so far of little economic significance and is confined mainly to the extraction and processing of limestone, silica sand and precious stones.

Four industrial zones have been planned, one at Bien-Hoa - 30 km north of Saigon, one at An-Hoa-Nong-Son in the centre of the country, one at Cam-Ranh and one at Can-Tho. So far, only the first two zones have been created.

The National Economic Development Plan lists 43 industrial projects, which include sugar-mills and refineries, pulp and paper projects, expansion of the fishing and animal-feed industries, the plastics industry, chemicals, cement, textiles and agricultural machinery. In 1969 industry formed 42 per cent of the GDP.

An oil-refinery project, with a capacity of 40,000 bbl/d, is in the planning stages for the Nha Trang area. It will produce elemental sulphur for the manufacture of sulphuric acid. Plans for setting up a sulphuric-acid plant with a capacity of 4,200 tons per annum, initially using imported ore, are under consideration.

Fertilizer manufacture

No fertilizers are produced in the country.

The central chemical complex, started in 1960 at An Hoa, near Da Nang, was not completed due to continued unsettled conditions in the country. This complex included a urea plant, with a capacity of 42,000 tons per annum, and an ammonium sulphate plant with a capacity of 40,000 tons per annum. The project has now been abandoned.

The establishment of a fertilizer plant is included in the government's list of priority projects: technical studies were prepared in 1967/68 for an ammonia plant, based on imported naphtha, to produce 600 tons per day of ammonia and convert it into 1,000 tons per day of urea. A pre-investment report for this project has been submitted to the Government.

Fertilizer consumption

From 1965 to 1970 the imports of fertilizer increased, as shown below:

Year	N	P_2O_5 (tons)	K_2O
1965-1966	26 380	56 955	11 122
1967-1968	57 500	18 800	18 300
1969-1970	137 482	51 567	25 381

Source: Ministry of National Planning and Development, Republic of Viet-Nam.

The suggested targets for the consumption of fertilizers in 1980 are: 220,000 tons N, 110,000 tons P_2O_5, and 65,000 tons K_2O. The probable demand for N in 1980 has been estimated at 200,000 tons N and for P_2O_5 at 75,000 tons P_2O_5.

In 1969/70, fertilizer consumption in the Republic of Viet-Nam amounted to 9.7 kg per capita, and 61 kg per hectare.[20/]

20/ UNIDO "Review of world production, consumption and international trade in fertilizers with projections to 1975 and 1980", Second Interregional Fertilizer Symposium, Kiev, USSR, 21 September-1 October and New Delhi, India, 2-13 October 1971, pp. 31 and 35.

General references

Committee for the Co-ordination of Investigations of the Lower Mekong Basin, Report on indicative basin plan: A proposed framework for the development of water and related resources of the Lower Mekong Basin (E/CN.11/WRD/MKG/L.340) (1970).

FAO, Annual Fertilizer Review (Rome, 1964, 1966 and 1970).

FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972).

FAO, Statistical tables prepared for the seventh session of the Ad Hoc Working Party on Fertilizer Statistics, 1972.

Hydrocarbon Processing: World-wide HPI Construction Boxscore, June 1972 (Houston, Texas, Gulf Publishing Co.).

Lloyd's Bank Ltd., Economic Report: Republic of Vietnam (London, March 1971).

Mineral Raw Material Resources for the Fertilizer Industry in Asia and the Far East, Mineral Resources Development Series No. 28 (United Nations publications, Sales No. 68.II.F.3), p. 72.

Monthly Bulletin of Statistics, vol. XXVII, No. 1 (January 1973).

UNDP, Annual Report of 1971 for the Inter-Agency Consultative Board, March 1972.

UNDP, Republic of Vietnam - Background Paper for the Preparation of the Country Programme, April 1972.

UNIDO, Review of World Production, Consumption and International Trade in Fertilizers with Projections to 1975 and 1980, paper presented to Second Interregional Fertilizer Symposium, Kiev, USSR, 21 September-1 October and New Dehli, India, 2-13 October 1971 (ID/WG.99/4).

United States Department of State, Background Notes on Republic of Vietnam, August 1968 (0-345-210 (11)).

THAILAND

Consumption and production of fertilizers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61[a]	1965/66[b]	1970/71[c]	1975/76[d]	1980/81[e]
N	Consumption	...	17 917	42 500*	289 600	466 200
	Production	-	-	10 000*	...	...
	Deficit	...	17 917	32 500*	...	...
	Surplus	...	-	-	...	...
P_2O_5	Consumption	...	11 275	36 000*	187 600	344 300
	Production	-	-	-	...	...
	Deficit	...	11 275	36 000*	...	...
	Surplus	...	-	-	...	...
K_2O	Consumption	...	4 569	15 000*	116 800	171 900
	Production	-	-	-	-	-
	Deficit	...	4 569	15 000*	116 800	171 900
	Surplus	...	-	-	-	-

Sources: a/ FAO, Fertilizers, An Annual Review of World Production, Consumption and Trade, 1964 (Rome, 1965), pp. 98, 126 and 151.

b/ FAO, Annual Fertilizer Review 1970 (Rome, 1971), pp. 80, 110 and 134.

c/ FAO, Production Yearbook 1971 (Rome, 1972), pp. 466, 470, 477 and 482.

d/ FAO, Indicative World Plan for Agricultural Development to 1975 and 1985, Provisional Regional World Study, No. 4, IWP.68/RS.4, (Rome, 1968), pp. 259 and 260 (Objectives).

e/ Mean based on figures for 1975/76 and 1985/86 from Indicative World Plan[d] above.

General

Thailand covers an area of 515,000 km^2 and is situated in the tropical zone; it has land boundaries with Burma to the north-east, with the Khmer Republic to the south-east, with Laos to the north-east and with Malaysia to the south. The country has coast lines with the Gulf of Siam to the south and the Andaman Sea to the west. There are four regions: the central plain; the northern mountainous and heavily forested area; the north-east area with the Mekong River; and the southern part of the country that forms the isthmus of the Malay Peninsula.

The climate is tropical and monsoon, with high temperatures and high humidity for the greater part of the year.

At mid-year 1971 the population was 35,340,000 and the annual rate of growth was 3.3 per cent. The density of the population is approximately 73 persons per square kilometre.

Agrioulture is the mainstay of the eoonomy, employing about 80 per cent of the working force.

The Second Development Plan, from 1966 to 1971, was aimed at an average annual increase of real national inoome of 8.5 per oent. In 1969 the aotual increase amounted to over 9 per cent, at oonstant prices from 1965 to 1969.

In 1969 imports amounted to $1,223 million and exports were $697 million. Thailand's main trading partners were the Federal Republic of Germany, Hong-Kong, India, Japan, Malaysia, the Netherlands, the United Kingdom and the United States.

In 1969 the GNP amounted to $6,291 million, and the per capita income for the same year was $166. Agriculture contributed 31.8 per cent to the GDP and mining about 1.8 per cent.

Agriculture

The agricultural rate of growth over the last two decades has averaged 4.6 per cent per annum. Although depressed world markets for rice have had an adverse effect on Thailand's export earnings, the 1970 rice exports amounted to 17 per cent of the total export value (1,061,000 tons) and rice is likely to continue to be the mainstay of the Thai economy for some time. The Central Plain is the centre of rice production. Double-cropping covers only 450,000 ha. About 1,830,000 ha of the rice area are irrigated. There are plans to irrigate the upper Chao Phraya Basin for dry-season irrigation. Greater emphasis is also being put on the introduction of new improved seed varieties to increase production. Improved rice varieties RD-1 and RD-3 have been introduced with success in the western part of the Chao Phya Delta.

Details of the main crops produced in 1971 are given below:

Crop	Area (thousand hectares)	Production (thousand tons)	Yield (kg/ha)
Rice (paddy)	6 730F	13 270F	1 970F
Maize	750F	1 900F	2 530F
Soybeans	90F	90*	1 000F
Sorghum/millet	50F	100F	2 000F
Sweet potatoes and yams[a/]	40F	250F	6 300F
Ground-nuts in shell	120F	190F	1 580F
Cassava[a/]	130F	1 969	15 200F
Tobacco	86F	95F	1 100F
Cotton (lint)	61*	21F	350F
Jute	10F	12F	1 200F

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 61, 68, 77, 112, 117, 230, 233, 275, 283 and 293.

a/ Crop year 1970.

Thailand is the only country in the region with no food problem. The main export commodities are rice and rice products, rubber, kenaf, jute and teak. Maize is expected to become an important export commodity in the near future.

Thailand is the third largest producer of natural rubber in the region, after Indonesia and Malaysia. Grown mainly on small holders' estates, rubber accounts for about 13 per cent of the country's foreign exchange. In 1971 production was 326,300* tons. Several intensive replanting schemes are being implemented with the intention of planting 16,000 ha with new varieties between 1968 and 1978.

Sugar is becoming an important export commodity. In 1970/71 there were 171,000 ha planted with sugar-cane and production amounted to 7,700,000 tons (F).

Approximately half of the country is forested, mostly under teak, which is exported mainly to Europe. The production of teak in 1969 was 245,000 m^3, yang was 507,000 m^3 and other timber 1,672,000 m^3.

The Third Plan for Agricultural Development (1972 to 1977) aims to accelerate diversification of the production base in view of the turnabout in the world markets for rice.

The distribution of land in the country in 1965 was as follows:

	Thousand hectares
Total area	51 400
Arable land	9 746
Land under permanent crops	1 669
Permanent meadows and pastures	...
Forest land	27 354
Other	...

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 6.

The amount of land irrigated in 1969 was 1,830,000 hectares.21/

Natural resources and industry

The country has modest reserves of brown coal and lignite in several different areas. At present lignite is being mined at Mae Mo, near Lampang, and at Krabi. Reserves are 120 million and 100 million tons, respectively. The production of lignite in 1971 was 445,200 tons. The lignite is used as feedstock for the production of ammonia in the fertilizer plant operated by the Chemical Fertilizer Company in Mae Mo.

An extensive exploration programme for crude oil is being carried out by several American and Japanese companies, so far with no major finds. Large deposits of oil-rich shale have, however, been found on the Burma border with an oil content varying between 14 per cent and 26 per cent.

The hydroelectric resources of the country are significant, though the number of suitable sites is limited. Several projects for development are being planned with the aid of the International Bank for Reconstruction and Development. The output of electricity in 1965 was 1,816 million kWh, of which approximately one quarter was generated by hydroelectric stations.

Thailand is a leading tin producer. The largest known tin deposits are in the south and on Phuket Island on the west coast; other areas are still being exploited. Reserves are believed to exceed 1 million tons. In 1966 a tin smelting plant was opened on Phuket Island with a capacity for producing up to 30,000 tons per annum of tin metal from concentrates. The 1971 tin concentrates (Sn content) production was 21,684 tons. The development plan estimates an annual growth rate of 2 per cent for the tin industry.

21/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p.9.

The crude oil reserves in 1972 amounted to 500,000 bbl. The production figure for 1971 was 400 bbl/d.[22/] The country has no natural gas reserves.

Extensive iron-ore deposits have been located in the south and central plain areas. Indicated reserves of 7 million tons were located at Lop Buri and 30 million tons at Loei. The 1969 production of iron ore was 477,393 tons.

In the north-east of Thailand vast deposits of rock salt have recently been discovered. The total production of salt reached 150,000 tons per annum in 1968. Copper is also indicated.

Relatively small quantities of other minerals are also exploited, including aluminium, lead, tungsten, manganese, zinc and antimony ores. Widely disseminated copper deposits have been located in the Loei area.

A programme of extensive exploration for phosphate, potash and sulphur deposits has been carried out during the past few years by the Department of Mineral Resources. So far, no really commercially viable finds have been made. In 1965 three small pockets of phosphate material were found at Prachuap Khiri Khan, with a P_2O_5 content of about 18 per cent. However, the only phosphate found in any sizeable quantities to date has been in the form of bird or bat guano and sedimentary marine deposits. Some of these have been mined for use as natural fertilizer for direct application to the soil.

The manufacturing industry is expanding rapidly. This includes the iron and steel industry, the production of cement and building materials and food processing. A semi-fabricating aluminium industry exists with a capacity of 1,000 tons per annum of aluminium extrusions.

Thick-bedded gypsum and anhydrite were first found in Phichit Province in Central Thailand. Limited exploration of the deposit indicated proved reserves of 11.5 million tons. The total reserves may exceed 25 million tons of gypsum and, perhaps, far more anhydrite. Some gypsum and anhydrite have been reported in the area of the Khorat plateau, Loei Province, and also in the area of the Surat Thani Province, South Thailand. The production of gypsum in the country in 1966 was 39,630 tons.

Some lime phosphate occurs at Khao Khlong Wan, south-west of Bangkok. Deposits are very slight. Surat Thani Province, in southern Thailand, has black shale containing traces of phosphate varying from 0.11-0.44 per cent P_2O_5. These are being investigated.

Fertilizer manufacture

All fertilizer consumption in Thailand is met by imports, with the exception of 25,000 tons per annum of ammonium sulphate and 10,000 tons per annum of urea produced locally.

22/ International Petroleum Encyclopedia, 1972 (Tulsa, Oklahoma, the Petroleum Publishing Co., 1972), p. 237.

