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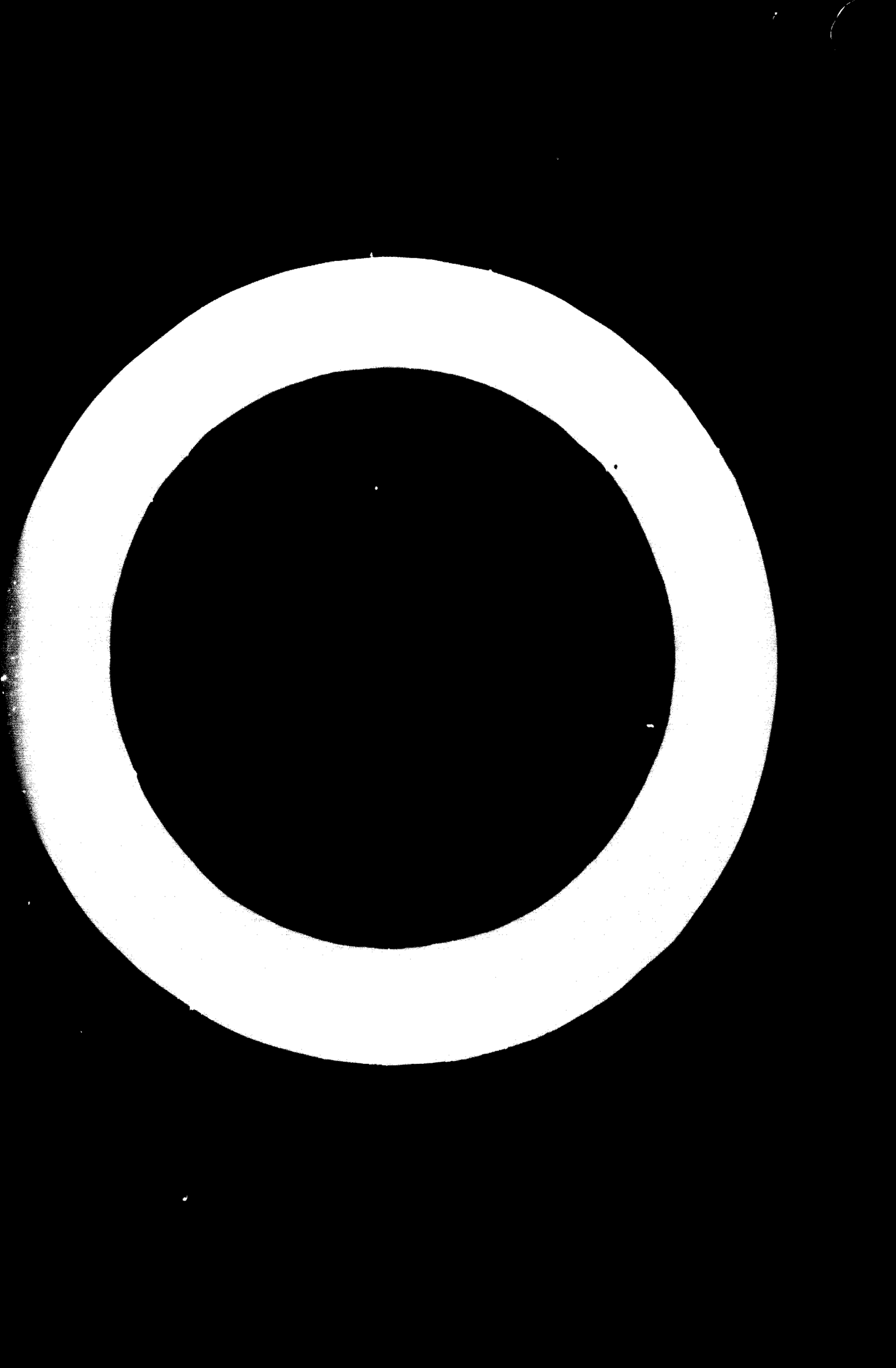
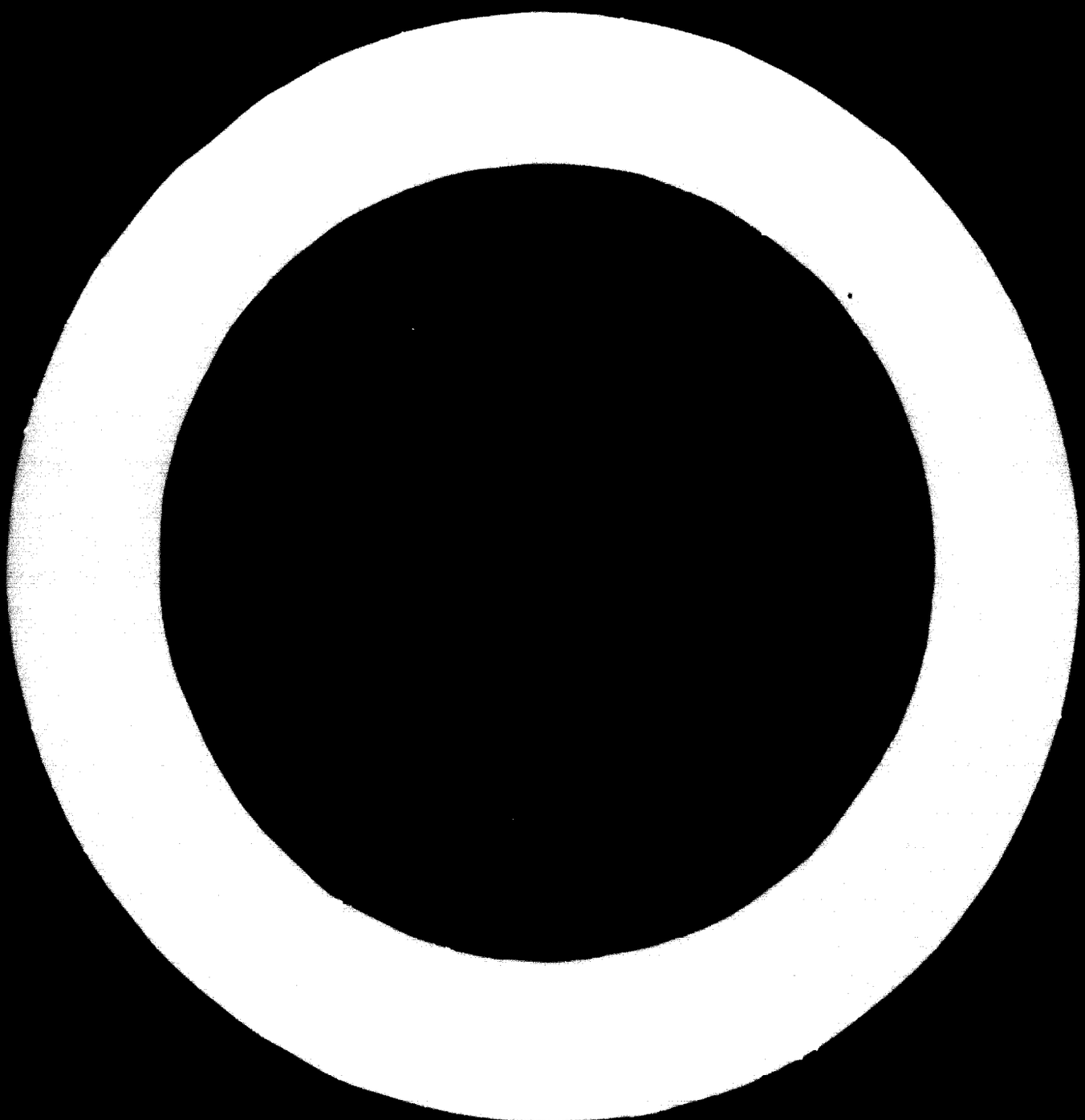
DIRECTORY OF FERTILIZER PRODUCTION FACILITIES

PART I AFRICA

UNITED NATIONS





UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION, VIENNA

DIRECTORY OF FERTILIZER PRODUCTION FACILITIES

PART I AFRICA

UNITED NATIONS

New York, 1970

ID/44, Vol. I

UNITED NATIONS PUBLICATION
Sales No.: E.70.II.B.28
Price: $U.S. 3.00 (or equivalent in other currencies)

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Explanatory notes

Billion refers to thousand million.

Dollar ($) refers to US dollar.

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 metre).

% BPL refers to percentage content of tricalcium phosphate in phosphate in phosphate rock.

% N refers to percentage fertilizer content in fertilizers.

% P_2O_5 refers to percentage of

(a) Total phosphorus content in case of phosphate rock

(b) Available phosphorus content in case of phosphate fertilizers both expressed as phosphorus pentoxide (P_2O_5).

% K_2O refers to percentage of water soluble potassium expressed as potassium oxide (K_2O) in potassium fertilizers.

Cultivated area refers to area of arable 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. 1965/1966) indicate a crop or a financial year.

Dates divided by a hyphen (e.g. 1965-1970) indicate the full period involved, including the beginning and end years.

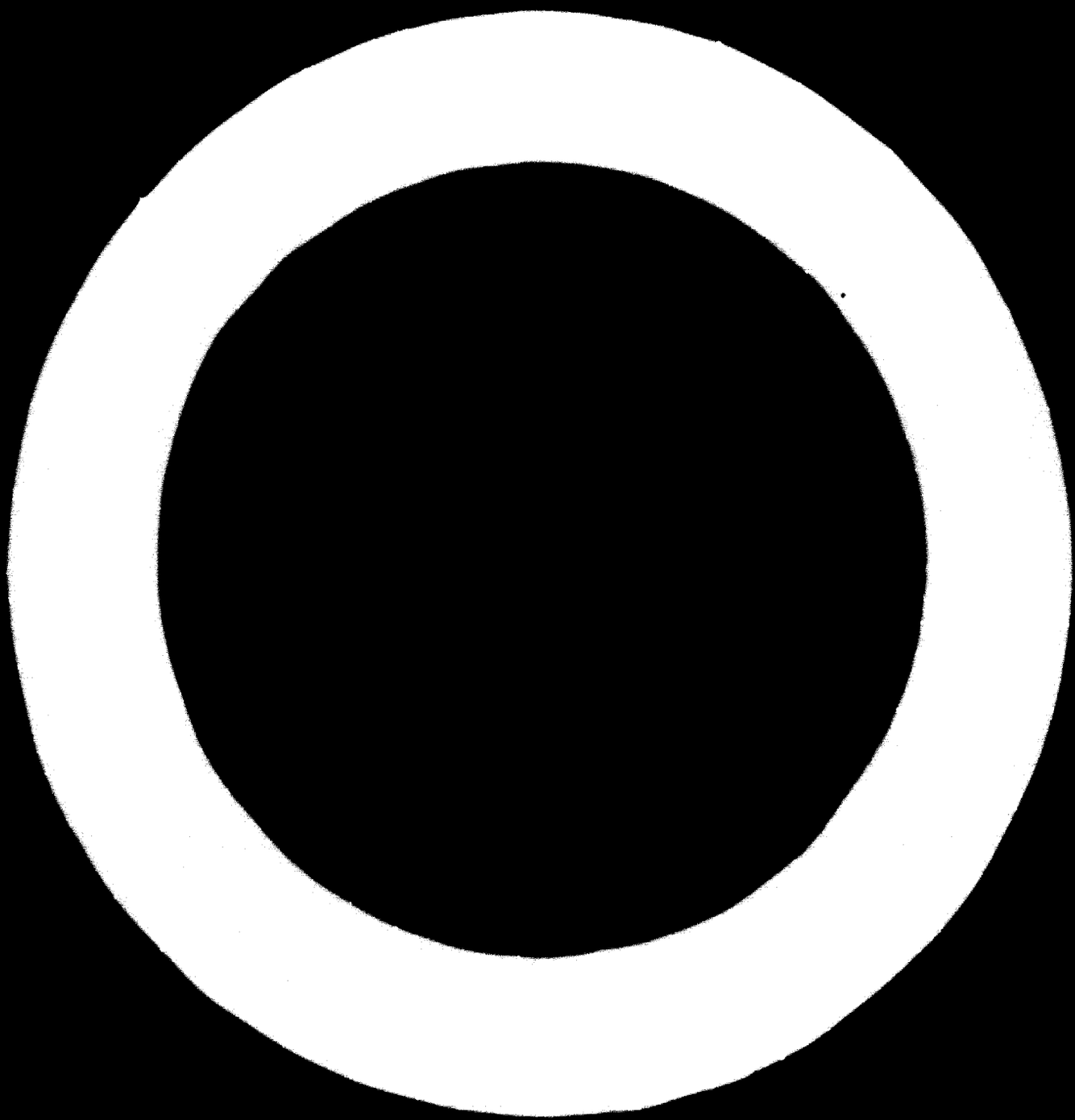
For the purpose of this study the estimated projections by ECA have been adopted, unless otherwise indicated.