In 1967 the Chemical Fertilizer Co. Ltd. (CHEMFERCO) of Thailand commissioned the Mae Mo ammonia plant, near Lampang, which used 270 tons per day of indigenous lignite and 45 tons per day of sulphur as feedstock. As mined, the lignite contained 38 per cent moisture, 12-15 per cent ash, 25 per cent volatile matter, 2.5 per cent sulphur and 25 per cent fixed carbon. The total capacity of the plant is 33,000 tons per annum of ammonia (27,000 tons per annum N), 28,000 tons per annum of urea, 48,000 tons per annum of sulphuric acid and 63,000 tons per annum of ammonium sulphate. Up to 1972 the plant had not been producing at full designed capacity; by June 1968 the inventory of urea and ammonium sulphate reached over 35,000 tons, due partly to unrestricted imports of lower-priced fertilizers. The Government accordingly banned imports of ammonium sulphate and urea and the plant sold the product and reduced stocks.

There are several plans for local fertilizer production. Market demand over the past few years shows a decided preference for ammonium phosphates over straight fertilizers. To date, the fertilizer production projects planned include the following:

A plant for the production of 150,000 tons per annum of triple superphosphate, 170,000 tons per annum of DPA and 250,000 tons per annum of mixed fertilizers. The promoters of the project are the Thai Agricultural and Chemical Industries Ltd. The planned location of the plant is Si Racha, near the refinery of the existing Thai Oil Refining Co. Local naphtha, fuel oil and refinery gases are to be used as feedstock.

A plant for the production of 2,000 tons per annum of ammonium chloride at Samut Prakan, using local by-product hydrochloric acid. This project is being promoted by the Siam Chemicals Co. Ltd.

Present and projected fertilizer consumption

The pattern of fertilizer use in Thailand has changed greatly since 1960, when the share of the N-group fertilizers was 60 per cent of the total amount of fertilizers used. It is now less than 15 per cent. Mixed fertilizers have gained in favour and their share of the total fertilizers used has risen from 32 per cent in 1960 to 85 per cent in 1970.

The principal fertilizer used is ammonium phosphate, which forms 60 per cent of all mixed fertilizers used. It is officially recommended for rice. The Government has drawn up the following formulae: N-P-K : 16-20-0 and 20-20-0; N-P-K-Mg : 11-18-4-3; N-P-K : 15-15-15 and N-P-K : 7-9-16 for rice, rubber, cassava and tobacco, respectively. Fertilizer consumption is dominated by rice.

The average fertilizer consumption in Thailand remains very low at 3.6 kg per capita and 11 kg per hectare of arable land.

The estimates by FAO of the fertilizer requirements in 1975 and 1985[23] to meet crop production objectives are as follows:

	1975 (thousands of tons)	1985 (thousands of tons)
N	289.6	642.8
P_2O_5	187.6	501
K_2O	116.8	227

23/ FAO, Indicative World Plan for Agricultural Development to 1975 and 1985, Provisional Regional World Study No. 4, IWP.68/RS.4 (Rome, 1968), p. 260.

The high cost of fertilizers relative to the prices received by farmers for their crops is a major deterrent to their use in Thailand. The high prices reflect the protection of domestic output of ammonium sulphate and urea.

Thailand is now importing about $25 million worth of fertilizers per annum. In 1968, 265,479 tons of chemical fertilizers were imported, mainly from the Federal Republic of Germany, Japan and the United States.

General references

FAO, Indicative World Plan for Agricultural Development to 1975 and 1985, Provisional Regional Study No. 23 (IWP/68/RS.4) (Rome, 1968).

FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972).

IBRD, Current Economic Position and Prospects of Thailand, vol. III (January 1972).

International Petroleum Encyclopedia, 1971 (Tulsa, Oklahoma, The Petroleum Publishing Co., 1972).

Mineral Raw Material Resources for the Fertilizer Industry in Asia and the Far East, Mineral Resources Development Series No. 28, (United Nations publication, Sales No. 69.II.F.2).

Monthly Bulletin of Statistics, vol. XXVII, No. 1 (January 1973).

Non-ferrous Metals: A Survey of their Production and Potential in the Developing Countries (United Nations publication, Sales No. 72.II.B.18), pp. 171-174.

UNIDO, "Country information sheet on Thailand, 3 August 1971 (UNIDO/IPPD/INF.49).

UNIDO, "The fertilizer industry of Thailand", paper presented to the Second Interregional Fertilizer Symposium, Kiev, USSR, 21 September-1 October and New Dehli, India, 2-13 October 1971 (ID/WG/99/109).

World Sulphur and Sulphuric Acid Atlas (London, British Sulphur Corp., Ltd., 1971).

SOUTH ASIA

AFGHANISTAN

Consumption and production of fertilizers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61[a]	1965/66[b]	1970/71[c]	1975/76[d]	1980/81[d]
N	Consumption	50F	70F	16 000*	30 000	40 000
	Production	-	-	-	30 000	40 000
	Deficit	50F	70F	16 000*	-	-
	Surplus	-	-	-	-	-
P_2O_5	Consumption	-	-	-	-	-
	Production	-	-	-	-	-
	Deficit	-	-	-	-	-
	Surplus	-	-	-	-	-
K_2O	Consumption	-	-	-	6 000	10 000
	Production	-	-	-	-	-
	Deficit	-	-	-	-	-
	Surplus	-	-	-	-	-

Sources: a/ FAO, Annual Fertilizer Review 1970 (Rome, 1971), p. 78. Estimate. Average figure for years 1960-1965.

b/ FAO, Annual Fertilizer Review 1970 (Rome, 1971), p. 78.

c/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 469.

d/ (Consumption): UNIDO projections from 1970/71 figures; (Production): Urea from natural gas plant with annual capacity of 105,000 tons currently being built and due for completion 1973 - operating at 60 and 80 per cent capacity, respectively: location - Mazar-i-Sharif.

General

Afghanistan has been a constitutional monarchy since 1964. The country is land-locked and covers an area of 647,000 km^2. Its immediate neighbours are China, Iran, Pakistan and the USSR. Plateaux and fertile valleys characterize the northern and central region, while the south-west is mainly desert. The Hindu Kush Range, with peaks more than 20,000 ft high, divides the country from south-west to north-east.

The climate is cold in winter and hot and dry in summer with wide variations in temperature. The average rainfall is 10 to 15 inches per annum (5 inches in the south-west). There are prolonged dry seasons, even in the most highly cultivated areas. The rainy season is from October to April.

No national census has ever been taken in Afghanistan. In 1970 the population was estimated to be 17,120,000, with an annual rate of growth of 2.3 per cent and a population density of 26 inhabitants per square kilometre. About 14 per cent of the population is nomadic and live by rearing cattle. The population engaged in agriculture is about 82 per cent.

The economy, predominantly agricultural and pastoral, is in the early stages of development - 60 per cent of the GDP is of agricultural origin, 10-15 per cent comes from cottage industry and 2-3 per cent from organized manufacturing. Over 75 per cent of the population are employed in agriculture.

Afghanistan is heavily dependent upon foreign aid, which comes from the Federal Republic of Germany, the United States and the USSR. Substantial amounts have also been provided by United Nations organizations and recently by China and Japan. In 1970 a total of $20,540,000 was received as project aid, of which Soviet aid amounted to $16,420,000.

In 1969 the GNP amounted to $1,470 million and the per capita income was $75. In recent years the rate of growth has averaged 2.3 per cent.

Agriculture

The distribution of land in the country in 1968 was as follows:

	Thousand hectares
Total area	64 750
Arable land	7 844
Land under permanent crops	136
Permanent meadows and pastures	6 020
Forest land	2 000
Other land	48 750

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 5.

In 1968, 813,000 ha of land were irrigated.[24] However, irrigation systems are inadequate and undependable and one-third of the total cropped acreage and agricultural production is still largely dependent on weather conditions. A major scheme exists in the Helmand Basin for the irrigation of 100,000 ha of arid land. Two other schemes exist near Jalalabad and on the Amu Dar'ya. The fourth Five-Year Plan (1972-1977) will concentrate on smaller irrigation projects more suitable to Afghanistan's needs. In the last three years 50-60 per cent of the total budget for agricultural development was allocated to irrigation.

The staple crop is wheat; other subsistence crops are corn, rice and barley. The main cash products are cotton, fruits and vegetables, nuts, hides and skins. The Government recently conducted a campaign to increase wheat production by introducing new varieties and a more widespread use of chemical fertilizers. The country is almost self-sufficient in basic foodstuffs and expects soon to recover self-sufficiency in wheat.

24/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 9.

Details of the main crops produced in 1971 are given below:

Crop	Area (thousand hectares)	Production (thousand tons)	Yield (kg/ha)
Wheat	2 000F	1 915*	960F
Barley	315F	310F	980F
Rice (paddy)	200F	300*	1 500F
Cotton (lint)	65F	33*	510F
Sugar-cane[a/]	3F	60F	24 000F
Sugar-beet[a/]	5F	80F	16 000F

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 89, 49, 75, 91, 96 and 282.

a/ Crop year 1970/71.

Livestock (mainly karakul and other varieties of sheep) contributes approximately one-fifth of the total agricultural income; however, due to disease and lack of water there are heavy losses. Overcutting and the lack of reforestation badly depletes the forestry resources in the country. In general, development plans have encouraged the cultivation of wheat, barley, maize and olives in the eastern provinces and sericulture in the north; some improvement of commercial crops, such as cotton and sugar-beet, has also been effected, mainly in the north. Agriculture contributed 84 per cent to total exports from Afghanistan in 1970.

Natural resources and industry

Deposits of copper, lead, zinc, beryl, chromite and iron ore are known to exist. The Government is encouraging feasibility studies with foreign assistance. There are no known bauxite or other ores of high aluminium content in the country. There are twelve known deposits of copper in nine provinces. Occurrences of sulphur ores (including gypsum) are reported in the central, eastern and northern parts of the country. A preliminary survey of deposits in northern Afghanistan indicated estimated reserves of 200,000 tons of sulphur near Mazar-i-Sharif. In 1954 about 250 tons of sulphur were produced. An estimated 2 billion tons of iron ore, containing over 60 per cent of iron, are located mainly at Hajigak.

Guano is found in a large bat cave north of Girishk in southern Afghanistan. Many occurrences have also been reported from other limestone caves in the Nauzad area.

Salt is worked in small quantities at many places in the country but no information as to the nature of the deposits is available.

A gas field (estimated reserves, 1964: 56,000 million cubic metres) was found in the Kawaja Gogerdak and Yatim Tagh area in northern Afghanistan. Coal deposits are estimated to be 85 million tons; coal is exploited commercially. Production in 1970 was 136,000 tons.

The production of natural gas began in 1967 in northern Afghanistan, near Shibarghan, with assistance from the USSR. Deposits have been estimated at 139 billion cubic metres. In 1970 the entire production of 2.5 billion cubic metres was exported to the USSR by means of a pipeline which was completed in 1967.

The production of selected minerals from 1966-1970 is shown below:

Commodity	1966/67	1967/68	1969/70
		(thousand tons)	
Coal	161.6	151.9	124.86
Salt	38.7	36.0	36.9
Lapis lazuli	10.3	5.5	...
		(million cubic metres)	
Natural gas	-	253.0	1 681.0

Source: Survey of Progress, 1968-1969, Ministry of Planning, Department of Statistics and Research (Kabul, Afghanistan, Government Printing Press, 1969).

The installed electric generating capacity in 1969 was 3.1 MW, most of which is hydroelectric. Natural gas is the largest potential source for thermal power and when the power station near Mazar-i-Sharif is completed 36,000 kW will be added to the country's thermal-power capacity. Additional hydroelectric power is planned for the Kajakai Dam, for Kandahar, and the Helmand Valley area.

Factory-scale industry contributed only 2-3 per cent to the GDP. Major industries include cotton and wool textiles, which constitute the largest industry, cement plants, cotton ginning, fruit processing and sugar milling. There are also many small consumer-goods industries. One plant producing factory-made houses exists. Plastics processing and pharmaceutical industries are planned.

The production of some industrial commodities in 1966-1969 is shown below:

Commodity	1966/67	1967/68	1968/69
		(thousand tons)	
Ginned cotton	24.0	18.5	13.9
Cement	174.0	123.6	90.6
Vegetable oil	3.4	3.1	3.0
Sugar	7.1	7.5	5.3
		(million metres)	
Cotton textiles	66.0	62.3	48.7
		(thousand bundles)	
Cotton yarn	245.2	198.3	80.3
		(thousand metres)	
Woollen textiles	463.0	443.0	445.8

Source: Survey of Progress, 1968-1969, Ministry of Planning, Department of Statistics and Research (Kabul, Afghanistan, Government Printing Press, 1969).

Fertilizer manufacture

The country is mainly agricultural; it began to use fertilizers in 1968, but because of its geographical position importation and transportation costs are high. About 16,000 tons of fertilizers were imported in 1970/71 under the government's policy of fertilizer promotion. Urea and superphosphate are imported mainly from the USSR and, to a lesser extent, from United States Commodity Aid; the latter also supplies diammonium phosphate.

As mentioned above, considerable deposits of natural gas exist. It is planned to manufacture nitrogenous fertilizers, using some of these deposits as raw materials.

A nitrogenous fertilizer plant, sited near Mazar-i-Sharif, Balkh Province, and a thermal electric power station had their start-up trials early in 1973, with the object of full production by mid 1976. Both projects are being financed by the USSR Technical Aid Programme and the World Food Programme (WFP). The fertilizer plant will have a capacity of 71,000 tons of ammonia per annum, from which 105,000 tons of urea will be produced each year. Initially, the power station will have two turbines, each with a capacity of 12,000 kW. A third turbine may be installed later, giving a total capacity of 36,000 kW.

Gas from Shibarghan will be brought to these projects and others in the same area by means of a pipeline, the capacity of which is estimated to be 560 millions of cubic metres per annum. The gas will be used as raw material for fertilizer production and to operate the steam turbines of the electro power plant.

General references

FAO, Annual Fertilizer Review, 1970 (Rome, 1971).

FAO, Fertilizers: An Annual Review of World Production, Consumption and Trade, 1966 (Rome, 1967).

FAO, The State of Food and Agriculture (Rome, 1966).

Fertilizer Technology, Production and Use (United Nations publication, Sales No. 68.II.B.1).

IBRD, Current Economic Position and Prospects of Afghanistan, May 1966.

Chemical Industry and Developing Countries: Vol. I, Summary Generalities - Sectoral Study (Frankfurt/Main, Verband der Chemischen Industrie e.V., 1967).

Industrial Developments in Asia and the Far East, vol. II (United Nations publication, Sales No. 66.II.B.20), pp. 1-19.

International Petroleum Encyclopedia (Tulsa, Oklahoma, Petroleum Publishing Co., Ltd., 1972).

International Petroleum Institute, International Petroleum Industry, vol. II (New York, Barrows, 1967).

Lloyd's Bank Ltd., An Economic Report on Afghanistan (London, 1967).

Mineral Raw Material Resources for the Fertilizer Industry in Asia and the Far East, Mineral Resources Development Series No. 28 (United Nations publication, Sales No. 68.II.F.3), p. 21.

Nitrogen, No. 75 (London, 1972).

Non-ferrous Metals: A Survey of Their Production and Potential in the Developing Countries (United Nations publication, Sales No. 72.II.B.18), pp. 143-145.

Proceedings of the Seminar on the Development and Utilization of Natural Gas Resources Mineral Resources Development Series No. 25 (United Nations publication, Sales No. 66.II.F.6).

The Far East and Australasia (London, Europa Publications Ltd., 1969).

UNDP, Resident Representative in Afghanistan, Annual Report on Development Assistance other than that provided by UNDP, 31 December 1969.

UNDP, Resident Representative in Afghanistan, Annual Report for 1970 for the Inter-Agency Consultative Board, 17 April 1971.

UNIDO, "Review of world production, consumption and international trade in fertilizers with projections to 1975 and 1980", paper presented to Second Interregional Fertilizer Symposium, Kiev, USSR, 21 September-1 October 1971 and New Dehli, India 2-13 October 1971 (ID/WG.99/4).

United States Department of State, Background Notes on Afghanistan (Washington, D.C., June 1968).

United States Department of Commerce, Basic Data on the Economy of Afghanistan, Overseas Business Reports, OBR 71-002 (Washington, D.C., United States Printing Office, January 1971). (Also September 1971).

USAID, Private Industrial Investment in Afghanistan, Review and Guidelines (Washington, D.C., 1971).

Weltwirkschaft am Jahreswechsel - Afghanistan, Bundesstelle für Aussenhandelsinformation (Köln, February, 1971).

BANGLADESH

Consumption and production of fertilizers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61	1965/66	1970/71	1975/76	1977/78
N	Consumption	19 000	42 900	...	194 000	283 000
	Production	...	...	...	133 000	161 000
	Deficit	...	...	...	61 000	122 000
	Surplus	-	-	...	-	-
P_2O_5	Consumption	3 000	9 300	...	207 000	332 000
	Production	...	...	...	80 000	100 000
	Deficit	...	...	...	127 000	232 000
	Surplus	-	-	...	-	-
K_2O	Consumption	500	54 200	...	74 000	187 000
	Production	-	-	-	-	-
	Deficit	500	54 000	...	74 000	187 000
	Surplus	-	-	-	-	-

Source: The above figures were approved by the Government of the People's Republic of Bangladesh (1973).

General

Bangladesh is an agricultural country in South-East Asia; it comprises a total area of 143,000 km^2, of which 91,000 km^2 are arable land. In 1972 the population was estimated at 76 million and the average rate of growth at 3 per cent per annum. The climate is tropical with heavy monsoon (June to September) rainfall.

Efforts are being made to restore the economy of the country, which was severely disrupted by war; in 1970 the GNP was $4,300 million and the per capita income was $60.

The main industries of Bangladesh comprise items such as jute products, newsprint and writing paper, some cotton textiles, urea fertilizers, some steel, cement, a few petroleum products and cigarettes. Small-scale and cottage industries provide a major source of employment.

Agriculture

In 1970 agriculture formed some 56 per cent of the GDP. The mainstay of the economy is the cash crop, jute, production of which averages about 6 million bales per annum. However, there is at present strong competition from synthetic fibres on the international market.

The main crops are rice (average production 11.5 million tons per annum), jute and tea. There are approximately 150 tea estates which produce black tea, as well as small quantities of green tea. In 1970 some 31,200 tons were produced.

Crop distribution, as a percentage of the total cultivated area, is as follows: rice - 86 per cent; jute - 8 per cent; the remainder - 6 per cent.

The country is suffering from an acute food shortage. The production of rice could barely keep pace with the population growth during the years 1965-1970, rising at a rate of only 3.2 per cent per annum.

The first Five-Year Development Plan (1973-1978) places major emphasis on the increased use of rice and wheat of the high-yielding varieties, for example, IRRI-8 and MEXI-PAK 65. The results are already promising.

The production figures for the main crops (1970/71) were as follows: wheat - 110,000 tons; rice (total) - 15,500,000 tons; and total food grains - 15,700,000 tons.

Natural resources and industry

There is one oil refinery, located at Chittagong (Eastern Refinery Ltd.), with a capacity of 30,000 bbl/d, and there are coal reserves in the north of approximately 750 million tons. The coal is of good quality but is buried deep underground, which makes exploitation difficult and expensive. Over 10 million cubic feet of natural gas have been discovered so far; the gas is methane-rich (95-97 per cent).

The country is generally too flat for any large-scale development of hydroelectric power but there is one project at Karnaphully which can produce 120-150 MW. The total installed production capacity for electricity is 400-500 MW.

Production of fertilizers

Fertilizer production was adversely affected by the war and the ensuing unsettled conditions in the country. The rated capacity and products for 1971 were as follows:

Plant	Built	Rated capacity (thousand tons)	Product	Comments
Fenchuganj	1962	106	Urea (46%N)	
		12	AS (20%N)	
Ghorasal	1972	340	Urea (46%N)	
Chittagong	1973	32	TSP (46%P)	Old unit
		120	TSP (46%P)	New unit

Factories that are being considered for implementation, their capacities and products, are as follows:

Plant	Capacity (thousand tons product per annum)	Product	Comments
Bengal Heavy Chemicals, Khulna	120	TSP (46%P)	Plans are kept in abeyance
Bangladesh Fertilizer Chemical Pharmaceutical Corporation (BFCPC)	450	Urea (46%N)	
BFCPC (together with India)	900	Urea (46%N)	

Erection of the project at Chittagong was disturbed by the war and the NH_3 urea and complex fertilizer projects did not materialize in the original form. However, the urea project, to produce 340,000 tons per annum, is going ahead and will probably be started up in 1975-1976 by the Bangladesh Industrial Development Corporation.

The ammonia/urea plant at Ghorasal was severely damaged during the war but production reached 80 per cent of its designed capacity in 1973.

Below are shown the estimated requirements, local production and import of fertilizers (urea, TSP, MP) per annum during the Five-Year Development Plan period (1973-1978):

Year	Requirements (thousand tons)				Local production (thousand tons)				Import (thousand tons)			
	Urea	TSP	MP	Total	Urea	TSP	MP	Total	Urea	TSP	MP	Total
1973/74	301	158	61	520	220	40	-	260	81	118	61	260
1974/75	342	173	74	589	242	60	-	302	100	113	74	287
1975/76	423	207	104	734	290	80	-	370	133	127	104	364
1976/77	518	254	134	906	350	100	-	450	168	154	134	456
1977/78	616	332	187	1 135	350	100	-	450	266	232	187	685
Total	2 200	1 124	560	3 884	1 452	380	-	1 832	748	744	560	2 052

Source: Draft Five-Year Development Plan of Bangladesh (1973-1978).

The local production of urea and TSP as a percentage of the annual rated capacity of the factories is as follows:

Year	Urea (percentage)	TSP (percentage)
1973/74	49	26
1974/75	54	39
1975/76	65	52
1976/77	78	66
1977/78	78	66

Source: Draft Five-Year Development Plan of Bangladesh (1973-1978).

Fertilizer consumption

The most widely used fertilizers in Bangladesh are straights and consist of urea, triple superphosphate and muriate of potash.

It is envisaged that fertilizer consumption will grow from the current level to over 1,135 million tons by 1977/78 if the programme of irrigation facilities and improved seed varieties are implemented according to schedule. The present use of phosphate and potash is very low. With more effective extension work the off-take of phosphate and potash is likely to rise. The projected requirement of 1,135 million tons of fertilizers during the last year of the Five-Year Plan represents an increase of some 280 per cent over the present level.

To cope with the extra demand it will be necessary to expand domestic production of the two urea fertilizer plants from the present level of 446,000 tons - 106,000 tons in Fenchuganj and 340,000 tons in Ghorasal. Assuming capacity utilization of about 49 per cent (223,000 tons) there will be an estimated shortfall of 81,000 tons urea in the first year of the Five-Year-Plan period. At about 78 per cent of capacity production the shortfall of urea will be about 266,000 tons during the last year. The demand for urea in 1977/78 is estimated to be 616,000 tons, of which only 350,000 tons will be met from local production. The two existing plants will have to maintain the maximum production schedule, which will be possible only when the supply of ingredients for urea manufacture and the maximum efficient utilization of manpower are assured.

There is a limited demand for ammonium sulphate from the tea gardens, which can be met from domestic production.

The installed capacity of TSP production is 152,000 tons from the two plants in Chittagong. Production will reach up to 26 per cent of the installed capacity (40,000 tons) in 1973/74 and may rise to a maximum of 66 per cent (100,000 tons) in 1977/78. The requirement for phosphatic fertilizer is likely to increase with the more intensive extension efforts aimed at making cultivators interested in a balanced use of NPK. Shortfalls in phosphatic fertilizer will have to be made good by imports on a priority basis until the total requirement is produced locally. The advisability of using DAP instead of TSP is now being studied.

Potassic fertilizer will continue to be imported as there is no prospect of manufacturing potash in the country.

The highly concentrated fertilizer, used at present, contains NPK only. It is certain that, with increasing use of NPK, a greater area will become deficient in elements such as magnesium, calcium and sulphur, as well as zinc and, possibly, borax. Due attention will be given to this problem. As Bangladesh soils appear to lack organic matter, which is essential for crop growth, its use will be encouraged to enrich the fertility of the soil.

General references

"Agricultural recovery in Bangladesh", Nitrogen, No. 83 (London, May/June 1973) pp. 34 and 35.

Planning Commission of the People's Republic of Bangladesh, Bangladesh Annual Development Programme 1973-1974.

UNIDO, Country information sheet on Bangladesh 31 July 1973 (UNIDO/IPPD/INF.54).

UNIDO, Pre-Investment Studies for the Promotion of Fertilizer and Petrochemical Industries (PAK-26) July 1971. Also Final Report on Fertilizer Use and Requirements.

World Fertilizer Atlas, 3rd ed. (London, British Sulphur Corp. Ltd., 1969).

INDIA

Consumption and production of fertilizers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61	1965/66	1970/71	1975/76	1980/81
N	Consumption	210 000	575 000	1 480 000	3 400 000	6 400 000
	Production	98 000	233 000	830 000	2 330 000	3 980 000
	Deficit	112 000	342 000	650 000	1 070 000	2 420 000
	Surplus	-	-	-	-	-
P_2O_5	Consumption	70 000	132 000	491 000	1 200 000	2 866 000
	Production	52 000	111 000	229 000	770 000	1 036 000
	Deficit	18 000	21 000	262 000	430 000	1 830 000
	Surplus	-	-	-	-	-
K_2O	Consumption	26 000	77 000	236 000	630 000	950 000[a/]
	Production	-	-	-	-	-
	Deficit	26 000	77 000	236 000	630 000	950 000[a/]
	Surplus	-	-	-	-	-

Source: Ministry of Petroleum and Chemicals, Government of India (1973).

a/ "Review of world production, consumption and international trade in fertilizers with projections to 1975 and 1980", Second Interregional Fertilizer Symposium, Kiev USSR, and New Delhi, India, 21 September-13 October 1971 (ID/WG.99/4/Rev. 1), pp. 51, 53 and 55.

General

India covers an area of 3,170,000 km^2. In 1971 the population numbered 559.6 million and it is estimated that by 1981 it will have reached 695 million.