The following abbreviations are used in this publication:

AID	Agency for International Development, U.S. Department of State
API	American Petroleum Institute
b/d	barrels per day
BP	British Petroleum
c.i.f.	cost, insurance, freight
DAP	diammonium phosphate
ECA	Economic Commission for Africa
ECE	Economic Commission for Europe
EDF	European Development Fund
EEC	European Economic Community
EIU	Economist Intelligence Unit
ENI	Ente Nazionale Idrocarburi

Explanatory notes (cont'd)

FAO	Food and Agriculture Organization
FFHC	Freedom from Hunger Campaign
GDP	gross domestic product
GNP	gross national product
ha	hectare
IBRD	International Bank for Reconstruction and Development
ICI	Imperial Chemical Industries
IDA	International Development Association
IDC	Industrial Development Corporation of Zambia Ltd.
IMF	International Monetary Fund
kVA	kilo volt ampere
kWh	kilowatt hour
LNG	liquefied natural gas
LPG	liquefied petroleum gas
MW	megawatt
NP	nitrogen-phosphate fertilizers
NPK	nitrogen-phosphate-potassium fertilizers
OCAM	Organisation Commune Africaine et Malagache (Common Afro-Malagasy Organization)
oz.	ounces
SICAI	Società Italo Congolese Attività Industriali
SSP	single superphosphate
TSP	triple superphosphate
UDEAC	Union Douanière et Economique de l'Afrique Centrale (Central African Customs and Economic Union)
UDI	Unilateral Declaration of Independence (Rhodesia)
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
UNTA	United Nations Technical Assistance



Foreword

The purpose of this directory is to provide developing and developed countries with a concise, factual and accurate source of information in the field of fertilizer production facilities of the various regions of the world, which can be of value in the long-range planning to develop fertilizer industries wherever appropriate without the wasteful duplication of effort within each subregion.

The present volume is the first part of the directory and deals with the region of Africa. It 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 briefly illustrating the state of development of the national economies and of the agricultural and manufacturing sectors. Further volumes of the directory are in the course of preparation, covering the Asian, Latin American and Middle East regions.

Information from a variety of sources has been used in the preparation of the directory, including data published by the Food and Agriculture Organization of the United Nations, the Economic Commission for Africa, and various national and international governmental and private organizations as well as information from experts in the field and that collected by UNIDO staff members while visiting African countries. The data have been verified as far as possible with the valuable assistance from a number of Governments; the Economic Commission for Africa and the Food and Agriculture Organization to whom drafts of the directory were referred for comments.

For the purpose of analysis and comparison, the countries considered in this volume are grouped in five subregions, as follows:

North Africa: Algeria, Ifni, Libya, Morocco, the Spanish Sahara, Sudan, Tunisia and the United Arab Republic.

West Africa: Dahomey, Gambia, Ghana, Guinea, Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Portuguese Guinea, Senegal, Sierra Leone, Togo and Upper Volta.

Central Africa: Cameroon, Central African Republic, Chad, Democratic Republic of the Congo, Equatorial Guinea, Gabon and People's Republic of the Congo.

East Africa: Burundi, Ethiopia, French Territory of the Afars and Issas, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Réunion, Rhodesia, Rwanda, Somalia, Uganda, United Republic of Tanzania and Zambia.

Southern Region: Angola, Botswana, Lesotho, Namibia, South Africa and Swaziland.

The above countries and the subregions are presented in figure 1.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country or territory or of its authorities, or concerning the delimitation of the frontiers of any country or territory.

The regional data presented in this volume are summarized in a chapter following the foreword, and are followed by detailed studies of the individual countries showing the main references used.

SUMMARY OF REGIONAL DATA

The data presented in this directory dealing with individual countries in Africa are summarized and presented on a subregional basis for the northern, western, central, eastern and southern parts of the continent. Owing to the wide variations in development of the national economies, particularly the agricultural and industrial sectors, of the various parts of Africa, as well as the enormous distances involved and the attendant transport difficulties, it is considered that this approach is more meaningful and realistic than to treat the continent 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 in general exceed 2 per cent *per annum*. These figures illustrate the problems facing the developing countries of Africa caused by rapid increase in population and underline the need for the modernization of the agricultural sectors in these countries.

Table 2 attempts to illustrate the state of economic development of the subregions. The data presented show the gross domestic product (GDP) at factor cost for the countries for which reliable information was available, and the contribution of the main sectors of the economy. With a few exceptions the *per capita* income in the countries considered is less than $200, and in a number of countries, especially in the central and western regions, less than $100. The agricultural sector - traditional and modern - dominates the economy with few exceptions (notably countries with relatively developed mining sectors based on natural resources, the Maghreb region, the United Arab Republic and the Republic of South Africa). In such cases the contribution of the industrial manufacturing sector is very low.

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

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

Consumption and production of fertilizers

Tables 4 to 8 show the past and estimated projected consumption and production of the primary fertilizer nutrients (nitrogen, P_2O_5 and potash) from 1960 to 1975 for the five subregions in Africa. Table 9 shows the corresponding data for the continent of Africa as a whole. These data are also illustrated graphically in figures 2 to 7. The bases for the projections are discussed in the sections dealing with individual countries.

Considering the whole of the African continent, it would appear that the fertilizer supply position will become comfortable in the near future. By 1975 the production of nitrogen will substantially exceed the probable demand. The annual surplus of phosphate fertilizers is likely to increase from about 80,000 tons of P_2O_5 in 1965 to about 200,000 tons of P_2O_5. There is even a likelihood of a surplus of potash of about 300,000 tons per annum of K_2O by 1975. Factually the situation is likely to be far less satisfactory when considered on a regional basis (see tables 4 to 8). On this basis the real disparity between the fertilizer production and demand becomes clear. This is further discussed in detail in the following notes, arranged for convenience in terms of the main fertilizer nutrients.

Nitrogen fertilizers

The northern subregion is likely to show a substantial surplus of nitrogen fertilizers by 1975. This is due to the large units shortly coming on stream in Algeria, and later in Libya. Other major countries in this region, i.e. Morocco, Tunisia and the United Arab Republic are likely to lag behind and continue to show a shortage of nitrogenous fertilizers by 1975.

In the southern subregion the most important country by far is South Africa, where, due to the high rate of expansion of the production of synthetic ammonia and nitrogenous fertilizers, a large excess will be available for export to other markets in Africa and in the Indian Ocean area. On the other hand, the western, central and eastern regions of Africa are likely to depend on imports of nitrogenous fertilizers well into the late 1970s. The probable pattern of the development of nitrogen fertilizer industries in these regions should be considered with the background of the world market situation in mind.

Until the beginning of the 1960s most of the ammonia produced throughout the world was consumed either in captive markets or transported over relatively short distances to other local consumers by road, rail or barge. Owing to the

development of oceangoing tankers for the shipping of LPG and ammonia, the concept of large tonnage shipments of ammonia became a reality. Producers in the United States Gulf area and in Trinidad (e.g. W. R. Grace and Co.) pioneered the development of significant markets for anhydrous ammonia in Europe, Australia, Canada and Mexico, and most of the other developed nitrogen producing countries now carry out a significant trade in ammonia. For example in 1967/1968 the transatlantic shipments of ammonia from the United States reached 460,000 tons per year.

A number of developing countries with significant raw material resources are establishing or planning to establish large export-oriented ammonia plants, mainly based on associated gas from crude oil producing fields, at present being flared. This trend is becoming most noticeable in the Arabian Gulf area (Iran, Iraq, Kuwait, Qatar and Saudi Arabia), Latin America (where Venezuela will have by the mid 1970s an ammonia production capacity of some 1.2 million tons per annum based on natural gas from Lake Maracaibo area) and Africa (Algeria, Libya, South Africa and possibly Mozambique).

In several areas of the world, e.g. in Latin America and Africa (Senegal and Mozambique, to be followed by Ivory Coast and possibly Angola), plants are or will be in operation based on imported anhydrous ammonia and in 1970/1971 a first large-scale nitrogen fertilizer complex based on imported ammonia (250,000 tons per annum of ammonia supplied from the Arabian Gulf) will start operation in Turkey. Some fertilizer plants in India will be using imported ammonia from Iran and other sources.

Owing to a number of new large units for the production of both ammonia and nitrogenous fertilizers (e.g. urea) and the factors described above, the world market prices for these products have been steadily weakening. As the result of these trends the most outstanding features of this sector of industry have been: the growth of the importance of using cheap sources of feedstocks for ammonia manufacture, i.e. natural gas and refinery gases; the growing world shortage of naphtha; and the need to operate plants of increasing capacities with their associated economies of scale. For example, whereas in 1966/1967 there were only nine ammonia plants with 1,000 tons per day or more single stream capacity, the number of such units is scheduled to increase by 1972/1973 to more than sixty, representing about 30 per cent of the world capacity.

On the other hand, several major markets in Asia (i.e. China (mainland), India, Indonesia and Pakistan) will play an important role in determining the

supply-demand pattern during the period up to 1975, moving towards self-sufficiency in nitrogen fertilizer production, while the exports from Japan are likely to remain substantial and the production in the USSR and Eastern European countries are showing a dramatic upsurge. (In Eastern Europe the total ammonia capacity has increased from about 3.8 million tons per annum of nitrogen in 1963/1964 to about 10 million tons per annum of nitrogen in 1968/1969.)

Bearing in mind the probable future supply-demand pattern for ammonia and nitrogenous fertilizers (persistently a buyer's market), changes in technology, the need for cheap feedstocks and fuels, and the increasing minimum economic plant size, a number of conclusions can be drawn as to how nitrogenous fertilizer manufacture should develop in the developing African countries, e.g.:

In view of the expected level of prices for ammonia and nitrogenous fertilizers bulk delivered c.i.f. African port, the manufacture of fertilizer intermediates, such as ammonia and nitric acid, should be based only on locations where abundant reserves of suitable feedstocks exist (e.g. proximity to natural gas supplies or a refinery of suitable size). Examples of countries in Africa where such prerequisites exist are Algeria, Gabon, Libya, Mozambique, Nigeria, South Africa and the United Arab Republic. The Lake Kivu reserves of methane can also be developed, but on a much more limited scale, to feed the internal markets of Burundi, the Democratic Republic of the Congo (Kinshasa) and Rwanda. Such facilities should be located with easy access to deep sea channels to reduce handling and shipping costs.

Owing the the limitations of domestic markets in the developing countries of Africa (with the possible exceptions of the South African Republic and the United Arab Republic) such operations would be supported to a large extent by export markets. Because of the world market situation, the majority of such exports must be directed to neighbouring countries in Africa. For this reason establishment of regional co-operation is absolutely necessary for the success of such projects.

Countries that do not have suitable raw materials for the manufacture of ammonia should initially establish their nitrogenous fertilizer operations based on imported ammonia. This is due to the limitation of their domestic markets and the attendant undesirability of establishing ammonia production facilities on an uneconomical scale. A number of African countries (e.g. Ivory Coast, Morocco and Senegal) are moving in this direction. In such cases imports of ammonia on the basis of bilateral agreements would be desirable possibly on a barter basis from African countries themselves.

Smaller countries of Africa, especially in the western and central regions, should establish their fertilizer manufacturing industries on the basis of NPK blending plants using imported fertilizer intermediates.

Phosphatic fertilizers

Considering the over-all African supply-demand pattern for phosphatic fertilizers, it would appear that the continent has reached self-sufficiency in recent years. This, however, is a misleading picture of the situation. As in the case of the nitrogenous fertilizer industry, deficits in the majority of countries are offset by surpluses in export-oriented industry in a limited number of countries, tied to local deposits of phosphate rock. This is most noticeable in the northern subregion in Africa where Morocco, Tunisia and to a lesser extent Algeria and the United Arab Republic are the major world producers and exporters of phosphate rock and are expanding their largely export-oriented phosphate fertilizer production.

On a more modest scale similar developments are taking place in Tanzania, Togo and Uganda, where phosphate fertilizer production is available, as in Uganda, or is planned to be available for export to neighbouring countries. On the other hand, South Africa has already reached self-sufficiency in this respect, the country's production of phosphate fertilizer being based primarily on local rock deposits. The position in Rhodesia is similar. The United Arab Republic is planning to ship some of the output from the planned complex at Aswan (based on electric furnace phosphorus) to India, probably for a transitional period. Other countries are establishing or planning to establish phosphate fertilizer production on a small scale consistent with their domestic market requirements. They include Senegal (based on Taiba rock deposits), Ivory Coast, and at a later stage Ghana and Nigeria (all based on Togo phosphate rock supplies) and Mozambique. Other countries in Africa with either very limited domestic requirements or lacking indigenous raw materials do not possess the necessary prerequisites for economic manufacture of phosphatic fertilizers solely on the national scale.