In 1969 the total GNP amounted to $47.7 billion, at current prices, and the per capita GNP was $88.

Agriculture contributes 48 per cent to the GDP and employs about 70 per cent of the working population. Manufacturing, mining and small enterprises contribute 15 per cent. Agricultural commodities account for more than 40 per cent of the total exports.

The Fourth Five-Year Development Plan, from 1969/70 to 1973/74 is now in force.

Agriculture

Beoause of the wide variety of terrain and climatic conditions in India the country's agrioulture is widely diversified.

The distribution of land in the oountry (1968) was as follows:

	Thousand hectares
Total area	326 809
Arable land	160 540
Land under permanent orops	4 070
Permanent meadows and pastures	13 880
Forest land	62 320
Other land	85 999

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 5.

In 1968 the net irrigated area was 27,520,000 ha.[25]

Eighty per cent of the arable land is used for food grains, the mainstay of the Indian diet; 20 per cent is used for cash crops, such as sugar-cane, jute, cotton, oil-seeds, cashew nuts, tea, coffee, tobacco, pepper and rubber. In some cases double and triple cropping systems are used. Multiple cropping in 1968/69 covered 10,129,000 acres.

The Fourth Five-Year Development Plan concentrates on intensive cropping and increasing irrigation facilities; the first objective is to provide the conditions necessary for a sustained increase of about 5 per cent per annum over the next decade in the agricultural sector. An important consideration is the objective of eliminating imports of food grains on concessional terms.

The programme of high-yielding varieties of grain is of crucial importance. It is expected that, by the extension of this programme, the production of food grains will rise by nearly two-thirds, from the base level of 8.5 million ha to 24.1 million ha. A varietal breakthrough is already in evidence in wheat and hybrids and research into paddy rice varieties is being pursued. In addition to the short-duration, improved varieties of paddy, maize, jowar, bajra and wheat, other groups, such as barley, ragi, oil-seeds, potatoes and vegetables, are included in the programme. The multiple cropping programme is to be extended to cover an additional 9 million ha.

Some 177 soil-testing laboratories were in existence in 1969/70 in India.

Details of the main crops produced in 1971 are given below:

Crop	Area (thousand hectares)	Production (thousand tons)	Yield (kg/ha)
Coffee	...	108.6	...
Cotton lint[a]	(7 610)[a]	(820)[a]	(110)[a]
Ground-nuts (in shell)	6 900F	5 800*	840F
Jute	950F	1 206*	1 270F
Linseed	1 833	455	250
Natural rubber	...	100*	...
Paddy rice	38 800F	66 500F	1 710F
Sesame seed	250F	4 600*	180F
Sugar-cane[a]	2 657	128 769	48 500
Tea	355F	425*	...
Tobacco	441	349.9	790
Wheat	17 892	23 247	1 300
Maize	5 840F	7 000F	1 200F

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 39, 60, 76, 91, 233, 243, 251, 265, 271, 277, 282, 292, 299.

a/ Figures for 1970.

b/ ( ) = Data not included in continental, regional and world totals, either because they are components of a country total, or because they refer to a different series whioh is not to be included in the totals. (FAO symbol).

In 1970 about 206,000 tons of rice and 3,425,000 tons of wheat were imported; these were the total cereal imports and amounted to 3,631,000 tons.

India is the largest tea producer and exporter in the world. Rubber production has recently soared and a production of 72,000 tons per annum was forecast for 1973. This figure, however, has already been surpassed.

25/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 9.

Natural resources and industry

India is a rich reservoir of arable land, mineral, forest and power resources. Iron-ore and coal reserves provide a substantial base for heavy industry. There is a shortage of sulphur and potash and requirements have to be imported. Raw materials for fertilizers include iron pyrites, copper pyrites, gypsum, phosphates, natural gas, coal, lignite and zinc pyrites.

Reserves of the following commodities are:

	Million tons
Phosphate rock	60-100
Copper	1
Lead/zinc	137
Bauxite	190
Coal	50 000
Lignite	210
Crude oil	222
	Million cubic metres
Natural gas	42 500

Production of the main mineral ores in 1970 included:

	Thousand tons
Iron ore	30 780 (metal content 61 per cent)
Manganese ore	634[a]
Copper ore	11.16 (Cu content)
Chromite	101.4[a]
Lead ore	3 (Pb content)
Zinc ore	9 (Zn content)
Bauxite	1 359.6
Phosphate rock	67[b]

a/ 1968 figures only.
b/ 1969 figure only.

In 1970 crude-oil production reached 6.8 million tons and is expected to rise to 9.7 million tons by 1973-1974. However, production does not cover the country's needs and much of the oil must be imported. In 1968 natural gas production was 392 million cubic metres, the average grade being 70-79 per cent CH_4, and 1-2 per cent CO_2, with some traces of N_2.

The main petroleum refineries in India are listed below:

Company	Location	Crude oil throughput[a] (thousand tons)	Source of crude oil
Assam Oil Co.	Gauhati	521	Assam oilfields
Burmah Shell Refinery Ltd.	Trombay	3 775	imported
Esso Standard	Trombay	2 551	imported
Caltex Oil Refinery Ltd.	Vishakapatnam	1 543	imported
Indian Oil Refinery Ltd.	Gauhati	814	indigenous
	Barauni	1 620	indigenous
	Gujarat	2 732	indigenous
	Cochin	2 542	imported

a/ 1968.

The basic petrochemicals industry in India is in the stage of development. Two naphtha crackers are in operation; these produce ethylene, propylene and other byproducts, such as PVC resins, solvents, etc. A third naphtha cracker at Koyali is planned to be on stream by 1973/74.

Fertilizer manufacture

There is no potash production in India and requirements are met by importing potassium chloride or, to a lesser extent, potassium sulphate.

The production of nitrogen fertilizer intermediates is based on a whole range of feed-stocks, from solid hydrocarbons to refinery and natural gas, by-product ammonia and, in one case, electrolysis of water.

The imports of fertilizer material for 1969/70 to 1971/72 are shown below:

Material	(Thousand tons) 1969/70	1970/71	1971/72
Ammonium sulphate	790	83	186
Ammonium sulphate nitrate	-	25	30
Urea	929	780	550
Calcium ammonium nitrate	83	280	317
Nitrophosphate	7	17	-
Diammonium phosphate	125	12	353
Muriate of potash	152	157	362
Sulphate of potash	4	17	-
NPK			
14:14:14	11	-	5
14:28:14	55	-	10
15:15:15	117	77	64
10:26:26	-	11	75
12:32:16	-	10	73
14:36:12	-	5	64
13:13:13	-	25	-

Source: Government of India (1973).

Below are listed the manufacturers and installed capacity, with likely dates of start-up in cases where the plant is under construction or in the planning stage, for nitrogenous, phosphatic and exomplex fertilizers:

Manufacturers and installed capacity of nitrogenous fertilizers[a]

Factory	Installed capacity (thousand tons) Material	Nutrient (N)
In production		
(a) Ammonium sulphate		
Fertilizer Corporation of India Ltd., Unit, Namrup, Assam	100	21
Fertilizer Corporation of India Ltd., Unit, Sindri, Bihar	320	69
Tata Iron and Steel Co. Ltd., Jamshedpur, Bihar	20	4
Gujarat State Fertilizers Co., Baroda, Gujarat	148	31
Fertilizers and Chemicals, Travancore Ltd., Alwaye, Kerala	198	41
Hindustan Steel Ltd., Bhilai, M.P.	20	4

Manufacturers and installed capacity of nitrogenous fertilizers[a/] (continued)

Factory	Installed capacity (thousand tons) Material	Nutrient (N)
In production		
(a) Ammonium sulphate (continued)		
Hindustan Steel Ltd., Rourkela, Orissa	25	5
E.I.D. Parry Ltd., Madras, Tamil Nadu	39	8
Hindustan Steel Ltd., Durgapur, W. Bengal	15	3
Indian Iron and Steel Co. Ltd., Burnpur-Multi, W. Bengal	20	4
Total	905	190
(b) Ammonium sulphate nitrate		
Fertilizer Corporation Ltd., Sindri, Bihar	50	13
(c) Calcium ammonium nitrate		
Hindustan Steel Ltd., Rourkela, Orissa	480	120
Fertilizer Corporation of India Ltd., Nangal, Punjab	320	80
Total	800	200
(d) Urea		
Coromandel Fertilizers Ltd., Visakhapatnam, A.P.	16	7
Fertilizer Corporation of India Ltd., Sindri, Bihar	18	8
Fertilizer Corporation of India Ltd., Namrup, Assam	55	24
Gujarat State Fertilizers Co. Ltd., Baroda, Gujarat	364	167
Fertilizer Corporation of India Ltd., Trombay, Maharashtra	99	45
Shriram Chemical Industries Kota, Rajasthan	240	110
Madras Fertilizers Ltd., Manali, Tamil Nadu	210	96
Neyveli Lignite Corp. Ltd., Leyveli, Tamil Nadu	154	70
Fertilizer Corporation of India Ltd., Gorakhpur, U.P.	174	80
Indian Explosives Ltd., Kanpur, U.P.	450	200
Total	1 780	807
(e) Ammonium chloride		
Fertilizers and Chemicals, Travancore Ltd., Alwaye, Kerala	25	6
New Central Jute Mills Ltd., Varanasi, U.P.	40	10
Total	65	16

Manufacturers and installed capacity of nitrogenous fertilizers[a/] (continued)

Factory	Installed capacity (thousand tons) Material	Installed capacity (thousand tons) Nutrient (N)	Possible date of production
Under implementation			
- Firmed projects			
(a) Ammonium sulphate			
Fertilizer Corporation of India Ltd., Sindri, Bihar - modernization scheme	40	7	1976/77
(b) Urea			
Fertilizer Corporation of India Ltd., Ramagundam, A.P.	495	229	1975/76
Fertilizer Corporation of India Ltd., Namrup, Assam	330	152	1973/74
Fertilizer Corporation of India Ltd., Barauni, Bihar	330	152	1973/74
Fertilizer Corporation of India Ltd., Sindri, Bihar - modernization scheme	330	152	1976/77
Zuari Agro Chemicals Co. Ltd., Sancoale, Goa	360	129	1972/73
Indian Farmers' Fertilizer Corporative Ltd., Kandla, Gujarat	396	177	1974/75
Cochin Fertilizer Project, Cochin, Kerala - Phase I	330	152	1972/73
Fertilizer Corporation of India Ltd., Korba, M.P.	495	229	1976/77
Mangalore Fertilizers and Chemicals Ltd., Mangalore, Mysore	340	160	1974/75
Fertilizer Corporation of India Ltd., Talcher, Orissa	495	229	1975/76
Southern Petrochemical Industrial Corporation Ltd., Tuticorin, Tamil Nadu	512	236	1974/75
Fertilizer Corporation of India Ltd., Durgapur, W. Bengal	330	152	1972/73
Fertilizer Corporation of India Ltd., Haldia, W. Bengal	165	77	1975/76
Fertilizer Corporation of India Ltd., Corakhpur, U.P.	111	51	1974/75
Shriram Chemicals, Kora, Rajasthan	90	42	1973/74
- Approved/under consideration			
(a) Urea			
Tata Fertilizer Project, Mithapur, Gujarat - Phase I	250	115	1978/79
Punjab State Industrial Development Corporation, Bhatinda/Sirhind, Punjab	330	152	1978/79
(b) Ammonium Chloride			
Tata Fertilizer Project, Mithapur, Gujarat	180	45	1978/79
New Central Jute Mills Co. Ltd., Varanasi, U.P.	108	27	1978/79

Manufacturers and installed capacity of phosphatic fertilizers[a/]

Factory	Installed capacity (thousand tons) Material	Nutrient (P)
In production		
(a) Single superphosphate		
Andhra Fertilizers Ltd., Tadepalle, A.P.	50	8.0
Andhra Sugars Ltd., Tanuku	45	7.2
Hyderabad Chemicals and Fertilizers Ltd., Maula Ali, A.P.	42	6.7
Krishna Industrial Corporation, Nidadavole, A.P.	50	8.0
Fertilizers and Chemicals Ltd., Travancore, Alwaye, Kerala	45	7.2
Chamundi Chemicals and Fertilizers, Munirabad, Mysore	40	6.4
Mysore Chemicals and Fertilizers Ltd., Belagula, Mysore	33	5.3
Blue Mountain Estates and Industries Ltd., Ennore, Tamil Nadu	41	7.0
Coimbatore Pioneer Fertilizers, Coimbatore, Tamil Nadu	40	6.4
E.I.D. Parry Ltd., Ranipet, Tamil Nadu	50	8.0
Premier Fertilizers, Cuddalore, Tamil Nadu	40	6.4
Shaw Wallace and Co., Avadi, Tamil Nadu	75	12.0
Adarsh Chemicals and Fertilizers Ltd., Udhna, Gujarat	54	8.6
Alembic Chemicals Works, Baroda, Gujarat	23	3.7
Anil Starch Products, Bhavnagar, Gujarat	33	5.3
Dharamsi Morarji Chemicals, Kumhari, M.P.	75	12.0
Bharat Fertilizer Industries, Bombay, Maharashtra	22	3.5
Dharamsi Morarji Chemical Co., Ambernath, Maharashtra	80	12.8
J.K. Chemical Co., Bombay, Maharashtra	6	1.0
Western Chemical Industries, Bombay, Maharashtra	3	0.5
West India Chemicals, Loni, Kalbhore	33	5.3
Hindustan Zinc Ltd., Rajasthan	76	11.2

a/ As of 31 December 1972.

Manufacturers and installed capacity of phosphatic fertilizers[a] (continued)

Factory	Installed capacity (thousand tons) Material	Nutrient (P)
In production		
(a) Single superphosphate (continued)		
Ralli Chemicals Ltd., U.P.	60	9.6
D.C.M. Chemicals, Delhi	132	21.1
Associated Industries, Assam	33	5.3
Bihar State Superphosphate Factory, Sindri, Bihar	23	3.7
Jay Shree Chemicals and Fertilizers, Khardah, W. Bengal	33	5.3
Phosphate Co. Ltd., Rishara, W. Bengal	60	9.6
Total	1 297	207.1
(b) Triple superphosphate		
Dharamsi Morarji Chemicals Co., Amburnath, Maharashtra	27	11.2
Under implementation - firmed project		
(a) Triple superphosphate		
Fertilizer Corporation of India Ltd., Sindri, Bihar	346	156
Khetri Project, Khetri, Jhunjhunu, Rajasthan	194	92
(b) Single superphosphate		
Maharashtra Agro Industries Corporation Ltd., Bombay, Maharashtra	50	8

Manufacturers and installed capacity of complex fertilizers[a]

Factory	Installed capacity (thousand tons) Material	Nutrient (N)	Nutrient (P_2O_5)
In production			
(a) Ammonium phosphate sulphate			
E.I.D. Parry Ltd., Ennore, Tamil Nadu	51	8	10
Fertilizers and Chemicals Ltd., Travancore, Alwaye, Kerala	171	34	36
Total	222	42	46
(b) Diammonium phosphate			
Gujarat State Fertilizers Co. Ltd., Baroda, Gujarat	108	18	50

a/ As of 31 December 1972.

Manufacturers and installed capacity of phosphatic fertilizers[a/] (continued)

Factory	Installed capacity (thousand tons) Material	Nutrient (N)	Nutrient (P_2O_5)
In production			
(c) Nitrophosphate			
Fertilizer Corporation of India, Ltd., Trombay, Maharashtra	180	36	36
(d) Urea ammonium phosphate			
Coromandel Fertilizers Ltd., Visakhapatnam, A.P.	260	73	73
(e) NPK Complex fertilizer			
Madras Fertilizers Ltd., Manali, Tamil Nadu	360	67	85

Factory	Installed capacity (thousand tons) Material	Nutrient (N)	Nutrient (P_2O_5)	Possible date of production
Under implementation - Firmed project				
(a) Urea ammonium phosphate				
Zuari Agro Chemicals, Goa	150	42	42	1972/73
(b) Complex fertilizers NPK				
Cochin Fertilizer Project - Phase II, Kerala	485	42	114	1975/76
(c) Nitrophosphate				
Fertilizer Corporation of India Ltd., Haldia, W. Bengal	379	75	75	1974/75
Approved/under consideration				
(a) Nitrophosphate				
Fertiliser Corporation of India Ltd., Trombay, Maharashtra	660	132	132	1974/75
(b) NPK fertilizers				
Indian Farmers' Fertilisers Corporation, Kamila, Gujarat	375	48	125	1974
Tuticorine	160	22	52	
(c) Urea ammonium phosphate				
Coromandel Fertilisers, Visag, A.P.	96	4	31	1975/76

Additional nitrogen plants in India under construction[a/]

	Capacity (thousand tons N)
Public sector	
FACT - Ambalamedu	152
Co-operative sector	
IFFCO - Kalol	230

a/ As of 1 January 1973.

Capacity and production of nitrogen plants in India, 1971/72

Plants in operation throughout 1971/72
(thousand tons N)

Public sector	Capacity	Production	Production as percentage of capacity
FCI/Sindri	117	51	44
FCI/Nangal	80	57	71
FCI/Trombay	81	69	85
FCI/Gorakhpur	80	65[a/]	81
FCI/Namrup	45	30	67
FACT/Alwaye	92	36	39
NLC/Neyveli	70	43[a/]	61
HSL/Rourkela	126	45	36
Total public sector	691	396	57
Private sector			
CFL/Visakhapatnam	80	65	81
GSFC/Baroda	218	184	85
Shriram/Kota	111	107	97
IEL/Kanpur	200	138[a/]	69
Parry's/Ennore	16	10	63
Sahu Jain/Varanasi	10	6	60
Total private sector	635	510	80
Total of plants operating in public and private sectors	1 326	906	68
Additional plant which started operation during 1971/72:			
MFL/Madras	168	20[a/]	n.s.
Coke ovens/steel plants	25	20	n.s.
Total India	1 519	946	n.s.

Source: Production and Consumption of Fertilisers, Annual Review, 1971-1972. Fertiliser Association of India, Sept. 1972.

a/ Estimated on basis of production data by states.

Fertilizer consumption

Despite advances in market supply and demand in fertilizers over the past few years, fertilizer consumption in India remains relatively low. Consumption targets, according to the Fourth and Fifth Five-Year Plans, are as follows:

Year	Thousand tons per annum		
	N	P_2O_5	K_2O
1973/74	3 200	1 400	900
1980/81	7 100	4 800	3 500
1985/86	9 600	6 200	4 200

Information recently received from the Ministry of Petroleum and Chemicals, Government of India (E and S Division) stated that the consumption of fertilizers for the year 1979/80 had been estimated as follows:

Nitrogen: 5,200,000 tons
Phosphate: 2,200,000 tons
Potash: ...

Fertilizer consumption in 1969/70 amounted to 10 kg per hectare of PNK fertilizers and 3.1 kg NPK per capita.

Apart from a significant expansion in the quantity of chemical fertilizers consumed, attention will have to be given to certain qualitative aspects of fertilizer use. To ensure that the available chemioal fertilizers are put to the most efficient and economic use, soil-testing facilities are being expanded in the Fourth Plan.

General references

FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972).

Fertiliser Statistics 1970-1971 (New Delhi, Fertiliser Association of India, Deoember 1971).

Government of India, Economios and Statistios Division, Ministry of Petroleum and Chemicals and Mines and Metals, Indian Petroleum and Chemicals Statistics, 1968.

IBRD, Indian Economic Policy and the Fourth Five-Year Plan, vols. II and III (1967).

UNESCO, Agricultural Education and Research, 1967 (WS/02,67.215-APS).

IRAN

Consumption and production of fertilizers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61[a]	1965/66[b]	1970/71[c]	1975/76[d]	1980/81[d]
N	Consumption	7 517	17 000*	58 000*	110 000	200 000
	Production	-	15 800*	28 200*	200 000	500 000
	Deficit	7 517	1 200*	29 800*	-	-
	Surplus	-	-	-	90 000	300 000
P_2O_5	Consumption	4 441	15 000*	30 000*	30 000	50 000
	Production	-	-	-	30 000	60 000
	Deficit	4 441	15 000*	30 000*	-	-
	Surplus	-	-	-	-	10 000
K_2O	Consumption	1 253	2 000*	2 500*	30 000	50 000
	Production	-	-	-	-	-
	Deficit	1 253	2 000*	2 500*	30 000	50 000
	Surplus	-	-	-	-	-

Sources: a/ FAO, Fertilizers, An Annual Review of World Production, Consumption and Trade, 1964 (Rome, 1965), pp. 102, 126 and 151.

b/ FAO, Annual Fertilizer Review, 1970 (Rome, 1971), pp. 69, 78, 109 and 133.

c/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 466, 469, 476 and 481.

d/ "Review of world production, consumption and international trade in fertilizers with projections to 1975 and 1980", Second Interregional Fertilizer Symposium, Kiev, USSR and New Delhi, India, 21 September-13 October 1971 (ID/WG.99/4/Rev.1), pp. 51, 53 and 55.

General

Iran is bordered by Iraq and Turkey on the west, the USSR and the Caspian Sea on the north, Afghanistan and Pakistan on the east, and the Persian Gulf on the south. Covering an area of 1,645,000 km^2, the country has three distinct regions: the lowlands, along the Caspian coast in the north, with a temperate climate and fairly high humidity and rainfall; the central plateau, which covers two-thirds of the country, with an average altitude of 1,150 metres above sea level, and the more arid land in the south and east. Rainfall can vary from 50 in. to under 3 in. per annum, depending on the region, but on the whole it is scanty.

In 1971 the population was estimated to be 29,780,000[26/] and the average annual rate of growth to be 3.2 per cent. Population density averages 17.4 per km^2 and is heaviest in the north. About 55 per cent of the labour force is engaged in agriculture, while only 15 per cent is engaged in industry. Essentially, Iran is an agricultural country. Agriculture forms 24 per cent of the GNP and is the second largest foreign-currency earner, after oil.

The per capita income in 1970 was $355 and the GNP was $10,181 million, at current prices.

Oil is the basis of the national economy. To combat over-dependence on one single commodity, however, the Government has encouraged rapid industrialization in various directions during the past decade.

26/ Estimate for mid-year 1971. Monthly Bulletin of Statistics, vol. XXVII, No. 1 (January, 1973), p. 2.

The Fourth National Development Plan, from 1968 to 1973, aims at an annual growth rate of 9 per cent and an increase in the GNP of 57 per cent over the whole five years. Oil is the main source of finance for the Plan. An annual growth rate of 15 per cent is planned for the industrial sector.

Agriculture

The distribution of land in the country in 1967 was as follows:

	Thousand hectares
Total area	164 800
Arable land	16 060
Land under permanent crops	500
Permanent meadows and pastures	11 000
Forest land	18 000
Other land	119 240

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 5.

In 1960, 4,651,000 ha of land were irrigated.[27/]

From the above figures it will be seen that a very small part of the total area is farmed. Only 9 per cent of the land has sufficient rainfall to be suitable for agriculture. Dry farming is feasible on a further 17 per cent of land surface, with an annual rainfall of 25-30 cm. The soil is generally relatively rich in potassium. Much of the country is forest land, or desert and wasteland.

The main crop is wheat and the principal cash crop is cotton. Other crops include barley, rice, dates, tobacco and sugar. A wide variety of foods can be grown and the country is normally self-sufficient in food, except for sugar and tea.

Details of the main crops produced in 1971 are given below:

Crop	Area (thousand hectares)	Production (thousand tons)	Yield (kg/ha)
Wheat	5 000F	3 500F	700F
Rice (paddy)	380F	1 100F	2 890F
Barley	1 300F	850F	650F
Cotton (lint)	360*	156*	430*
Tobacco	17*	19.7*	1 190*
Sugar-cane[a/]	17F	600F	35 300F
Sugar-beet[a/]	157F	3 800	24 200F
Tea	27F	20.6F	...

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 39, 49, 76, 92, 96, 271, 277 and 282.

a/ Crop year 1970/71.

One of the aims of the Fourth Development Plan is to increase the average yield per hectare through the use of fertilizers rather than to increase the area under cultivation.

27/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 9.

Natural resources and industry

Iran is the fourth largest oil-producer in the world, after the United States, the USSR and Saudi Arabia.

Oil was first discovered in 1908 at the Jurassic Masjid-i-Suleiman field. The major oil-producing fields are: Agha Jari, discovered in 1937, Gach Saran, discovered in 1928, and Marun, discovered in 1964. There are millions of acres of land with oil potential still to be explored.

Proven reserves of crude oil were estimated in 1972 to be about 7,463 million tons (55,500 million bbl) and the total production of crude oil in 1971 was 224,600,000 tons per annum (4,535,000 bbl/d).

The oil industry was nationalized in 1951.

Between 1960 and 1967, 10 off-shore wells were drilled. Production in 1971 from these wells amounted to 130 million bbl per annum. In 1972 the estimated remaining reserves were 1,318 million bbl.

The domestic refining capacity is 32.7 million tons per annum and the throughput in 1971 amounted to 29.1 million tons per annum.

The main companies and their crude capacities are shown below:

Company	Crude capacity (thousands of barrels per day)
In production	
Iranian Oil Exploration and Producing Co., Masjid-i-Suleiman	78
Iranian Oil Refining Co., Abadan	460
National Iranian Oil Co., Kermanshah	15
National Iranian Oil Co., Teheran	100
Under construction	(Estimated)
National Iranian Oil Co., Shiraz	45

Iran possesses the largest proven reserves of natural gas in the world. In 1972 they totalled 5,660 billion cubic metres (200,000 billion cubic feet). Production in 1971 was 35,257 million cubic metres (1,245,100 million cubic feet). The major gas fields are Khangiran and Pazanan, with estimated reserves of 18,000 and 50,000 billion cubic feet, respectively.

A new elemental sulphur recovery plant for treating sour natural gas went into operation at Bandar Shahpur in 1970. A similar plant exists at Kharg Island, which treats sour natural gas reported to have a hydrogen sulphide content of approximately 12 per cent. These two plants represent the first attempts to recover elemental sulphur from the very large sulphur reserves present in the sour natural gas deposits of Iran. In 1970, 39,000 tons of elemental sulphur were recovered.