With the world-wide build-up of phosphate rock mining capacity, which is expected to exceed 100 million tons in the early 1970s, and which will probably outpace the availability of sulphur, the likely results will be increased competition for world markets, lower operating rates and a softening of prices. A number of African countries are now leading producers and exporters of

phosphate rock, as can be seen from the international statistics for the first quarter of 1969:

	Phosphate rock exports January-March 1969 (thousand tons)
Algeria	80
Florida	2,040
Israel	270
Jordan	230
Morocco	2,350
Nauru, Ocean and Christmas Islands	880
Senegal (Taiba)	220
Togo	420
Tunisia	550
United Arab Republic	60

With this world market situation in mind, the following conclusions can be reached as relating to the development of the phosphate fertilizer manufacturing industry in Africa.

Production facilities should be based on local phosphate rock deposits and located within easy reach of shipping facilities, i.e. deep water channels and railways.

Regional co-operation on a bilateral or multilateral basis should be promoted to facilitate operations on an economic scale. This is especially important in cases of countries where the domestic market limitations preclude economic production during the foreseeable future, e.g. the western, central and southern regions (apart from the Republic of South Africa). In this way, shipment of intermediate products to local NPK blending plants servicing individual countries would be possible.

Agreements between countries to share the production of various types of fertilizers (e.g. nitrogenous, phosphate and potash) on a barter basis should be promoted. Such developments are already beginning to take place (Libya and Tunisia) and should be further promoted in East Africa and the West African countries.

Wherever possible, export of phosphate rock could be combined with production and export of high analysis phosphatic fertilizers or phosphoric acid using imported sulphur.

Potash fertilizers

At present there is no production of potash in Africa and the demand is met by imports. There are known deposits in a number of locations, in the

People's Republic of the Congo, Ethiopia and Libya, with favourable indications in the Democratic Republic of the Congo and Guinea.

Exploration of the reserves in the People's Republic of the Congo is scheduled to commence in the early 1970s, followed by the mining of potash from the Danakil deposit in Ethiopia at a later date. It is unlikely that the other potash deposits will be exploited before 1975. The demand by the remaining African countries will have to continue to be met by imports.

When planning the development of the potash mining operations in the People's Republic of the Congo and in Ethiopia, the world market trends will have to be carefully considered. Although the world demand for potash fertilizers has been growing at a steady rate of about 7 per cent per year during the last two to three years, the potash market has been over-supplied during the period 1966-1968. At the same time the steady increase in the potash production in Canada, the German Democratic Republic and the USSR caused weakening of the market in 1967-1968. The Canadian mining capacity is scheduled to double during the next few years to exceed 5 million tons of K_2O. This situation will not be improved by the appearance of large quantities of African mined potash on the world markets and will require a great deal of market development both within Africa and on world markets to absorb these additional supplies.

However production of potash in Africa, if and when developed, may benefit to a certain extent from being closer to some major consuming countries such as India and China (mainland) with corresponding reduction in shipping costs.

Sulphur

There are no known substantial deposits of elemental sulphur in Africa. There are favourable indications of sulphur in Ethiopia (Dallol) and Angola, which are not as yet proved, and only the United Arab Republic is producing a small annual tonnage of native sulphur.

On the other hand, several countries in Africa have proved deposits or favourable indications of pyrites, including Algeria, the Democratic Republic of the Congo, Malawi, Mauritania, Morocco, Rhodesia, South Africa, United Republic of Tanzania, Uganda and Zambia. The only large-scale producers of pyrites are South Africa, followed by Rhodesia, Algeria and Morocco. The substantial balance of the sulphur requirements of the continent has been supplied by imports and to a lesser extent by the production of recovered

sulphur (South Africa and the United Arab Republic). The imports of sulphur in 1967 and 1968 by all African countries were as follows, in tons of sulphur:

	1967	1968
Total Africa	230,000	290,000
South Africa	110,000	170,000

The main suppliers were France, Canada and to a lesser extent the United States and Mexico.

The position in the future is likely to remain basically unchanged as the indigenous supplies of sulphur in all forms are likely to be insufficient and will have to be supplemented by imports on a substantial scale. The world supply of sulphur is likely to continue to increase due to the emergence of a number of new production centres, e.g. Poland, the Middle East and Japan (recovered sulphur), and expansion of production in others (Canada), resulting in weakening of prices. It is unlikely that the shortage of sulphur experienced during the period 1964-1968 will recur in the foreseeable future.

Availability of fertilizer feedstocks and fuels

Table 10 indicates the available indicated reserves, the probable grades and the rates of production of the raw materials and fuels for fertilizer manufacture, including crude oil, natural gas, coal, phosphate rock, potash, sulphur and pyrites. The location and capacities of petroleum refineries are also indicated. The impact of these sources of fertilizer feedstocks on the establishment and expansion of a fertilizer manufacturing industry in Africa has already been mentioned in a previous section of this chapter and will be discussed in greater detail in the sections dealing with individual countries.

Factors limiting the extension of fertilizer use in Africa

There are several factors impeding the development of the fertilizer markets in the developing countries of Africa. Some of these problems are of a general nature but the others are more specific to African conditions, e.g.:

Lack of suitable rainfall or supply of irrigation water;

Use of traditional seed varieties which often do not show economic response to the fertilizer application;

Lack of disease and pest control measures and practices;

Lack of adequate inland transportation facilities in several developing countries, especially in the western and central regions, e.g. road, railway or developed water transport facilities;

Lack of a fertilizer and farm crop distribution system;

Lack of adequate supplies of fertilizers and of credit facilities to enable farmers, who as a general rule have a very limited spending power, to use fertilizers;

Tenure systems still existing in wide areas of tropical Africa, which generally tend to discourage the use of new agricultural techniques;

Lack of information on fertilizer application techniques combined with the reluctance on the part of the farmers to adopt new agricultural techniques.

In order to promote further the application of fertilizers, the use of a number of measures will have to be extended. Action on this front necessarily requires government participation and includes further expansion of agricultural extension work, development of an effective pricing and distribution system for farm crops and farming inputs such as fertilizers, and the development of a system of farm credits and government subsidies. In this connexion, the work of the Food and Agriculture Organization under the Freedom from Hunger Campaign (FFHC) is playing a major role in the proper utilization of fertilizers in Africa.

Figure 1

Map of Africa

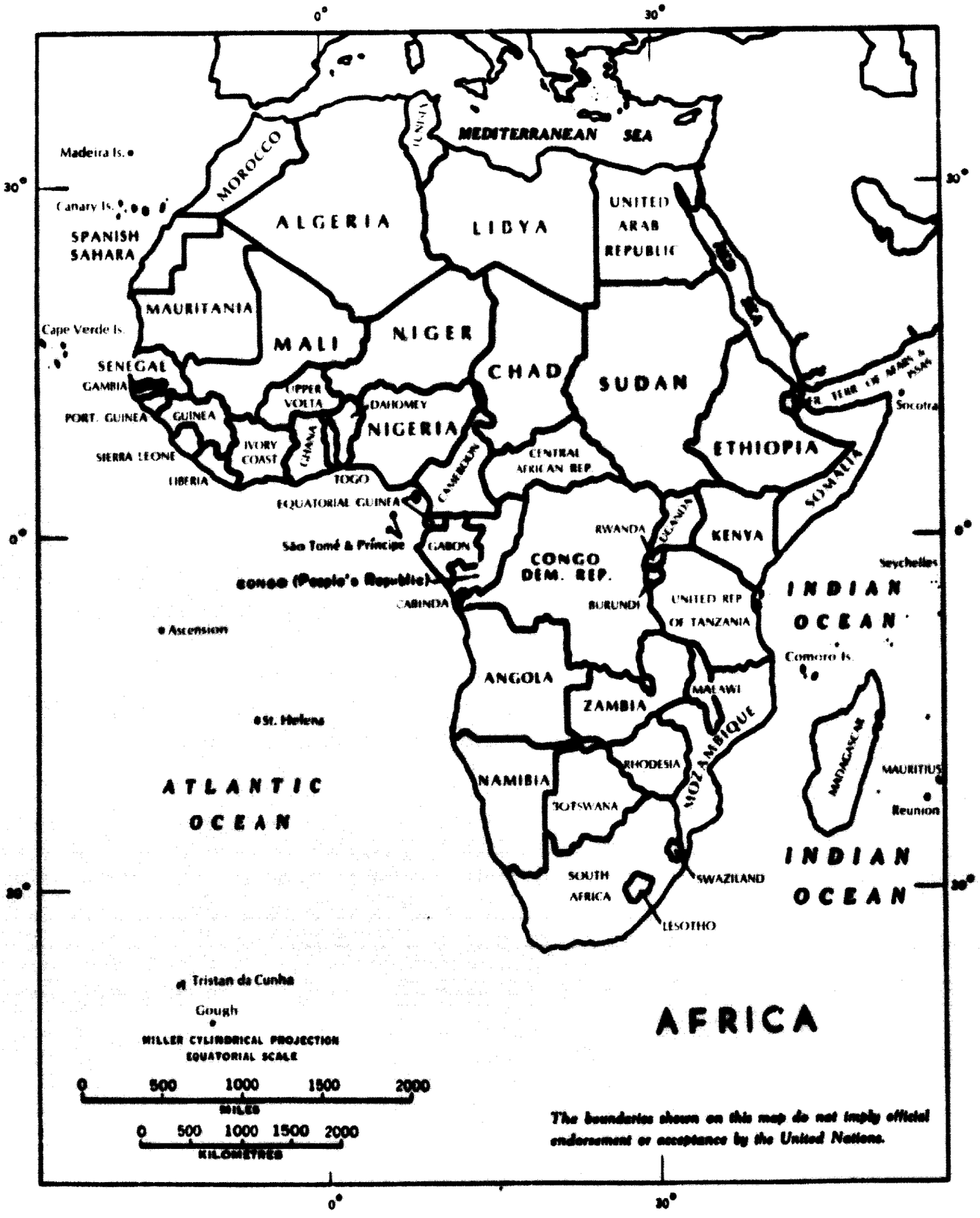


Table 1

Areas and population of Africa, by regions and countries

	Area (thousand km^2)	Population	
		Millions	Average annual growth rate (percentage)
North Africa			
Algeria	2,380	12	...
Ifni	1.3	0.52	...
Libya	1,750	1.7	3.7
Morocco	450	13.7	3.2
Spanish Sahara	266	0.24	...
Sudan	2,500	13	2.8
Tunisia	125	4.7	2
United Arab Republic	1,000	30.9	2.8
West Africa			
Dahomey	112.8	2.2	2.8
Gambia	1.4	0.34	3
Ghana	238	8	2.7
Guinea	246	4	2.5-3
Ivory Coast	322	3.5	2.6
Liberia	110	1.1	1.5
Mali	1,204	5	2.4
Mauritania	419	1.1	1.7
Niger	1,300	3.5	2.7
Nigeria	912	58	2.5
Portuguese Guinea	36.1	0.52	2
Senegal	200	3.5	2.5
Sierra Leone	72.3	2.2	1.1
Togo	56	1.7	2.8
Upper Volta	274	5.2	2
Central Africa			
Cameroon	475	5	2
Central African Republic	617	1.3	1.2
Chad	1,284	3.3	1.5-2.5
Congo (Dem.Rep.of)	2,350	17	2.5

Table 1 (cont'd)

	Area (thousand km^2)	Population	
		Millions	Average annual growth rate (percentage)
Central Africa (cont'd)			
Equatorial Guinea	28	0.25	...
Gabon	267	0.5	0.6
People's Republic of the Congo	343	0.9	2
East Africa			
Burundi	28	3.3	...
Ethiopia	1,100	22	1.6
French Territory of Afars and Issas	23	0.1	2.5
Kenya	579	9.8	3
Madagascar	588	6.5	2.6
Malawi	120	4	3
Mauritius	1.9	0.77	2.7
Mozambique	783	6.6	2
Réunion	2.5	0.35	...
Rhodesia	* 388.4	3.9	2.5
Rwanda	23.6	3.3	3
Somalia	638	2.5	1.5
Uganda	236.5	7.7	2.7
United Republic of Tanzania	939.8	10.5	2.2
Zambia	752.6	3.8	2.8
Southern Region			
Angola	1,246	5	2
Botswana	570	0.57	3
Lesotho	30.3	0.74	3
Namibia	823	0.52	...
South Africa	1,200	18.5	2.5
Swaziland	17.4	0.4	...

Table 2

Gross domestic product of Africa, by regions and countries

	GDP (million $)	Per capita income ($)	Percentage distribution of GDP		
			Agriculture	Mining	Industry and commerce
North Africa					
Algeria	...	...	23	3	13
Libya	...	...	23	8	12
Morocco	...	180	35	6.6	15
Sudan	...	71-100	57	0.1	5
Tunisia	220	180	18	18	...
United Arab Republic	4,700	150	27	23	30
West Africa					
Dahomey	180	70-100	very low	...	...
Gambia	1,798	95	...	...	...
Ghana	2,500	200	70	...	...
Guinea	240	70-100	50	...	...
Ivory Coast	1,100	266	...	...	...
Liberia	317	290	19	29	...
Mali	300	51-70	57	negl.	...
Niger	280	51-70	...	...	...
Nigeria	4,500	71-100	58	11	11
Senegal	800	190	36	...	37
Sierra Leone	270	120	40	23	...
Togo	175	95	50	...	33
Upper Volta	240	50	...	...	...
Central Africa					
Cameroon	1,100	80	55	10	
Central African Republic	100	60	49	12	
Chad	240	51-70	70	10	
Congo (Dem. Rep. of)	1,300	83.6	21.5	15.2	16.1
Gabon		100	29	33	
People's Republic of the Congo		100	37	21	

Table 2 (cont'd)

	GDP (million $)	Per capita income ($)	Percentage Distribution of GDP		
			Agriculture	Mining	Industry and commerce
East Africa					
Ethiopia	1,400	50	60	...	14
Kenya	1,100	100	40	...	11.5
Madagascar	700	112	35	10	...
Malawi	200	50	...	...	...
Mauritius	170	220	...	...	7
Rhodesia	1,000	150	...	...	...
Rwanda	62	...	70[a/]	2	...
Somalia	125	50	...	...	...
Uganda	...	113	60	2.7	28
United Republic of Tanzania	770	78	53	2.6	5
Zambia	900	240	10	50	6.6
Southern Region					
Lesotho	50	60	...	....	...
South Africa	9,600	...	10	13	21

a/ Including livestock.

Table 3

Cultivated land area and main crops in Africa, by regions and countries

	Cultivated land area as percentage of total area	Main crops in thousand tons											
		Cereals	Rice	Tea	Coffee	Cocoa	Oil-seeds	Rubber	Fruit	Sugar	Sisal	Cotton	Tobacco
North Africa													
Algeria	3.5	1,520	some	-	-	-	-	-	some	-	-	-	-
Libya	0.3	160	-	-	-	-	some	-	some	-	-	-	-
Morocco	17.0	2,818	-	-	-	some	-	-	some	-	-	some	-
Sudan	2.8	2,200	-	-	-	-	112	55.7	-	-	-	550	-
Tunisia	40.0	900	-	-	-	-	some	-	some	-	-	-	-
United Arab Republic	3.5	2,600	2,300	-	-	-	-	-	400	6,000	-	-	-
West Africa													
Guinea	...	1,000 to 1,400	350	-	6 to 16	-	some	-	some	imports	-	-	-
Ivory Coast	5.0	950	import	-	250	140	-	a/	200	-	-	50	-
Liberia	...	200	180	-	4	some	some	60	55	-	-	-	-
Mali	1.5	850	185	-	-	-	110	-	-	-	-	[illegible]	-
Nigeria	27.0	7,800	-	-	-	260	1,200	-	-	-	-	150	-
Senegal	27.0	500	100	-	-	-	800	-	-	28[illegible]	-	[illegible]	-
Sierra Leone	...	70	400	-	6	3	50	-	-	-	-	-	-
Togo	15.5	100	some	-	10.4	8.3	23.4	-	-	-	-	[illegible]	-

a/ Projected latex production 10,000 tons.

Table 3 (cont'd)

	Cultivated land area as percentage of total area	Main crops in thousand tons											
		Cereals	Rice	Tea	Coffee	Cocoa	Oil-seeds	Rubber	Fruit	Sugar	Sisal	Cotton	Tobacco
Central Africa													
Cameroon	4.0	700	some	-	60	80	105	-	110	-	-	60	-
Central African Republic	...	330	7	-	10	-	80	-	-	-	-	30	-
Congo (Dem.Rep.of)	1.0	95	65	-	80	4.5	350	-	-	31	-	45	-
Gabon	1.3	some	-	-	some	-	-	-	some	-	-	-	-
People's Republic of the Congo	2.0	4.6	4.4	-	some	some	some	-	-	-	-	-	-
East Africa													
Burundi	22.0	250	2	-	19	-	4.2	-	1,278	-	-	8	-
Ethiopia	22.0	5,000	-	-	400	-	370	-	-	900	-	14	-
Kenya	3.0	490	25	-	47	-	14	-	20	800	50.9	some	-
Madagascar	3.0	900	580	-	55.5	-	30	-	some	1,000	20	13	-
Malawi	16.0	100	5	15	-	-	50	-	-	18.2	-	1.5	15
Mauritius	50.0	900	-	2.2	-	-	970	-	-	614	-	-	-
Mozambique	2.5	...	30	8	-	-	119	-	-	200	30	40	-
Rhodesia	4.6	1,000	-	1.6	-	-	-	-	-	226	-	-	137
Ruanda	30.0	410	-	0.5	11	-	15.8	-	1,500	-	-	-	-
Uganda	19.0	some	some	11	213	-	115	-	-	135	-	240	-
United Republic of Tanzania	10.0	32.8	37.7	6.7	18.6	-	81.2	-	-	69.9	222	77.6	5.2
Zambia	2.5	some	some	-	-	-	18.2	-	-	some	-	2.7	6.6

Table 3 (cont'd)

	Cultivated land area as percentage of total area	Main crops in thousand tons											
		Cereals	Rice	Tea	Coffee	Cocoa	Oil-seeds	Rubber	Fruit	Sugar	Sisal	Cotton	Tobacco
Southern Region													
Angola	0.8	some	-	-	120	some	-	15	-	75	50	-	-
South Africa	10.0	5,700	-	-	-	-	some	-	-	900	-	-	20

Table 4

Annual consumption and production of fertilizer nutrients in North Africa, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	226,975	350,600	514,000	739,000
	Production	55,024	154,000	250,000	1,155,000
	Deficit	171,951	196,600	264,000	-
	Surplus	-	-	-	416,000
P_2O_5	Consumption	90,200	108,100	240,000	398,000
	Production	122,800	236,700	486,000	755,000
	Deficit	-	-	-	-
	Surplus	32,600	128,600	246,000	357,000
K_2O	Consumption	28,510	36,000	73,000	132,000
	Production	-	-	-	-
	Deficit	28,510	36,000	73,000	132,000
	Surplus	-	-	-	-

Figure 2

Annual consumption and production of fertilizer nutrients in North Africa, 1960 to 1975

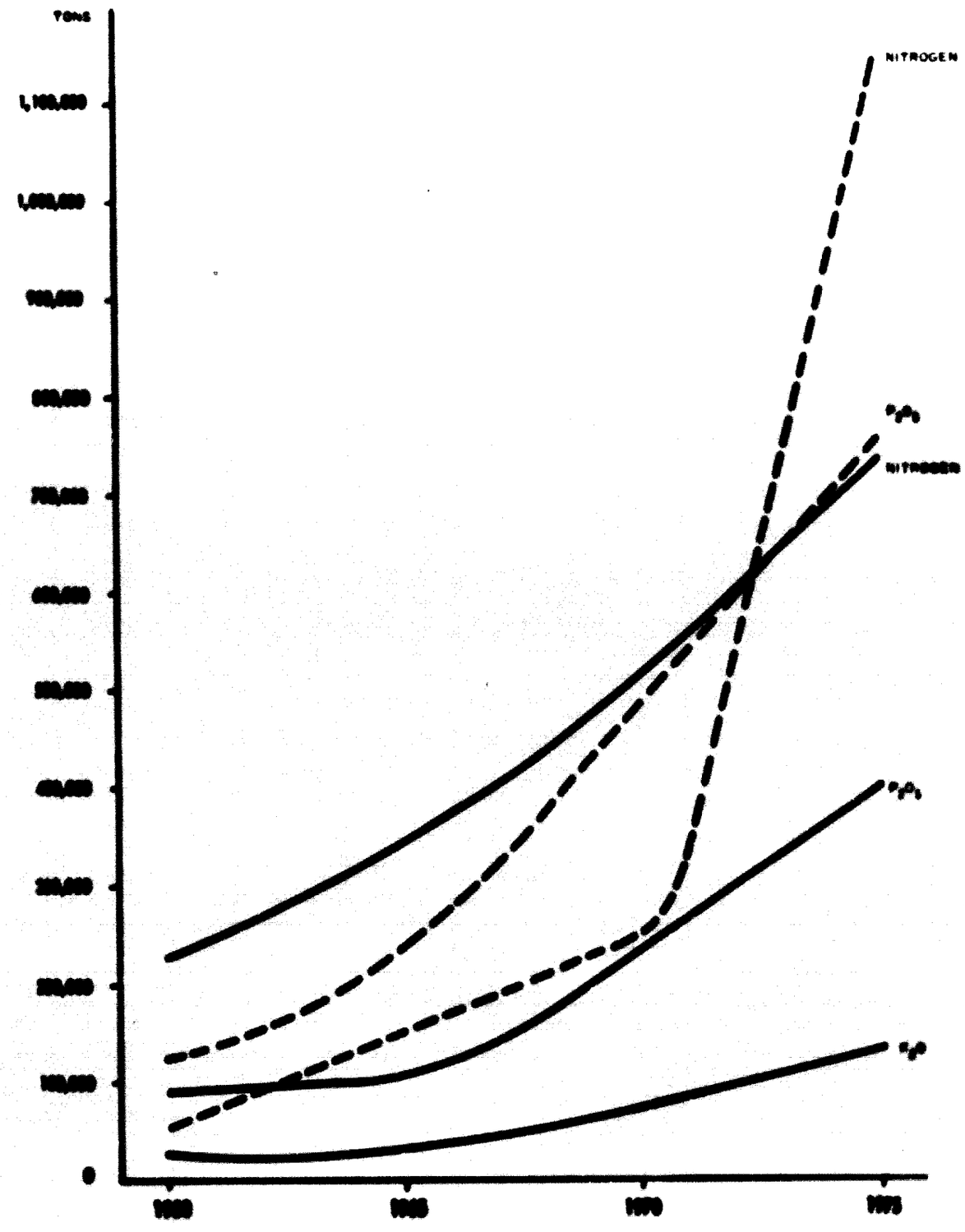


Table 5

Annual consumption and production of fertilizer nutrients in West Africa, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	4,253	12,800	45,350	101,500
	Production	-	-	6,500	28,000
	Deficit	4,253	12,800	38,850	73,500
	Surplus	-	-	-	-
P_2O_5	Consumption	8,825	18,200	54,000	118,500
	Production	-	-	12,000	30,100
	Deficit	8,825	18,200	42,000	88,400
	Surplus	-	-	-	-
K_2O	Consumption	8,150	18,000	40,700	92,400
	Production	-	-	-	-
	Deficit	8,150	18,000	40,700	92,400
	Surplus	-	-	-	-

Figure 3

Annual consumption and production of fertilizer nutrients in West Africa, 1960 to 1975