Gypsum deposits are found mainly in Miocene lagoon deposits in the country. The annual production since 1956 has been estimated to be 500,000 tons.

Two marine phosphorite deposits have been discovered in the Cretaceous-Eocene and the Upper Devonian rock formations by the Geological Survey of Iran.[28] The P_2O_5 values in the discoveries made in the country so far are apparently not high enough to warrant economical exploitation. A feasibility study of systematic exploration for potash carried out in 1966 revealed sufficient indications of potash to justify more thorough investigation.

Other minerals exist in small quantities, e.g. francolite (apatite), quartz, ankerite, kaolin, pyrite, Goethite-limonite, carbon, barite, magnetite and glauconite.

Several bauxite deposits are under investigation; in 1963 reserves were estimated to be 7 million tons of commercial ore, and 16 million tons of low-grade ore. An aluminium reduction plant was constructed at Arák, Central Iran. Its initial capacity of 20,000 tons per annum can be expanded later to 45,000 tons per annum.

Copper ore deposits are known to exist in various parts of Iran.

A useful amount of hard coal is produced (195,000 tons in 1966).

The total electricity generation in 1968/69 was estimated at 2,430 million kWh. Power distribution facilities are unevenly developed and private power generation accounts for an estimated additional 5-7 per cent.

Modern industry in Iran is of recent origin. Besides petroleum, only twenty-five years ago industry was largely confined to handicraft products, e.g., carpets and pottery. Now plants have been established and machinery imported to produce many consumer goods and building materials. The Government plays an important role in ownership and management. Textiles is the largest branch of private industry, and wool and cotton spinning and weaving are also important. A steel mill and a machine-tool plant are under consideration.

Fertilizer manufacture

Production of urea and calcium ammonium nitrate commenced in 1961 at the Shiraz Fertilizer plant near Persepolis. Initial capacity was 110 tons per day of urea and 120 tons per day of calcium ammonium nitrate. Urea production was stepped up in 1965 to 175 tons per day. The plant comprises synthesis gas, ammonia, urea, nitric acid and ammonium nitrate units, as well as other utility and ancillary plants. The feedstock, natural gas (90 million cubic metres per day), comes from Gach Saran.

The Bandar Shahpur Complex came on stream in 1970. It utilizes local sour natural gas with an average content of 25 per cent H_2S, and imported phosphate rock. It has the following units:

A sulphur recovery unit with a capacity of 1,500 tons per day
A sulphuric-acid unit with a capacity of 1,300 tons per day
An ammonia plant (Kellog design) with a capacity of 1,000 tons per day
A urea plant with a capacity of 500 tons per day
A phosphoric-acid plant with a capacity of 480 tons per day

In addition the complex has facilities for producing 300 tons per day of diammonium phosphate or 430 tons per day of triple superphosphate.

28/ Mineral Raw Material Resources for the Fertilizer Industry in Asia and the Far East, Mineral Resources Development Series, No. 28 (United Nations publication, Sales No.: 68.II.F.3), p. 58.

The Kharg Chemical Company (KHEMCO), located at the Darius field on Kharg Island in the Persian Gulf, processes sour gases from crude production facilities, using 145 millions of cubic feet per day. About 600 tons per day of sulphur are produced. It is intended to manufacture methanol or ammonia in the near future from residue gas, predominantly methane.

The following projects are planned for completion under the Fifth Five-Year Plan, from 1974-1979:

Shahpur Industrial Complex[29/]

It is planned to augment production as follows:

Produce 500-740 tons per day of urea
Produce 300-600 tons per day of ammonium phosphate
Produce 480-840 tons per day P_2O_5 from phosphoric acid
Produce 1,300-2,450 tons per day of sulphuric acid

Bandar Shahpur

An ammonia plant, independent of Shahpur Industrial Complex, and with a capacity of 1,000 tons per day, is under consideration. As an alternative to this, Shahpur's planned expansion would also include doubling its ammonia production.

Shiraz

A mixed fertilizer unit is planned, with a capacity of 30,000 tons per annum of 20-20-0 and 20,000 tons per annum of 15-15-10 formulated compound fertilizer. The raw material will be residual phosphoric acid from the phosphoric-acid purification unit of a sodium tripolyphosphate plant, together with urea or ammonium nitrate and imported potassium sulphate.

Fertilizer units are under consideration for the provinces of Khorrasan in the north-east and Kermanshaman in the west, both of which are rich in natural gas.

With the low price and abundant reserves of natural gas, its conversion to ammonia as a basic product is clearly a sound economic proposition.

Fertilizer consumption

The consumption of fertilizers has soared in recent years as a result of the government's programme under which imports of foodstuffs were to be scaled down. In 1965 Iran's total fertilizer nutrient consumption was 36,400 tons; this had reached 104,600 tons by 1970. According to FAO sources, fertilizer consumption is expected to reach 300,000 tons per annum by 1980.

The total fertilizer consumption in 1970 amounted to 3.1 kg per capita and 7.5 kg per hectare, which is still very low.

At the beginning of 1971 a ban was enforced on imports of nitrogen and P_2O_5 fertilizers. This was in anticipation of the Shahpur Chemical Company's fertilizer complex at Bandar Shahpur coming into full operation during the early part of 1971. Potassic fertilizers were unaffected by the ban.

29/ Iranian National Petroleum Co. (29 August 1972).

General references

USAID, Economic Background Highlights: Iran, Revision No. 251, August 1967 (PPC/SRD).

USAID, Economic Background Highlights: Iran, Revision No. 280, March 1969 (PPC/SRD).

UNIDO, "The fertilizer industry of Iran", paper presented to the Second Interregional Fertilizer Symposium, Kiev, USSR, 21 September-1 October 1971 and New Delhi, India, 2-13 October 1971 (ID/WG.99/98).

FAO, Production Yearbook, 1970, vol. 24 (Rome, 1971).

International Petroleum Encyclopedia, 1972 (Tulsa, Oklahoma, Petroleum Publishing Co., 1972).

Mineral Raw Material Resources for the Fertilizer Industry in Asia and the Far East, Mineral Resources Development Series No. 28 (United Nations publication, Sales No. 68.II.F.3), pp. 57-58.

Non-ferrous Metals: A Survey of their Production and Potential in the Developing Countries (United Nations publication, Sales No. 72.II.B.18), pp. 176-180.

Proceedings of the Seminar on Mineral Raw Materials for the Fertilizer Industry in Asia and the Far East, Mineral Resources Development Series No. 32 (United Nations publication, Sales No. 69.II.F.2).

UNIDO, "Development of the petrochemical industry in Iran", paper presented to the Interregional Petrochemical Symposium on the Development of the Petrochemical Industries in Developing Countries, Baku, USSR, 21-31 October 1969 (ID/WG.34/106)

UNIDO "Review of world production, consumption and international trade in fertilizers with projections to 1975 and 1980", paper presented to the Second Interregional Fertilizer Symposium, Kiev, USSR, 21 September-1 October and New Delhi, India, 2-13 October 1971 (ID/WG.99/4).

United States Department of the Interior, Bureau of Mines, Minerals Yearbook, vol. I (Washington, D.C., 1972).

PAKISTAN

Consumption and production of fertilizers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61[a]	1965/66[b]	1970/71[b]	1975/76[b]	1980/81[b]
N	Consumption	31 000	69 000	252 000	650 000	830 000
	Production	...	...	...	...	...
	Deficit	...	...	...	...	...
	Surplus	...	...	...	...	...
P_2O_5	Consumption	400	1 000	30 000	63 000	185 000
	Production	...	...	...	...	...
	Deficit	...	...	...	...	...
	Surplus	...	...	...	...	...
K_2O	Consumption	-	-	1 000	12 000	35 000
	Production	...	...	...	...	...
	Deficit	...	...	...	...	...
	Surplus	...	...	...	...	...

Sources: a/ (Consumption) : statistics supplied by the Food and Agriculture Section of the Planning Commission of Pakistan (1968).

b/ (Consumption) : statistics supplied by the Ministry of Industries, Pakistan (Nov. 1972).

General

Before 1971 Pakistan was called West Pakistan; it covers an area of 801,408 km^2 and is basically an agricultural country.

In 1970 the population was 53.51 million inhabitants and the rate of growth has recently averaged 3 per cent per annum.

Agriculture

Agrioulture is the most important sector of the economy. Wheat and rice are the main food crops and the main cash crops are wheat and cotton. After the extremely bad harvest years of 1966 and 1967, due mainly to adverse weather conditions, Pakistan was forced to import 1.5 million tons of wheat. A food self-sufficiency programme was initiated then based on the introduction of new varieties of wheat and rice, the intensive use of fertilizers and pesticides, water control, and government incentives and subsidies to farmers.

Over 28 million acres are irrigated.

The distribution of the main crops as a percentage of the total cultivated area is shown below:

Crop	Percentage
Wheat	44
Cotton	11.3
Rice	10.0
Chickpeas	8.6
Millet	6.5
Corn	4.4
Remainder	15.2

Projections in 1970 of the net sown acreage were 33.5 million acres, and of current fallows 12.5 million acres.

Details of the main crops produced in 1967/68 are given below:

Area	Crop	Irrigated acreage (thousand acres)	Production (long tons)	Non-irrigated acreage (thousand acres)	Production (long tons)
Punjab	Wheat	7 498	4 224	3 061	755
	Rice	1 581	754	69	17
	Maize	576	347	149	45
	Sorghum	320	80	379	55
	Sugar-cane	912	13 430	23	197
	Cotton (American)	2 928	2 029	13	4
	Cotton (Desi)	323	128	29	7
Sind	Wheat	2 155	860	433	88
	Rice	1 744	667	202	...
	Maize	48	16	5	2
	Sorghum	509	121	283	39
	Sugar-cane	119	1 839	-	-
	Cotton (American)	948	669	-	-
	Cotton (Desi)	169	70	-	-
North West Frontier	Wheat	546	200	964	188
	Rice	113	37	1	...
	Maize	464	276	259	94
	Sorghum	27	10	58	9
	Sugar-cane	186	29 222	5	44
Baluchistan	Tobacco	5	2	-	-
	Wheat[a]	145	44	314	59
	Potato	8	31	-	-

a/ The data refer to 1965/66.

Natural resources and industry

The main resources of Pakistan are coal, crude oil, natural gas, iron ore and gypsum. Coal production meets less than half of the national requirements, while crude oil production meets only a fraction.

In 1972 the total crude-oil reserves were estimated at 38 million barrels (five million tons). In 1971 crude-oil production reached about 500,000 tons per annum (10,000 bbl/d crude oil).[30] The country's seven oilfields lie in the Potwar Basin (north-east Pakistan) and their total output comes from 15-20 wells.

The refineries are shown below:

Company	Crude-oil capacity (bbl/d)
Attock Oil Co. Ltd., Rawalpindi	11 640
National Refinery Ltd., Karachi	13 500
Pakistan Refinery Ltd., Karachi	58 000

The total refining capacity of these three refineries is, therefore, about 83,140 bbl/d crude oil. The National Refinery Ltd. is increasing its capacity to 35,000 bbl/d crude oil. This is expected to be completed by 1973.

30/ International Petroleum Encyclopedia, 1972 (Tulsa, Oklahoma, The Petroleum Publishing Co., 1972), p. 237.

The abundant natural gas reserves are only partially exploited so far. These were estimated in 1972 at 439 billion cubic metres (15,500 billion cubic feet). The most important field, with one of the world's largest production rates, is the Sui Field, Baluchistan. It has estimated reserves of 6,300 billion cubic feet and since 1965 has produced 750 million cubic feet. The total production of natural gas in Pakistan in 1971 was 3,259 million cubic metres per annum (115,100 million cubic feet per annum).

Mari gas field is owned by Esso (Standard Oil Company of New Jersey, United States) and Mobil Oil and the Pakistan Government. Its reserves are estimated at some 4 million cubic feet. The main outlet for this is the Esso fertilizer plant at Dharki.

Several other gasfields, at present idle, are shown below:

Gasfield	Estimated reserves (billion cubic feet)
Uch	2 500
Khairpur	1 000
Khandkot	200
Zin	100
Mazarani	30
Sari	30
Hundi	not yet estimated

The estimated coal reserves total 335 million tons in Pakistan. However, most of the coal appears to be of low quality with low energy capacity. Only about 10 per cent of the hydroelectric potential in the country is exploited. As the potential capacity is located mainly in the northern mountains, this presents problems of access and transportation.

There are vast gypsum reserves, the most important of which are easily accessible, such as those of the Punjab Saline Series, in the Khewra, Dandot and Daud Khel areas. During 1967/68 about 60,000 tons were mined.

A large deposit of potash-bearing brine was discovered in 1952-1953. Reserves consist of brine under pressure at a depth of 1,400 metres underground. The Pakistan Industrial Development Corporation has been exploring these deposits since 1968.

Fertilizer manufacture

The domestic production of fertilizers is expanding rapidly due to the discovery of large reserves of natural gas.