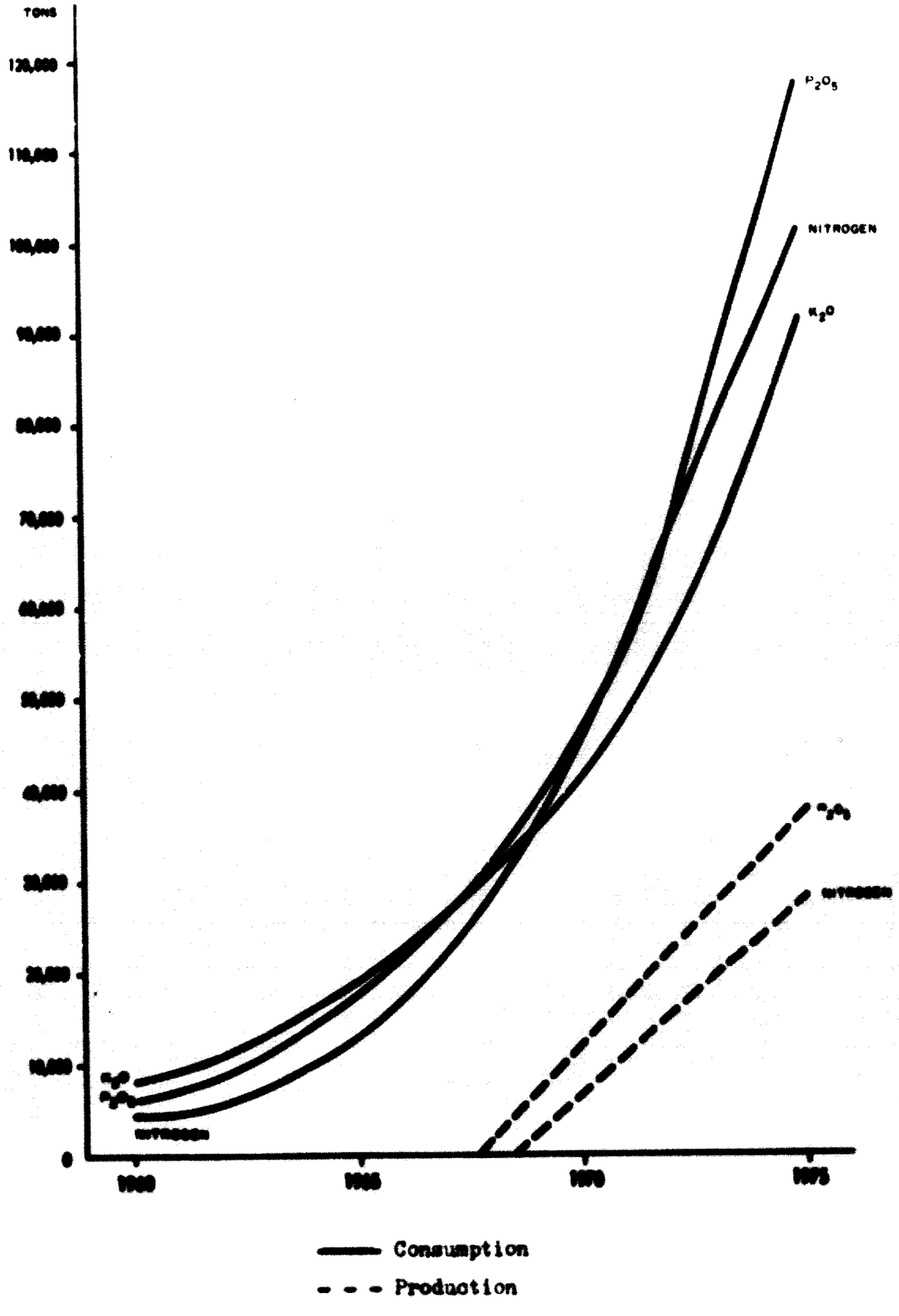


Table 6

Annual consumption and production of fertilizer nutrients in Central Africa, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	2,400	5,900	21,250	47,300
	Production	-	-	-	-
	Deficit	2,400	5,900	21,250	47,300
	Surplus	-	-	-	-
P_2O_5	Consumption	740	1,700	7,460	14,700
	Production	-	-	-	-
	Deficit	740	1,700	7,460	14,700
	Surplus	-	-	-	-
K_2O	Consumption	2,900	7,500	13,950	24,200
	Production	-	-	-	500,000
	Deficit	2,900	7,500	13,950	-
	Surplus	-	-	-	475,800

Figure 4

Annual consumption and production of fertilizer nutrients in Central Africa, 1960 to 1975

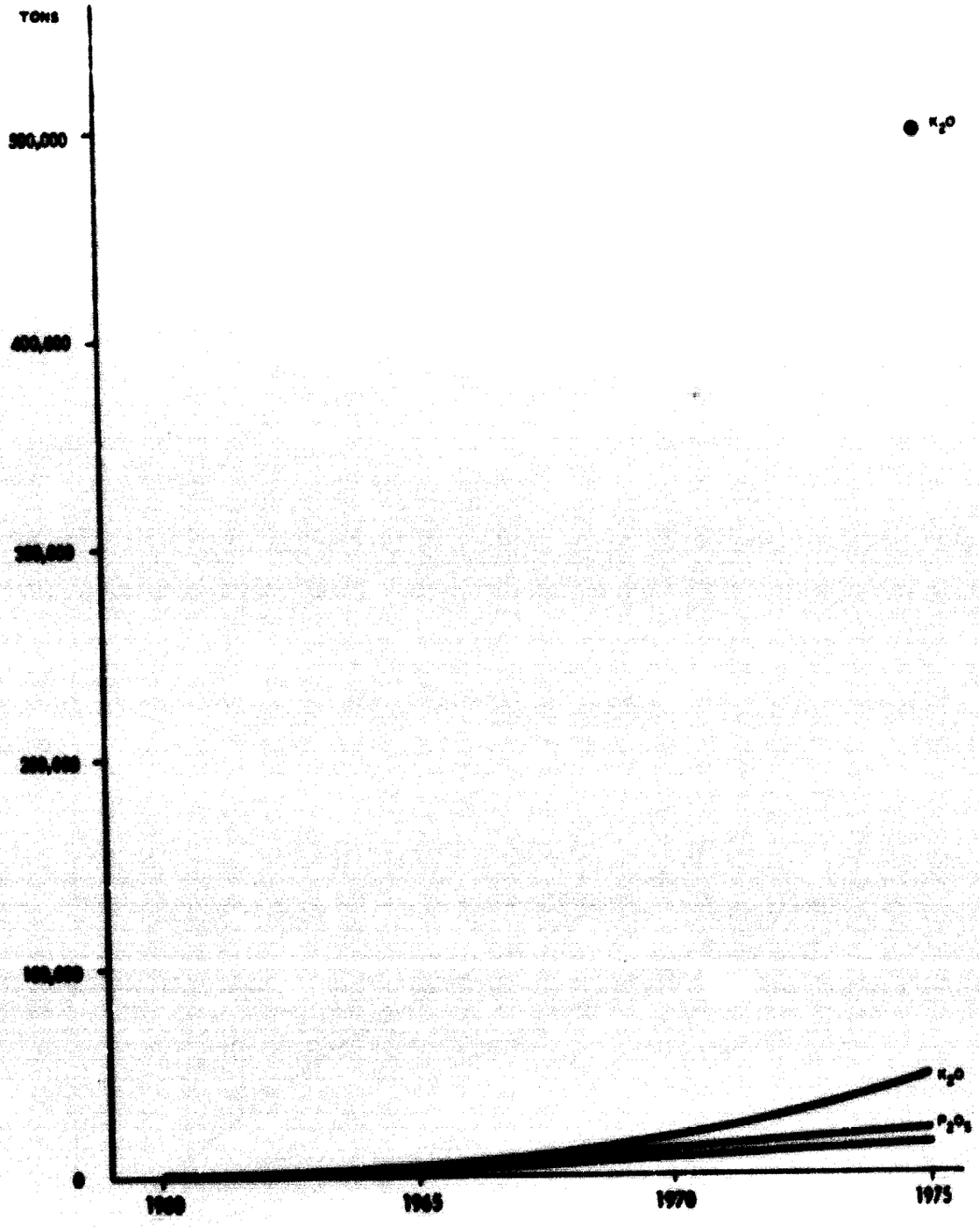


Table 7

Annual consumption and production of fertilizer nutrients in East Africa, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	20,528	94,700	146,000	195,200
	Production	-	150	19,150	124,500
	Deficit	20,528	94,550	126,850	70,700
	Surplus	-	-	-	-
P_2O_5	Consumption	13,587	61,900	111,350	146,750
	Production	-	40,900	50,700	103,900
	Deficit	13,587	21,000	60,650	42,850
	Surplus	-	-	-	-
K_2O	Consumption	10,531	30,800	71,600	99,500
	Production	-	-	-	380,000
	Deficit	10,531	30,800	71,600	-
	Surplus	-	-	-	280,500

Figure 5

Annual consumption and production of fertilizer nutrients in East Africa, 1960 to 1975

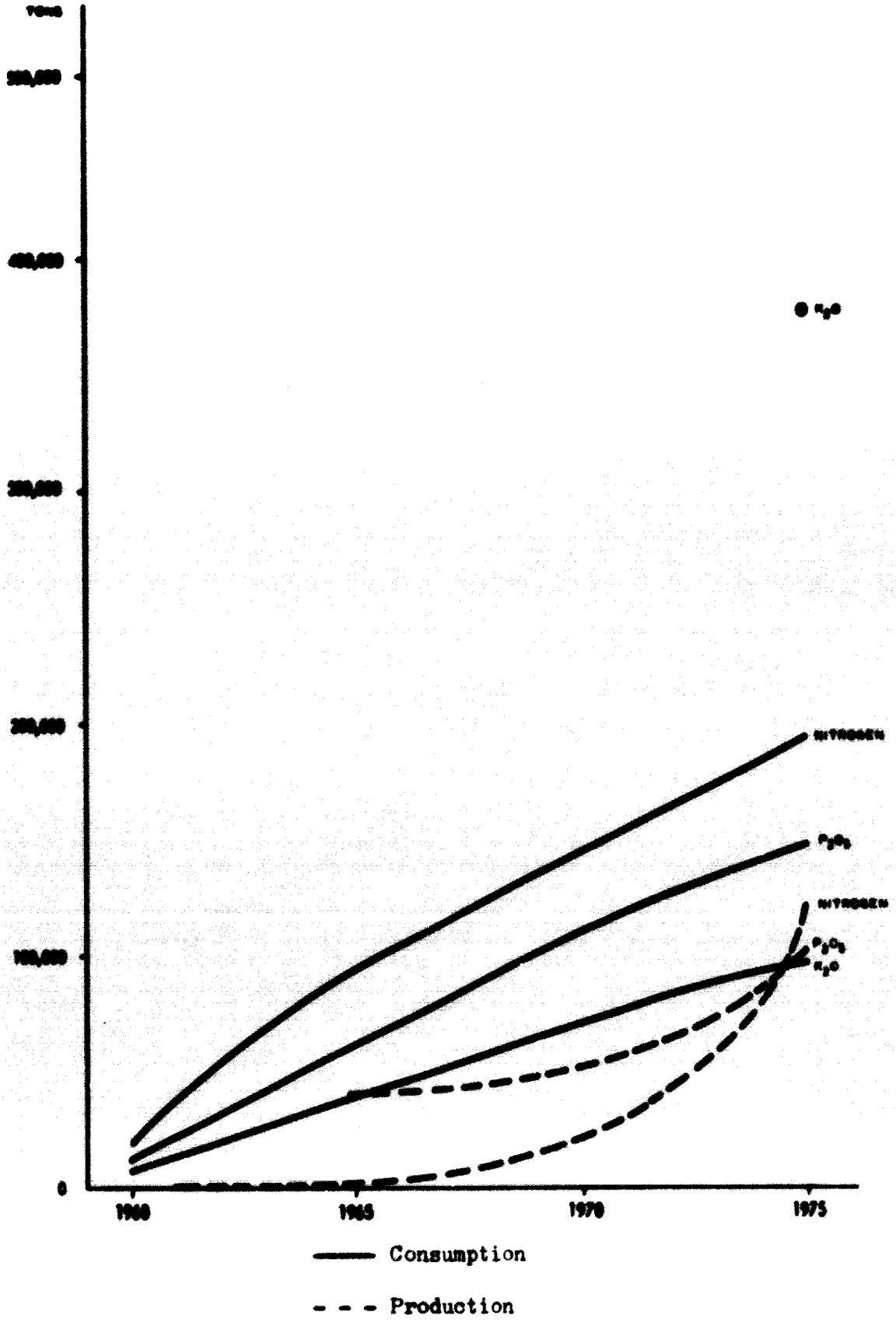


Table 8

Annual consumption and production of fertilizer nutrients in the Southern Region, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	48,100	106,300	196,100	329,300
	Production	22,000	75,000	325,000[a/]	500,000[a/]
	Deficit	26,100	31,300	-	-
	Surplus	-	-	128,900[a/]	170,700[a/]
P_2O_5	Consumption	145,400	192,800	365,500	511,500
	Production	136,000	184,500	360,000	500,000
	Deficit	9,400	8,300	5,500	11,500
	Surplus	-	-	-	-
K_2O	Consumption	33,400	76,800	141,650	203,100
	Production	-	-	-	-
	Deficit	33,400	76,800	141,650	203,100
	Surplus	-	-	-	-

a/ Includes nitrogen for non-fertilizer uses, e.g. explosives manufacture.