The fertilizer production capacity in Pakistan is shown below:

Existing capacity	N	P_2O_5
	(Tons)	
Multan		
Ammonium nitrate	27 300	
Urea	27 300	
Daud Khel		
Ammonium sulphate	18 000	
Lyallpur		
Single superphosphate		9 600

Existing capacity (continued)	N	P_2O_5
	(Tons)	
Daharki		
Urea (Esso)	79 580	
Shekhupura		
Urea	156 400	
Sub-total	308 580	9 600
Capacity sanctioned		
Multan (Expansion)	70 000	70 000
Nitrophosphate (23:23)		
Calcium ammonium nitrate	85 000	
(Additional calcium ammonium nitrate from existing)	7 000	
Mari/Khandkot		
(Hyesons/Fauji Foundation)		
Urea	156 000	
Karachi		
(Pakistan Fertilizer Co. Ltd.)		
MAP (for Urea-MAP)	12 000	57 000
Sub-total	330 000	127 000
Total	638 580	136 600
Capacity under consideration		
Kowshera		
Urea	36 000	
Lyallpur expansion		
Single superphosphate		9 6000

Thus the installed and sanctioned capacity for the fertilizer industry, for net tons N, according to type, is as follows:

	Existing	Sanctioned	Under consideration	Total
Ammonium sulphate	18 000	-	-	18 000
Calcium ammonium nitrate	27 300	85 000	-	112 300
(Caloium ammonium nitrate and Urea)	-	7 000	-	7 000
Urea	263 280	156 000	36 000	455 280
Nitrophosphate	-	70 000	-	70 000
MAP	-	12 000	-	12 000
Total	308 580	330 000	36 000	674 580

Fertilizer use

Following fertilizer crop trials by UNDP/FAO in 1971 it was discovered that crop responses to N, P_2O_5 and K_2O (in the form of sulphate of potash) were substantial. (The predominance of calcareous soils in Pakistan necessitates the use of highly water-soluble phosphates.) The need for phosphate fertilizers in Pakistan was only recognized as late as 1967, and for potash fertilizers even later.

Negros Island contains gypsum; the estimated reserves are 54,000 tons. Phosphate occurs as phosphatic limestone - the estimated reserves are 186,000 tons, with an average P_2O_5 content of 22.7 per cent - and as guano, with estimated reserves of 140,000 tons and a P_2O_5 content of 13.8 per cent. Limestone, dolomite and serpentine deposits exist in quantity. The main metallic minerals found are: cadmium, chromite, copper, gold, silver, iron, lead, manganese, mercury, nickel and zinc.

The production figures (1970) for some minerals are shown below:

Mineral	Production (tons)
Iron ore (metal content)	1 869 877
Manganese ore	5 121
Copper ore (metal)	160 296
Zinc ore (metal)	3 191
Chromite ore	566 443
Coal	42 401
Sand and gravel	4 619 123
Salt	4 206 120
Silica	684 614
	(fine oz)
Gold	602 715
Silver	1 701 899
	(flasks-76 lb each)
Mercury (quicksilver) (metal)	4 648

Natural gas was discovered in Echagul, in Isabela Province, with reserves of 2.5 billion cubic feet and an average grade of 98 per cent methane. Oil exploration has been unsuccessful to date, but the four oil refineries listed below process crude oil imported from the Middle East.

Company	Location	Crude-oil capacity (thousand bbl/d)
Bataan Refining Company	Bataan	50
Caltex Philippines Incorporated	Batangas	62
Filoil Refinery Corporation	Rosario Cavite	15
Shell Refining Company (Philippines) Ltd.	Batangas	65
	Total	192

Source: International Petroleum Encyclopedia, 1971 (Tulsa, Oklahoma, The Petroleum Publishing Co., 1972), p. 249.

The feedstock situation for fertilizer plants in the Philippines may be summarized as follows:

Natural gas is not available in sufficient quantities and the import of liquified gas is too expensive. Naphtha would be available from the domestic refineries only if motor fuel were restricted; imported naphtha is too expensive. Fuel oil would only be available from the domestic refineries if deliveries to electric power plants were restricted; however, the importation of fuel oil is a definite possibility.

Ten million cubic feet of refinery gas are available each day from the Caltex Refinery at Batangas; this would be enough for a plant producing 500 or 600 tons of fertilizer per day. The gas has a high content of hydrogen, methane, ethane and ethylene.

Coal is not available in the Philippines in sufficient quantities and imported coal is too expensive in view of the basically high cost of the production of ammonia from coal.

Crude oil is possibly the best feedstock for Philippine fertilizer plants as it can be obtained from different sources, such as Alaska, South America, or the Persian Gulf.

The total electricity generating capacity in 1966 was 1,222 MW. The total public capacity in 1969 was 1,490 MW, of which 547 MW were hydroelectric. The Government is giving priority to hydroelectric projects in its national development plan and major current schemes include a 218-MW plant at Angat, Luzon.

Manufacturing and construction contributed about 21 per cent to the GDP and employed 10 per cent of the labour force.

The plastics industry is developing quickly. A polyvinyl plant of the Mabuhay Vinyl Corporation, using calcium carbide and chloride as basic raw materials, produces 6,000 tons of plastics per annum. Production in 1968 was 19,700 tons.

Basically, the petrochemical industry depends on imported raw materials. 'Petrochemical Complex I', consisting of 65,000 tons per annum of ethylene, 50,000 tons per annum of dyethylene, 20,000 tons per annum of PVC resin and 10,000 tons per annum of dodecylbenzene, using naphtha as the main raw material, was proposed in 1967 at the First Action Group Meeting on Petrochemical Industries convened by ECAFE. This plant was to be located in either Singapore or the Philippines.

Fertilizer manufacture

The fertilizer industry has good potential. A consumption growth of 8 per cent per annum was reached in 1970 but, due to cheap, imported fertilizers, an inadequate supply of raw material, and the lack of spare parts, only half of the existing capacity in the country was exploited. The importation of fertilizers at low prices was due to the availability of Japanese fertilizers through the Reparations Commission (REPACOM) and tax-free imports by co-operatives.

There are three organic fertilizer plants that produce chemical fertilizers mixed with organic compost, and several blending plants operating with imported products. However, 90 per cent of the fertilizer production in the Philippines is chemical fertilizer, which is produced in the following plants:

Company	Location	Date of commissioning	Feedstock	Design capacity (thousand tons)	
				N a/	P_2O_5 b/
Atlas Fertilizer Corporation	Cebu	1958	Imported NH_3	-	18
Maria Cristina Fertilizer and Chemical Corporation (MARCELO)	Iligan City	1958	Naphtha	27	-
Planters Products Incorporated	Limay	1966	Refinery gas	84	60
			Total	111	78

a/ Includes primary nitrogen production only and not imported ammonia.

b/ Includes all P_2O_5 production in the form of superphosphate, ammonium phosphate and NP/NPK products.

The Atlas Fertilizer Corporation makes AS and DAP, based on imported NH_3. They also make 14-14-14 and other NPK fertilizers. The Maria Cristina Fertilizer and Chemical Corporation (MARCELO) makes only AS and NH_3 for direct application. Planters Products Incorporated produce H_3PO_4, DAP, 14-14-14 and other NPK fertilizers. Chemical Industries of the Philippines (CHEMFIL) at Taguig, Rizal, which produced AS, has not been operating since 1971.

Planned fertilizer projects

To meet the future demand for fertilizers in the Philippines by 1980 one or two ammonia/urea plants, each with a capacity of 500-1,000 tons per day, will be needed (with possible associated facilities for the production of phosphoric acid, ammonium phosphate and NP/NPK). Ammonium sulphate may be a possible additional product from plants that may be located near the copper smelters planned for San Fernando (La Union) and Toledo (Cebu).

Suggested possible locations for ammonia/urea plants in the Philippines are Luzon, Panay, Cebu and Mindanao. Crude oil could be used as feedstock. If a plant were situated in Batangas it could well use refinery gas from the Caltex Refinery.

Phosphoric acid would be needed to make ammonium phosphate (either MAP or DAP). Phosphoric acid could be imported, or it could be made from phosphate rock and sulphuric acid.

The production figures for nitrogenous fertilizers in 1970/71 are shown below:

Fertilizer	Production (tons)
Ammonium sulphate	15 412
Urea	9 741
Other nitrogenous fertilizers	-
Other complex fertilizers	22 562
	47 715

Source: FAO, Annual Fertilizer Review, 1972 (Rome, 1973), pp. 69 and 105.

Fertilizer consumption

Nitrogen is being used to an increasing extent in the form of urea but many growers insist on applying part of it as ammonium sulphate. Other N sources are mono- and diammonium phosphate which, with NPK compounds, supply virtually all of the P_2O_5 uptake.

The import figures for 1971/72 were as follows:

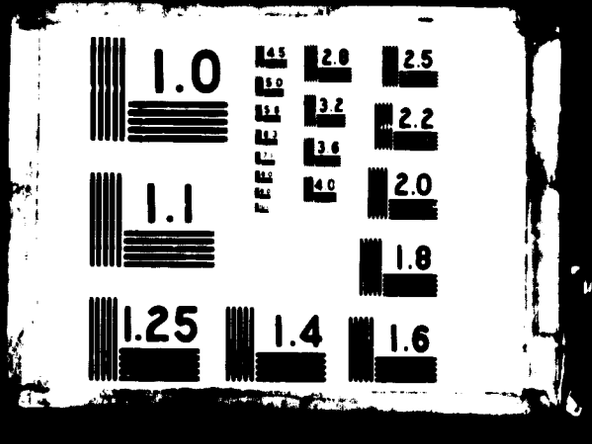
Nitrogenous fertilizers	70 100 tons N*
Phosphate fertilizers	5 200 tons P_2O_5*
Potash fertilizers	36 600 tons K_2O*

Source: FAO, Annual Fertilizer Review 1972 (Rome, 1973), pp. 96, 128 and 151.

The principal supplier of imported fertilizers is Japan.

3 OF 3

05668



Estimates of projected growth of consumption of fertilizers in Pakistan vary considerably depending on the source. For example, estimates by USAID and Esso give the following:

Thousand tons per annum nutrient

	1975			1980		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
USAID	571	128	10	804	270	27
Esso[a]	450	114	-	600	185	-

a/ Estimates are for the years 1974/75 and 1979/80.

General references

Hydrocarbon Processing: World-wide HPI Construction Boxscore, June 1972 (Houston, Texas, Gulf Publishing Co.).

Monthly Bulletin of Statistics, vol. XXVII, No. 1 (January 1973).

Sulphur, No. 98 (January/February 1972).

United Nations, "Technical and economic aspects of the fertilizer industry in Pakistan", paper presented to the United Nations Interregional Conference on the Development of the Petrochemical Industries in Developing Countries (PET/CHEM/CONF.50) (October 1964).

UNIDO, Pre-Investment Studies for the Promotion of Fertilizer and Petrochemical Industries (Draft Report on Project Results, Conclusions and Recommendations by UNIDO)(SF Project PAK-26, July 1971); also Final Report.

SRI LANKA

Consumption and production of fertilizers
Nutrients (tons per annum)

		Actual			Projected	
		1960/61[a]	1965/66[b]	1970/71[c]	1975/76[d]	1980/81[d]
N	Consumption	29 914	42 479	58 000*	95 000	120 000
	Production	-	-	-	100 000	120 000
	Deficit	29 914	42 479	58 000*	-	-
	Surplus	-	-	-	5 000	-
P_2O_5	Consumption	2 576	8 239	5 000*	35 000	45 000
	Production	-	-	-	-	-
	Deficit	2 576	8 239	5 000*	35 000	45 000
	Surplus	-	-	-	-	-
K_2O	Consumption	27 748	34 422	30 700*	54 000	69 000
	Production	-	-	-	-	-
	Deficit	27 748	34 422	30 700*	54 000	69 000
	Surplus	-	-	-	-	-

Sources: a/ FAO, Fertilizers, An Annual Review of World Production, Consumption and Trade, 1964 (Rome, 1965), pp. 102, 130 and 155.

b/ FAO, Annual Fertilizer Review, 1970 (Rome, 1971), pp. 78, 109 and 132.

c/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), pp. 469, 476 and 481.

d/ UNIDO estimates.

General

The island of Sri Lanka lies at the extreme south-east of the Indian subcontinent. It covers an area of 65,610 km^2. The north of the island is almost entirely flat, while the south is mountainous, with peaks rising to over 2,000 metres in places. The island is contained by a flat coastal strip.

From May to September the south-west monsoon determines the weather in the wet zone, situated in the south and south-west. The wet zone forms only 25 per cent of the total area but because of the favourable climatic conditions and fertile soil it is economically the most important part of the country. The population density is correspondingly high and the capital, Colombo, lies here. Conditions for agricultural production are excellent; the temperature remains almost constant, ranging from 19-27°C, depending on height; the rainfall is considerable, reaching up to 5,000 mm annually. Rice, the main food crop, is grown in the region.

The population (12.7 million in 1971) is increasing at an average annual rate of 2.1 per cent. The wet zone has over-population problems; it supports 80 per cent of the entire population.

Sri Lanka's economy is basically agricultural and the country is heavily dependent on foreign trade. Its export trade relies mainly on a few agricultural commodities and is subject to price fluctuations on the world market.

In 1970 the GNP amounted to $2,117 million, and the per capita income to $169. The average growth rate of the GNP was 4 per cent. The country imports almost 50 per cent of its total food requirements and almost all manufactured goods.