Figure 6

Annual consumption and production of fertilizer nutrients in the Southern Region, 1960 to 1975

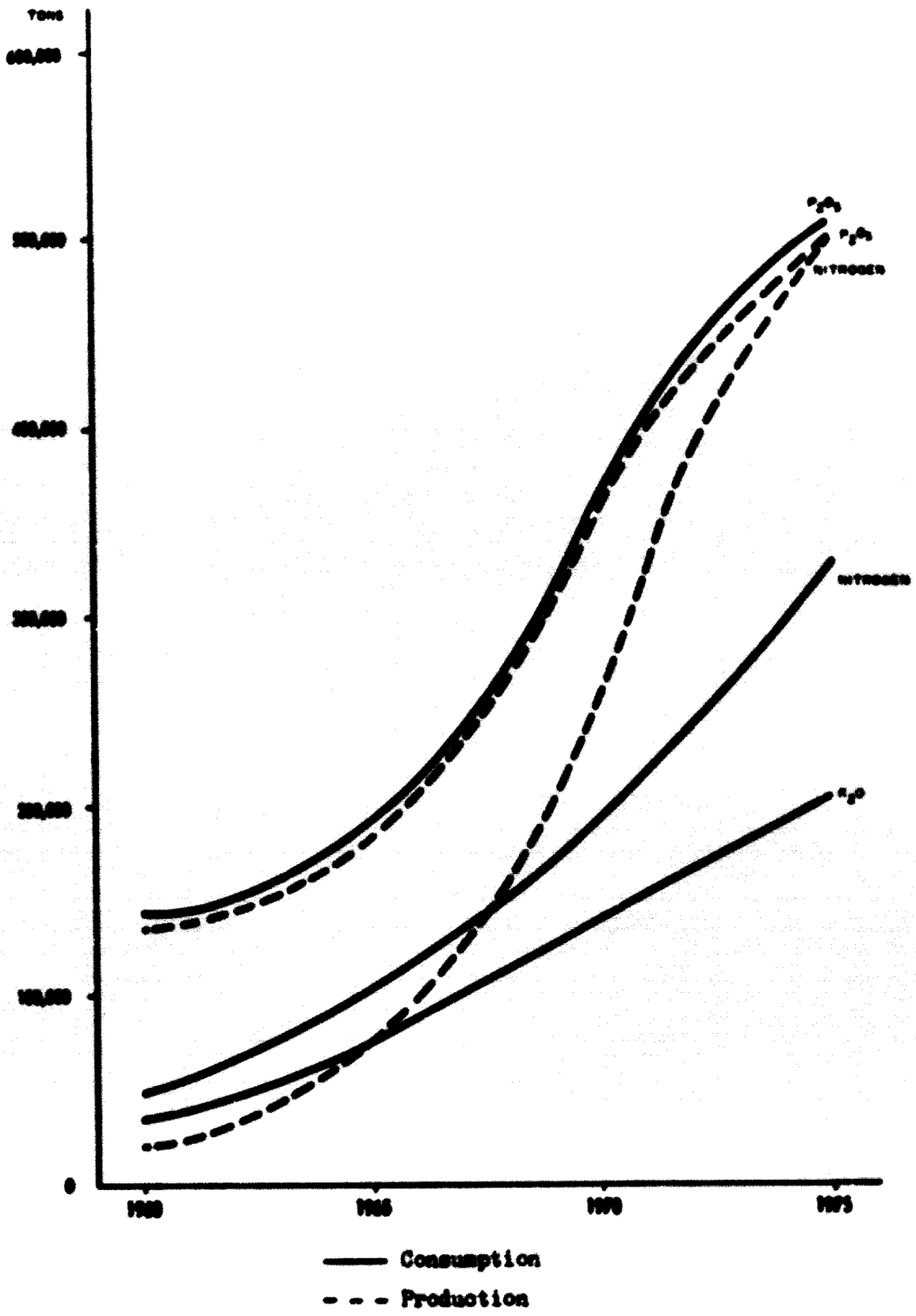


Table 9

Annual consumption and production of fertilizer nutrients in Africa, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	302,256	570,300	922,700	1,412,300
	Production	77,024	229,150	600,650[a]	1,807,500[a]
	Deficit	225,232	341,150	322,050	-
	Surplus	-	-	-	395,200[a]
P_2O_5	Consumption	256,752	382,700	778,910	1,189,400
	Production	258,800	462,100	908,700	1,397,000
	Deficit	-	-	-	-
	Surplus	2,048	79,400	129,790	207,600
K_2O	Consumption	83,500	178,500	340,900	561,200
	Production	-	-	-	880,000
	Deficit	83,500	178,500	340,900	-
	Surplus	-	-	-	328,800

a/ Includes nitrogen for non-fertilizer uses in South Africa, e.g. explosives manufacture.

Figure 7

Annual consumption and production of fertilizer nutrients in Africa, 1960 to 1975

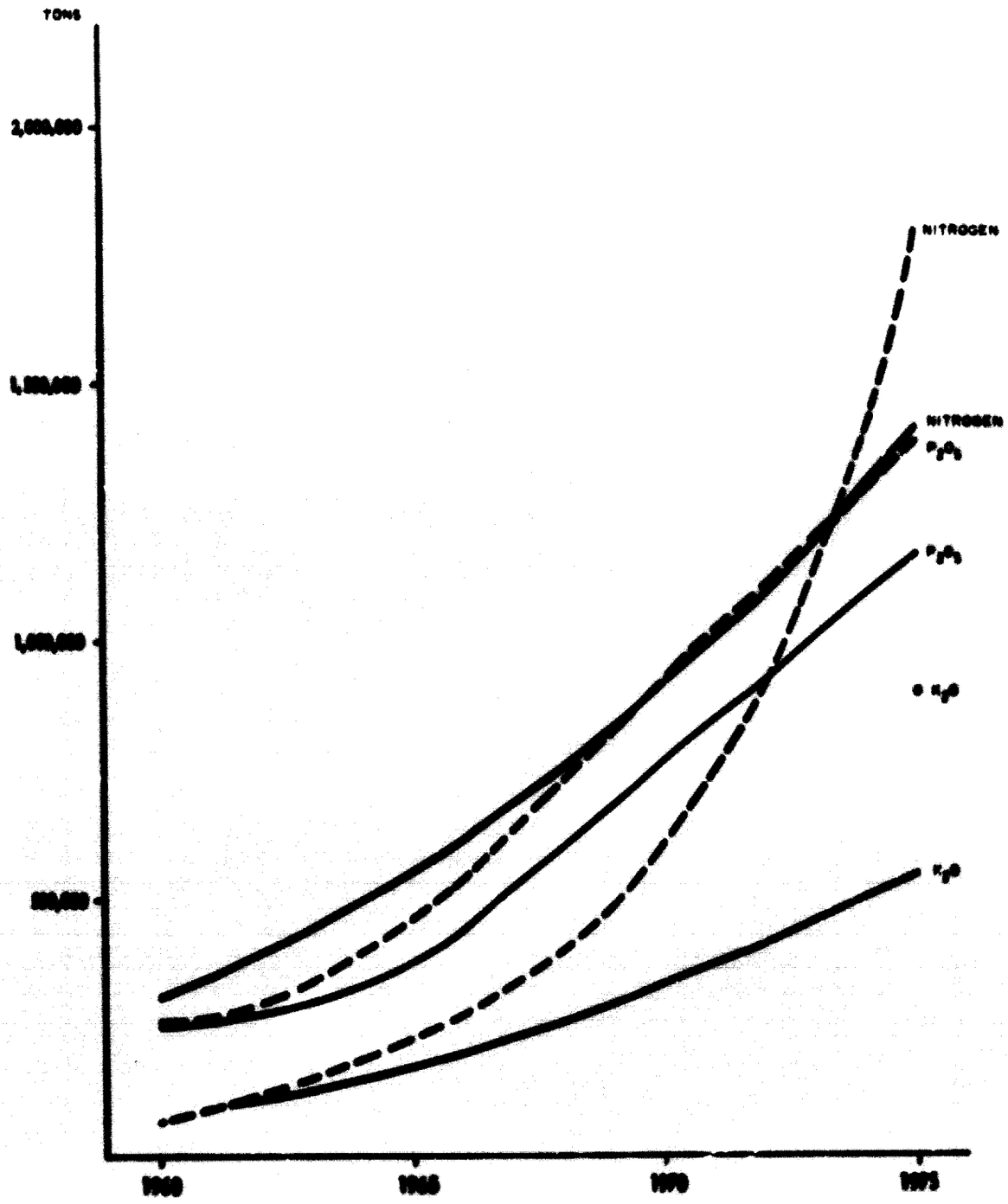


Table 10

Availability of fertilizer feedstocks in Africa, by regions and countries

(a) Natural gas and coal and lignite

	Natural gas				Coal and lignite		
	Total proved and probable reserves		Annual production		Total proved and probable reserves (millions of tons)	Annual production	
	Year	Billions of m^3	Year	Millions of m^3		Year	Thousands of tons
North Africa							
Algeria	1966	1,800	1967/68	2,100 export	20	1966/67	45
Libya	1967	420	1969 1970	start up 3,000 export	-	1966/67	-
Morocco		0.5	1966/67	11	95	1966/67	400
Tunisia	1967	0.1	1966/67	8	-	1966/67	-
United Arab Republic		21	1966/67	2,000	50	1966/67	20
West Africa							
Niger		-	1966/67	-	Indications	1966/67	-
Nigeria		about 2,500	1966/67	3,000 (used 170, flared 2,830)	350	1966/67	650
Senegal		Indications	1966/67	-	-	1966/67	-
Central Africa							
Cameroon		0.4	1966/67	-	-	1966/67	-
Congo (Dem. Rep. of)		-	1966/67	-	900	1966/67	100
Gabon		3	1966/67	11	-	1966/67	-
People's Republic of the Congo	1965	0.4	1966/67	-	-	1966/67	-

Table 10 (cont'd)

	Natural gas				Coal and lignite		
	Total proved and probable reserves		Annual production		Total proved and probable reserves (millions of tons)	Annual production	
	Year	Billions of m^3	Year	Billions of m^3		Year	Thousands of tons
East Africa							
Ethiopia		-	1966/67	-	10 (indicated)	1966/67	-
Madagascar		-	1966/67	-	coal 60 (indicated) lignite 18 (indicated)	1966/67	2
Malawi		-	1966/67	-	160 (indicated)	1966/67	-
Mozambique		...	1966/67	-	700 (indicated)	1966/67	250
Rhodesia		-	1966/67	-	6,000	1966/67	3-3,500
Ruanda		50 (24% CH_4)	1966/67	-		1966/67	-
United Republic of Tanzania		-	1966/67	-	190 (recoverable)	1966/67	3
Zambia		-	1966/67	-	17	1969	500
Southern Region							
Angola		-	1966/67	-	8		...
South Africa		-	1966/67	-	60,000	1966/67	50,000
Swaziland		-	1966/67	-	5,000 (estimated)	1966/67	30

Table 10 (cont'd)

(b) Crude oil and refineries

	Crude oil				Refineries
	Total proved and probable reserves		Annual production		
	Year	Millions of tons	Year	Thousands of tons	Capacity in thousands of tons/year of crude oil
North Africa					
Algeria	1966	1-2,000	1968	42,000	3,500 (approximately)
Libya	1966	2,300	1968	130,000	500
Morocco		small	1968	100	1,700
Sudan		-		-	1,000
Tunisia	1967	48	1968	3,300	1,000
United Arab Republic	1967	300	1967	10,000	8,900
West Africa					
Dahomey		indications	1966/67	-	-
Gambia		indications	1966/67	-	-
Ghana		-	1966/67	-	1,250
Guinea		-	1966/67	-	750
Ivory Coast		-	1966/67	-	700
Liberia		-	1966/67	-	750 (approximately)
Mali		indications	1968	70	-
Nigeria		very substantial	1967 1970	22,000 50,000	2,000
Senegal		indications	1966/67	negligible	600

Table 10 (cont'd)

	Crude oil				Refineries
	Total proved and probable reserves		Annual production		Capacity in thousands of tons/year of crude oil
	Year	Millions of tons	Year	Thousands of tons	
Central Africa					
Cameroon		...	1966/67	-	-
Congo (Dem. Rep. of)		...	1966/67	-	650
Gabon		...	1966/67	4,000	600
People's Republic of the Congo		...	1966/67	62	500
East Africa					
Ethiopia		-	1966/67	-	500
Kenya		-	1966/67	-	1,500
Madagascar		-	1966/67	-	500
Mozambique		...	1966/67	-	700
Rhodesia		-	1966/67	-	1,000
United Republic of Tanzania		-	1966/67	-	600
Southern Region					
Angola	1967	300	1966/67	700	100
South Africa		indications	1966/67	-	6,000 (approximately)