Agriculture

Under the colonial system a dual agrarian economy developed. In addition to the traditional small-scale subsistence farming system the plantation system developed, which used modern methods and equipment and aimed at the world market. Modern plantation techniques have still to be adopted by the small-scale farmers today.

The distribution of land in the country in 1970 was as follows:

	Thousand hectares
Total area	6 561
Arable land, including land under permanent crops[a]	1 979
Permanent meadows and pastures	439
Forest land	2 899
Other land	1 244

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome 1972), p. 5.

a/ Over half of this land is used for plantations. By 1985 it is planned to increase this area to 2,800,000 ha.

In 1969, only 403,000 hectares were irrigated.[31]

In 1970, agriculture, forestry and fishing together contributed 34 per cent to the GNP. The agricultural GDP has been estimated for 1975 at 31.7 per cent of the total and for 1985 at 26.4 per cent.

Details of the main crops produced in 1971 are given below:

Crop	Area (thousand hectares)	Production (thousand tons)	Yield (kg/ha)
Rice (paddy)	611F	1 616F	2 640F
Maize	20F	16F	800F
Millet/sorghum	25F	18F	1 560F
Ground-nuts in shell	5F	5F	850F
Sweet potatoes/yams[a]	16	72	4 600
Cassava[a]	60	354	5 900
Tobacco	13*	9.2*	690*

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 60, 67, 76, 111, 117, 233 and 277.

a/ Crop year 1970.

The most important plantation crops are tea, rubber and coconuts. Coffee, cocoa, cotton, sugar-cane and spices are also produced, but mainly consumed locally. Almost all tea and rubber produced is exported but 50 per cent of the coconut production is consumed locally.

31/ FAO, Production Yearbook, 1971, vol. 25 (Rome, 1972), p. 9.

The highlands of Sri Lanka are exceptionally well suited to high-quality varieties of tea, especially the south-west wet zone. The flatter areas are suited to rubber production; the coastal strip favours coconut production.

Over 30,000 tea factories exist on the island. Details of the main cash crops produced in 1971 are given below:

Crop	Area (ha)	Production (tons)	Yield (kg/ha)
Tea	240 000F	217 000*	...
Rubber (natural)	...	138 000*	...
Copra	...	195 000*	...
Coconuts[a/]	...	2 536 million nuts	...

Source: FAO, Production Yearbook, 1971, vol. 25 (Rome 1972), p. 261, 263, 271 and 299.

a/ Crop year 1970.

Paddy rice is the most important crop in the small-scale sector. Prior to the take-over of land for plantations rice production could meet local requirements. Rice is now produced in two annual harvests, the Maha harvest (February-March) and the Yala harvest (July-September), and can meet approximately half of the local requirements.

Less important sectors in agriculture are the timber and the fishing industries. Although 40 per cent of the island is forested the resources are not widely exploited as transport facilities to ports are extremely limited. Fishing contributes about 2.3 per cent to the GDP; the 1968 catch amounted to only 144,000 tons; fishing methods are somewhat primitive, however, and there is at present a serious shortage of port facilities.

Settlement schemes have been planned for new areas in order to bring the many additions of arable land into production.

The main objective of government policy is to increase the portion of high-quality tea through large-scale replanting and improvement of modernization schemes and expansion of processing facilities. In addition, some 35,000 ha of old seedling tea are included in a rehabilitation scheme which, through promotion of fertilizer application (in particular, of nitrogen), soil conservation and other improvements, has resulted in yields of 2,000 kg/ha of 'made' tea as against present yields of 1,050 kg/ha on estates and 420 kg/ha on small holdings.

Imports and exports

The main imports are food, textiles, petroleum products, fertilizers, machinery and transport equipment, chemicals and pharmaceuticals. Imports in 1969 totalled (c.i.f.) $427.3 million and exports (f.o.b.) $315 million.

Tea, rubber and coconut account for 93 per cent of annual exports (tea alone accounting for 60 per cent). Ceylon produces 30 per cent of the world's marketable supply of tea. Rubber exports are sinking, mainly because of competition from synthetic fibres. Local and world demand for coconut products is rising. Tea is exported to Australia, Canada, New Zealand, the United Kingdom (which takes 40 per cent of the tea with no import tax) and the United States. Coconut is exported mainly to East and West Europe, and rubber to Poland and the USSR.

National resources and industry

Sri Lanka has, from all available records, no appreciable amounts of mineral raw materials which could be used in the manufacture of chemical fertilizers in the country.

Some gypsum is mined for the Government Cement Factory. It is also produced from solar evaporation of sea-water as a byproduct of the salt industry, but only in relatively small amounts.

Phosphate has not so far been found in commercial quantities on the island. Apatite is commonly present as an accessory mineral in the dolomites and dolomitic limestones of Pre-Cambrian age. Organic phosphate deposits are not known.

High-grade limestone exists in quantity.

There are no known deposits of coal or oil, and large quantities of fuels are imported. Plans are under way to test for petroleum or natural gas in the north-west region and the off-shore area.

Considerable hydroelectric power potential exists and this is being developed. In 1968 the installed electric-power capacity was 217,000 kW.

Important among Sri Lanka's limited known mineral resources are its black sands, with total estimated reserves of 4 million tons, composed of 78-80 per cent ilmenite, 8-12 per cent rutile, 8-10 per cent zircon and 2-3 per cent quartz and magnetite. The ilmenite (54 per cent TiO_2 content) is mainly exported to Japan.

Iron ore exists in the south-west, with reserves estimated at 6 million tons. Other mineral deposits at present exploited include limestone, graphite, mica, precious and semi-precious stones, kaolin and salt. Much of the country has been very incompletely surveyed for minerals owing to the difficult terrain.

A petroleum refinery owned and operated by the Sri Lanka Petroleum Corporation, with an annual capacity of 1.5 million tons per annum, using imported crude oil, was recently commissioned at Hapugaskandya. The chemical industry is still limited: plants in operation include a small caustic soda and chlorine plant (Paranthan Chemicals Corporation) and a sulphuric acid plant producing 3,000 tons per annum.

Lack of progress in the development of the petrochemical industry may be attributed to the limited market potential and non-availability of raw materials locally.

Diversification of the economy through a measure of industrialization began barely ten years ago. Industrial production is oriented towards import substitution in consumer and capital goods markets, using domestic and imported raw materials. Industrial plants in operation include an iron foundry, a steel-rolling mill, tire-plant and tea and sugar processing plants. About 15 synthetic textile-weaving and finishing mills exist.

Fertilizer manufacture

No fertilizer industry exists. A plant for the production of ammonia (500 tons per day) for conversion to urea (860 tons per day), located at Hapugaskandya, is planned by the State Fertilizer Manufacturing Corporation. Naphtha from the local refinery (140,000 tons per annum) is to be used as feedstock. Originally the planned completion date was 1972, but due to a number of difficulties execution of the project has been postponed indefinitely for the time being.

For the purpose of this study it has been assumed that the ammonia/urea plant at Hapugaskandya will be operating at 75 per cent of its rated capacity in 1975, and at 90 per cent in 1980. It has also been assumed that the proportion of ground phosphate rock applied directly to the soil (17,000-20,000 tons per annum in 1969) will remain at about 20,000 tons P_2O_5 per annum.

According to the projections of the 'Indicative World Plan for Agricultural Development to 1975 and 1985' of the FAO, future fertilizer consumption trends are as follows:

Year	Tons		
	N	P_2O_5	K_2O
1975	73 000	53 600	54 700
1985	146 800	122 000	114 700

This is generally rather higher than the UNIDO estimate quoted under d/ in the table at the beginning of this section.

General references

Asian Development Bank, Asian Agricultural Survey (Pasay City, Philippines, 1969).

Chemical Industry and Developing Countries: Vol. II, Asia and the Far East (Frankfurt/Main, Verband der chemischen Industrie e.V., 1966).

FAO, Annual Fertilizer Review, 1970 (Rome, 1971).

FAO, Indicative World Plan for Agricultural Development to 1975 and 1985, Provisional Regional Study No. 23 (IWP/68/RS.4) (Rome, 23 April 1969).

FAO, Production Yearbook, 1970 (Rome, 1971).

FAO, Provisional Indicative World Plan for Agricultural Development, vols. I and II (Rome, 1970).

IBRD, The Problem of Foreign Exchange and Long-term Growth of Ceylon (Washington, D.C., January 1968).

Lloyd's Bank Ltd., Ceylon (London, June 1968).

Mineral Raw Material Resources for the Fertilizer Industry in Asia and the Far East, Mineral Resources Development Series No. 28 (United Nations publication, Sales No. 68.II.F.3).

Monthly Bulletin of Statistics, vol. XXIII, No. 11 (November 1969).

Monthly Bulletin of Statistics, vol. XXV, No. 1 (January 1971).

Nitrogen, No. 71 (London, May/June 1971), pp. 25-28.

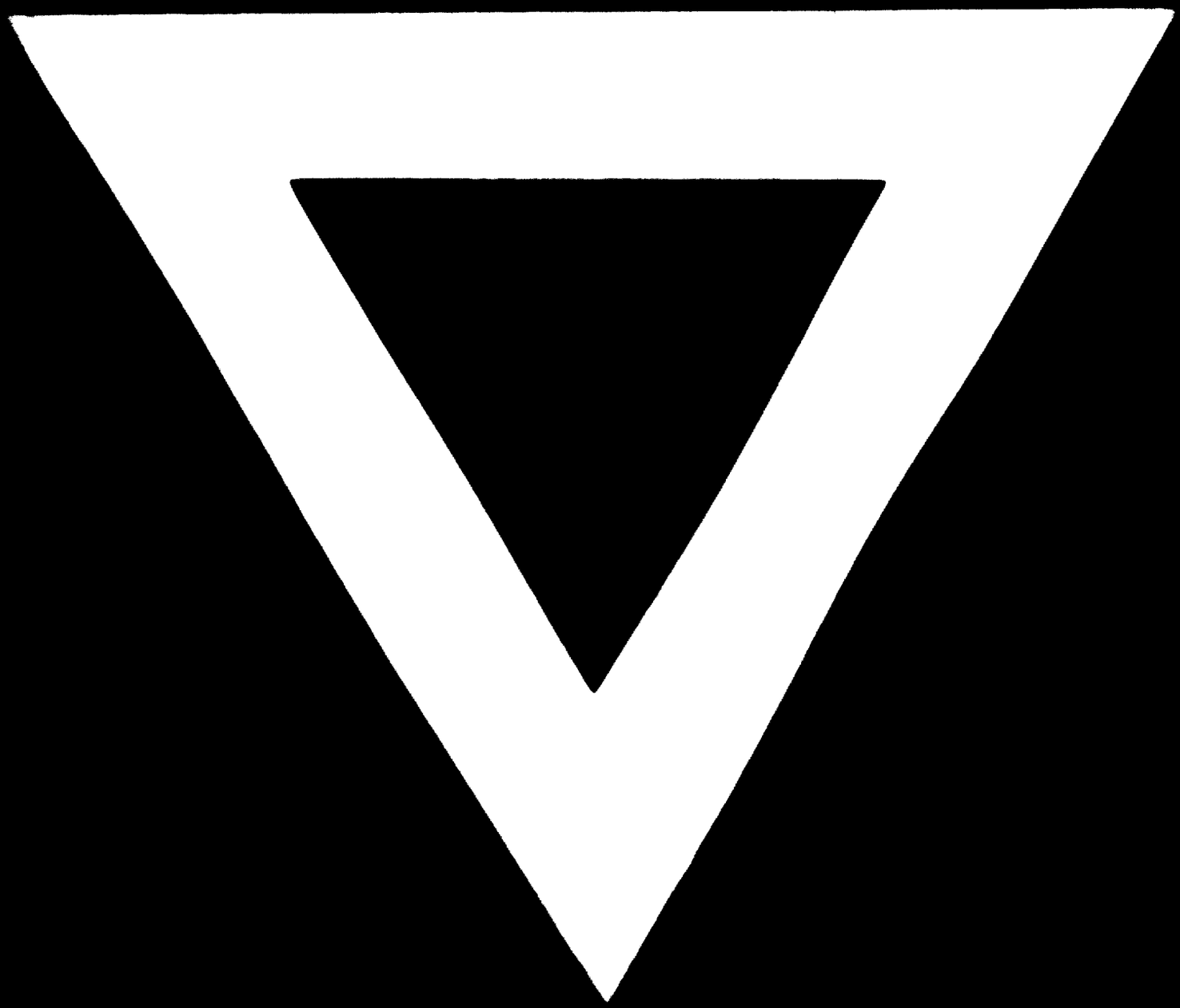
Non-ferrous Metals: A Survey of Their Production and Potential in the Developing Countries (United Nations publication, Sales No. 72.II.B.18), p. 148.

USAID, Economic Data Bank, Ceylon (Washington, D.C., August 1969).

United States Department of Commerce, Basic Data on the Economy of Ceylon, Overseas Business Reports (Washington, D.C., United States Printing Office, December 1966).

United States Department of State, Background Notes on Ceylon (Washington, D.C., June 1968).

World Fertilizer Atlas, 3rd ed. (London, British Sulphur Corp., Ltd., 1969).



74. 10. 9