Table 10 (cont'd)

(b) Crude oil and refineries

	Crude oil				Refineries
	Total proved and probable reserves		Annual production		Capacity in thousands of tons/year of crude oil
	Year	Millions of tons	Year	Thousands of tons	
North Africa					
Algeria	1966	1-2,000	1968	42,000	3,500 (approximately)
Libya	1966	2,300	1968	130,000	500
Morocco		small	1968	100	1,700
Sudan		-		-	1,000
Tunisia	1967	48	1968	3,300	1,000
United Arab Republic	1967	300	1967	10,000	8,900
West Africa					
Dahomey		indications	1966/67	-	-
Gambia		indications	1966/67	-	-
Ghana		-	1966/67	-	1,250
Guinea		-	1966/67	-	750
Ivory Coast		-	1966/67	-	700
Liberia		-	1966/67	-	750 (approximately)
Mali		indications	1968	70	-
Nigeria		very substantial	1967 1970	22,000 50,000	2,000
Senegal		indications	1966/67	negligible	600

Table 10 (cont'd)

	Crude oil				Refineries
	Total proved and probable reserves		Annual production		
	Year	Millions of tons	Year	Thousands of tons	Capacity in thousands of tons/year of crude oil
Central Africa					
Cameroon		...	1966/67	-	-
Congo (Dem. Rep. of)		...	1966/67	-	650
Gabon		...	1966/67	4,000	600
People's Republic of the Congo		...	1966/67	62	500
East Africa					
Ethiopia		-	1966/67	-	500
Kenya		-	1966/67	-	1,500
Madagascar		-	1966/67	-	500
Mozambique		...	1966/67	-	700
Rhodesia		-	1966/67	-	1,000
United Republic of Tanzania		-	1966/67	-	600
Southern Region					
Angola	1967	300	1966/67	700	100
South Africa		Indications	1966/67	-	6,000 (approximately)

Table 10 (cont'd)

(c) Phosphate rock and potash

	Phosphate rock			Potash		
	Total proved and probable reserves (millions of tons)	Average grade (per cent P_2O_5)	Annual production 1966/1967 (thousands of tons)	Total proved and probable reserves (millions of tons)	Average grade or composition	Annual production 1966/1967 (thousands of tons)
North Africa						
Algeria	1,000	29	80	-	-	-
Libya	-	-	-	substantial Marada 1.6	carnallite	-
Morocco	20,000	31-36	9-10,000	50	11	-
Spanish Sahara	600	21	planned to start production shortly	-	-	-
Tunisia	600	27-31	3,000	...	...	...
United Arab Republic	200	...	approximately 600	-	-	-
West Africa						
Dahomey	indications	-	-	-	-	-
Guinea	-	-	-	...	leucite (4-12% K_2O)	...
Mali	2.5	26-28	-	-	-	-
Mauritania	20	22-31	-	-	-	-
Nigeria	indications	low grade	-	-	-	-
Senegal	Thies - 40 Taiba - 110	Thies - 28-30 as aluminium phosphate; Taiba - average - 26 recoverable - 37	1967 1,200 Taiba	-	-	-

Table 10 (cont'd)

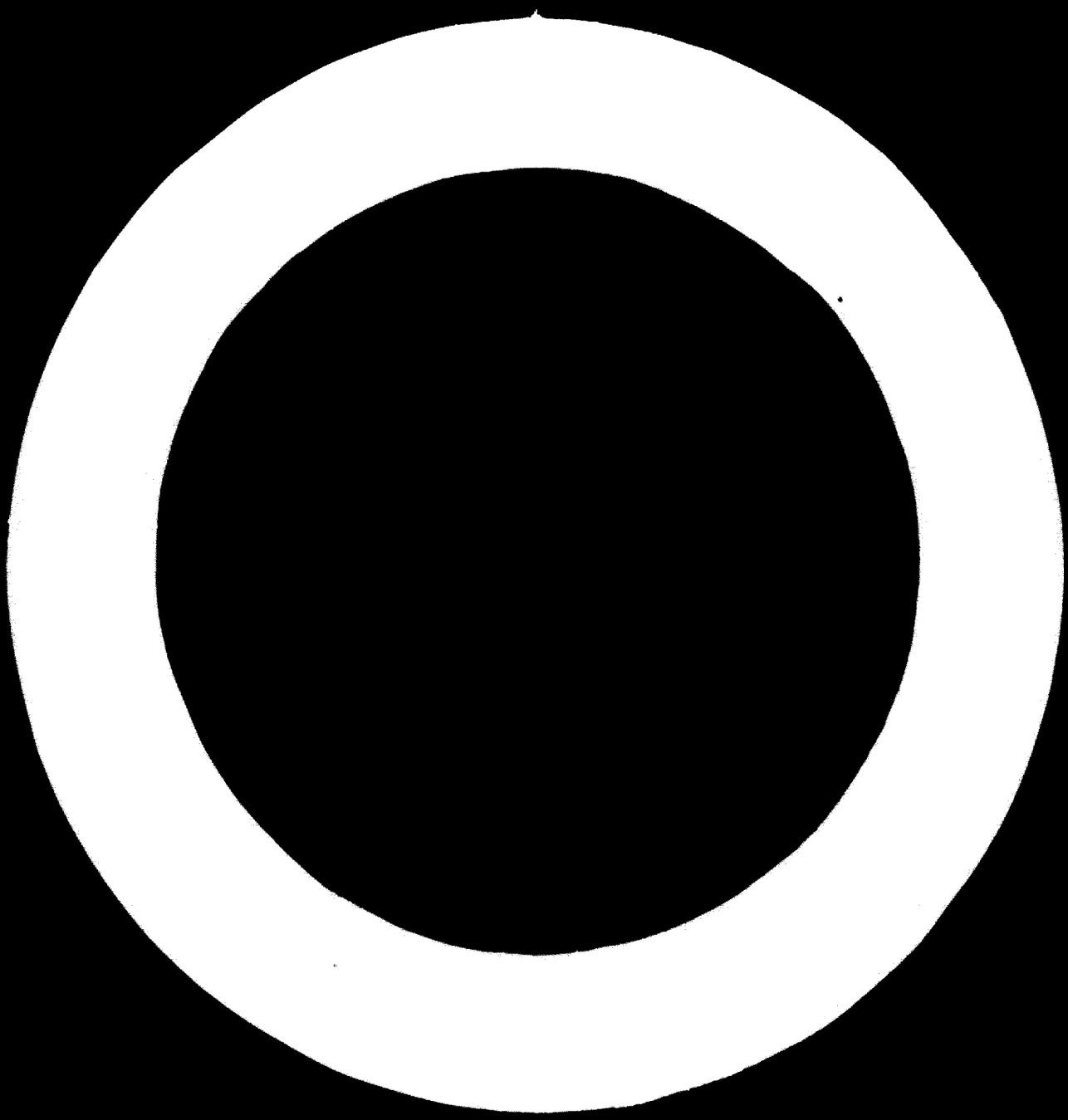
	Phosphate rock			Potash		
	Total proved and probable reserves (millions of tons)	Average grade (per cent P_2O_5)	Annual production 1966/1967 (thousands of tons)	Total proved and probable reserves (millions of tons)	Average grade or composition	Annual production 1966/1967 (thousands of tons)
West Africa (cont'd)						
Togo	recoverable 50	36	1,000	-	-	-
Central Africa						
Congo (Dem. Rep. of)	favourable indications	-	-	favourable indications	-	-
Gabon	...	...	-	-	-	-
People's Republic of the Congo	4	24	-	30	25% K_2O	planned production of 800,000 tons/year 60% K_2O early 1970s
East Africa						
Ethiopia	-	-	-	indicated 60	sylvanite 25% K_2O	-
Malawi	indicated 2.3	5-20	-	-	-	-
Mauritius	...	-	-	-	-	-
Rhodesia	16	7	about 30,000 P_2O_5	-	-	-
United Republic of Tanzania	indicated 10	20	-	-	-	-
Uganda	200	12-15	16,000 (concentrate 40% P_2O_5)	-	-	-
Southern Region						
Angola	40	up to 33	-	-	-	-
South Africa	considerable	...	1,000	-	-	-

Table 10 (cont'd)

(d) Elemental sulphur and pyrites

	Elemental sulphur			Pyrites		
	Total proved and probable reserves (millions of tons)	Grade (per cent S)	Annual production 1966/1967 (thousands of tons)	Total proved and probable reserves (millions of tons)	Grade (per cent S)	Annual production 1966/1967 (thousands of tons)
North Africa						
Algeria	-	-	-	substantial	45	23
Morocco	-	-	-	substantial	31-33	...
United Arab Republic	...	...	5	-	-	-
West Africa						
Mauritania	-	-	-	copper 20	...	-
Central Africa						
Congo (Dem. Rep. of)	-	-	-	favourable indications	-	-
East Africa						
Ethiopia	probably small	...	-	-	-	-
Malawi	-	-	-	...	10	-
Rhodesia	-	-	-	2	38	30 as sulphur
Uganda	-	-	-	...	...	-
United Republic of Tanzania	-	-	-	...	30	-
Zambia	-	-	-	...	...	-
Southern Region						
Angola	...	...	-	-	-	-
South Africa	-	-	-	...	...	200

COUNTRY DATA,
GROUPED BY SUBREGION



Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	16,600	16,000	30,000	55,000
	Production	-	-	-	350,000
	Deficit	16,600	16,000	30,000	-
	Surplus	-	-	-	295,000
P_2O_5	Consumption	25,000	14,500	35,000	55,000
	Production	14,000	10,000	25,000	200,000
	Deficit	11,000	4,500	10,000	-
	Surplus	-	-	-	145,000
K_2O	Consumption	16,000	16,500	20,000	35,000
	Production	-	-	-	-
	Deficit	16,000	16,500	20,000	35,000
	Surplus	-	-	-	-

General

Algeria is the second largest country in Africa with an area of approximately 2.38 million km^2, about 90 per cent of which consists of either desert or mountains and only about 3.5 per cent is under cultivation. The population of Algeria is about 12 million, concentrated mainly in the narrow fertile coastal plain, which contains all the major towns. About 80 per cent of the population lives in the rural areas and depends on agriculture for its living. The country became independent in 1962.

Crude oil and gas are Algeria's most important exports and the output of both is increasing steadily, about 50 per cent of the country's crude production going at present to French refineries. Another important source of exports are agricultural products, including wine. No official figures relating to the country's balance of payments and finance have been available since independence, but it is believed that the trade deficit has been reduced. Although Algeria's economy is assisted by its large reserves of oil and gas, the exports of gas have recently become more difficult due to the weakening of the market. The uncertain political situation and loss of confidence on the part of foreign companies has had an adverse effect on the exploitation of the gas and oil fields in the Sahara. The level of industrial activity is still low and the country suffers from unemployment.

ALGERIA

A proposed Six Year Development Plan budgeting for an investment of about $4 billion allocates about 50 per cent of this budget to help industry and primarily to develop the petrochemical and steel industries. Recent agrarian reforms may lead to higher agricultural productivity and reduce the migration of the rural population to the urban centres.

Agriculture

The total agricultural land area in the country has been estimated at about 48 million ha, including 7 million ha of arable land and 3 million ha of forests. It is believed that this is very close to the total potential agricultural area of the country. The most important crop is wheat, covering about 2.2 million ha of this area, with an annual production of about 1.2 million tons. Barley production is about 280,000 tons (on 600,000 ha) and the production of oats is about 40,000 tons (on 50,000 ha). Other crops are maize, rice, citrus fruit, grapes and vegetables.

Natural resources and industry

The country is rich in natural resources, which include considerable deposits of crude oil and natural gas, phosphate rock, iron ore, pyrites and zinc, lead, antimony and copper ores.

Crude oil and natural gas: The crude oil deposits first discovered during the late 1950s are centred around Hassi Messaoud in the Trias Basin and the Edjeleh region (Polignac Basin) close to the Libyan frontiers. Estimates of total available reserves vary, but in 1966 the results obtained indicated a total of 1 to 2 billion tons. The Hassi Messaoud fields are linked by 61 cm pipelines to the crude ports at Bougie and Arzew and by a 76 cm line to the pumping station at In-Amenas. A 61 cm pipeline joins the Edjeleh fields to the port of La Skhirra. The total production of crude oil in Algeria was estimated at 33.3 million tons in 1966 rising to about 42.5 million tons in 1968, which is now approaching the design capacities of the pipeline system. A new major pipeline to relieve this situation is being constructed and should be in operation in 1970.

Very extensive deposits of natural gas were discovered near Hassi R'Mel, the recoverable reserves having been estimated in 1966 at 1,800 billion m^3. The gas is conducted by a pipeline to Arzew with branch lines to Algiers and Oran, supplying annually about 1 billion m^3 for power requirements. At Arzew a gas liquefaction plant has been constructed and is operated by the Compagnie Algérienne du Méthane Liquefié (CAMEL) since 1965. Delivery contracts were signed with the United Kingdom (1966) and France. In 1967 an agreement was reached to set up the deliveries to France. Another agreement was reached with Spain to supply 60 billion m^3 of LNG during the period 1970-1985. Total exports of LNG from Algeria were

ALGERIA

about 2.1 billion m^3 in 1967/1968. A new liquefaction plant owned by SOMALGAZ, a joint French-Algerian undertaking, joined by a pipeline to the Rhourde, Gassi-Touil and Nezla fields, should be in operation at Skikda in 1972 with an initial annual capacity of 3.7 billion m^3 of LNG, 150,000 tons of ethane and 250,000 tons of propane/butane. Several gas fields have been discovered in the central Sahara region of the country, but are not yet in operation.

Phosphate rock: Algeria has large deposits of phosphate rock centred around Djebel Onk near the Tunisian border. The available reserves have been estimated to exceed 1 billion tons of rock averaging 65 per cent BPL. The production in 1964 and 1966 was about 70,000 and 80,000 tons respectively. This rate is expected to increase in the near future.

Coal is found in several locations, the total available reserves being estimated at about 20 million tons. The production of coal in 1966/1967 was about 45,000 tons, used within the country.

Iron pyrites are found on the coast near Annaba. The available reserves are believed to be substantial with an average content of 45 per cent sulphur. The production in 1966/1967 was equivalent to about 23,000 tons of sulphur and was used for the production of sulphuric acid.

Other mineral deposits which are of no importance for fertilizer manufacture include iron ore (production in 1966 was about 3 million tons), lead, zinc, antimony and tungsten.

Manufacturing and oil refining industry: There are three petroleum refineries in Algeria; one at Algiers (2 million tons/year crude oil capacity), one at Oran and a third one at Haoud-al-Hamra, the total refining capacity being about 3.5 million tons of crude per year. In 1966 the production of petroleum products was about 60,000 tons of LPG, 400,000 tons of motor spirit, 135,000 tons of residual fuel oil. The industrial sector includes production of cement, pulp and paper, textiles, building materials, structural steel, food processing and a limited tonnage of basic chemicals, including sulphuric acid mainly for superphosphate manufacture. Plants for the production of petrochemicals including ammonia, ethylene, propylene and their derivatives are in the planning stage.

Fertilizer manufacture

The Société Nationale Algérienne de Produits Chimiques et d'Engrais (SNAPCE) operates three plants producing sulphuric acid and single superphosphates at the following locations:

El Harrach (Algiers), constructed in 1902 with an annual capacity of:

20,000 tons of sulphuric acid;
30,000 tons of single superphosphate.

ALGERIA

Annaba, constructed in 1948 with an annual capacity of:

20,000 tons of sulphuric acid;
40,000 tons of single superphosphate.

La Senia (Oran), constructed in 1959 with an annual capacity of:

40,000 tons of sulphuric acid;
60,000 tons of single superphosphate.

The over-all rate of production of single superphosphate from the three plants is about 65 per cent of the rated capacity.

In addition there are seventeen fertilizer blending plants (nine in the Algiers district, six in the Oran and two in the Constantine district) with an annual capacity of 270,000 tons and operating at about 50 per cent of their capacity. There are also four composting plants, two in Algiers and two in Oran, with an annual capacity of 18,000 tons (actual production rate about 5,000 tons/year).

The following projects are in planning or implementation stage:

The Société Djebel Onk is planning the construction of a fertilizer complex at Annaba with the following annual capacity:

Ammonia from natural gas	75,000 tons
Sulphuric acid	440,000 tons
Phosphoric acid	150,000 tons
Triple superphosphate	400,000 tons
Di-ammonium phosphate	300,000 tons

The plant will be designed to produce either the full tonnages of TSP or DAP, or alternatively intermediate tonnages of both products. The plant is unlikely to be in operation before 1975.

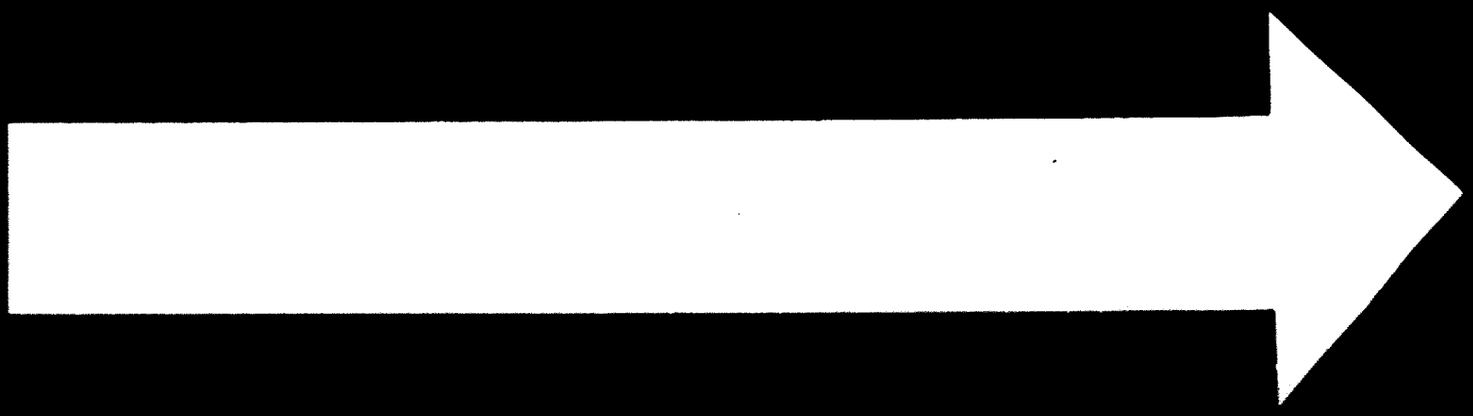
Sonatrach (the Government) is constructing a complex at Arzew, consisting of plants with the following annual capacities:

Ammonia from natural gas	350,000 tons
Nitric acid	150,000 tons
Ammonium nitrate	175,000 tons
Urea	150,000 tons

It is understood that the complex will be completed in 1971. It is planned to export both the surplus of ammonia not captively used on the plant and the final products not sold on the home market.

If the above plans materialize and none of the existing plants are scrapped, the total fertilizer production capacity in tons/year in Algeria will be as follows:

Nutrient	1970	1975
N	-	350,000
P_2O_5	25,000	200,000
K_2O	-	-



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ALGERIA

Present and projected fertilizer consumption

The present nutrient consumption per ha of arable land in Algeria is still low; at about 6 kg N + P_2O_5 and K_2O in 1965. An upward trend in the consumption of fertilizer is noticeable starting from 1965. The estimates made by ECA in 1968 are based on the projected growth of agricultural production in the country and seem to reflect the stimulation to the home fertilizer market by the projected expansion of fertilizer production facilities. The annual rates of growth of nutrient consumption for the period 1965-1975 have been taken as: N - 12.2 per cent; P_2O_5 - 9.7 per cent; and K_2O - 13.9 per cent, which appears to be reasonable, bearing in mind the state of the country's economy and the projected growth of the agricultural sector. The projected N:P:K ratios for 1970 and 1975 are therefore estimated at 1:1.16:0.67 and 1:1:0.64 respectively. The estimated fertilizer consumption for 1970, 1975 and 1980 is summarized below.

	Tons		
Nutrient	1970	1975	1980
N	30,000	55,000	90,000
P_2O_5	35,000	55,000	90,000
K_2O	20,000	35,000	70,000

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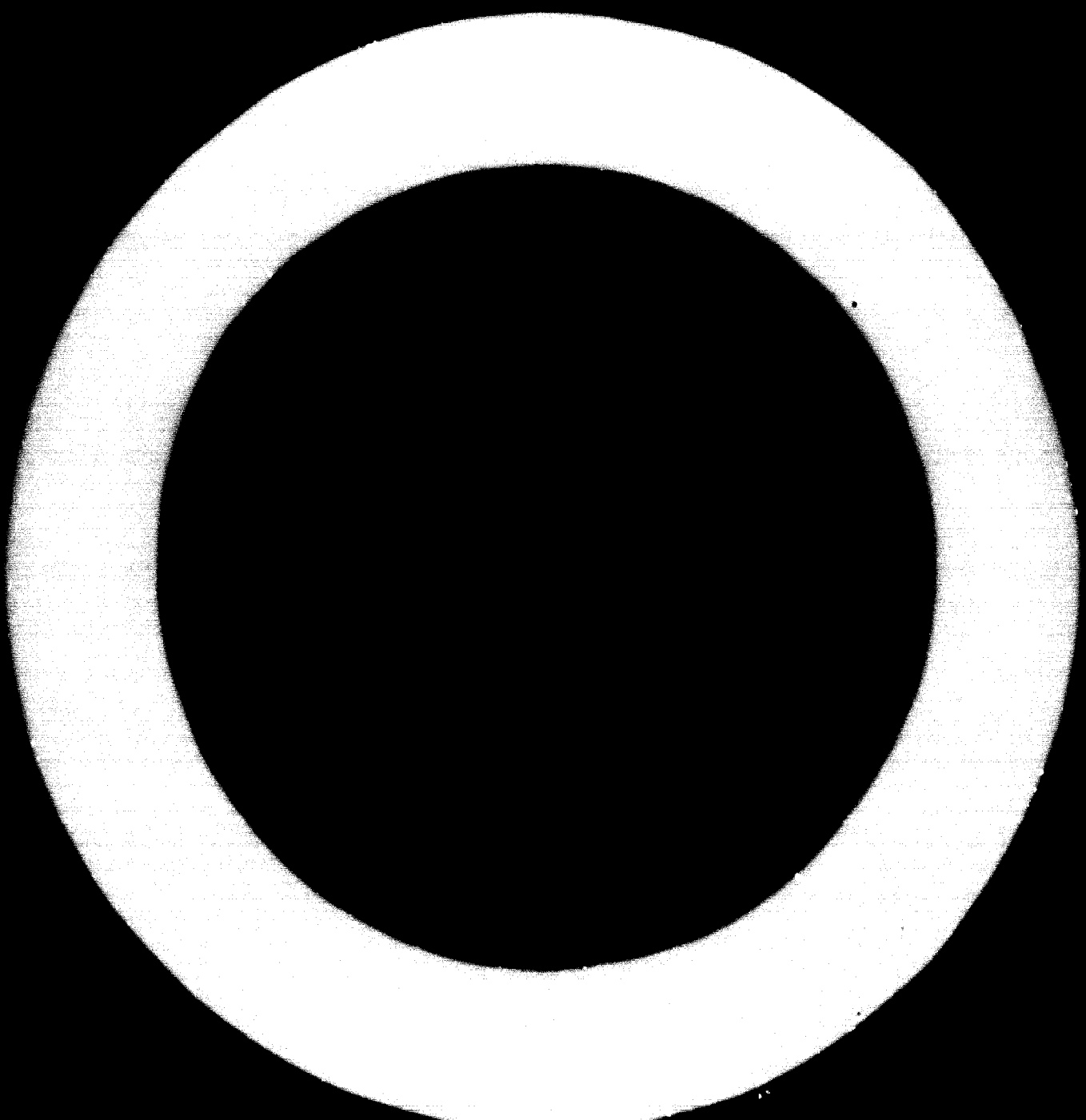

NORTH AFRICA

IFNI

General

Ifni covers an area of about 1,300 km^2, but the effectively controlled area is only some 25 km^2. At the 1964 census the population (mostly Berbers) was about 51,517, the capital Sidi Ifni having some 15,723 inhabitants. The capital has grown up since 1934 around ravines leading to Wadi Ifni.

The country is completely landlocked, consisting of a semi-desert area of mountains and a coastal plain with grass steppe vegetation and rare dry farming. Camels, goats, sheep and fish are almost the only resources.

Port facilities were inaugurated at Sidi Ifni in 1967 and the country handles trade with Morocco, the Canary Islands and Spanish Sahara.

Surplus labour emmigrates to northern Morocco.

Natural resources and industry

There are no natural resources or any industry in the country.

Fertilizer manufacture

There is no fertilizer industry in the country and no figures are available relating to fertilizer consumption.

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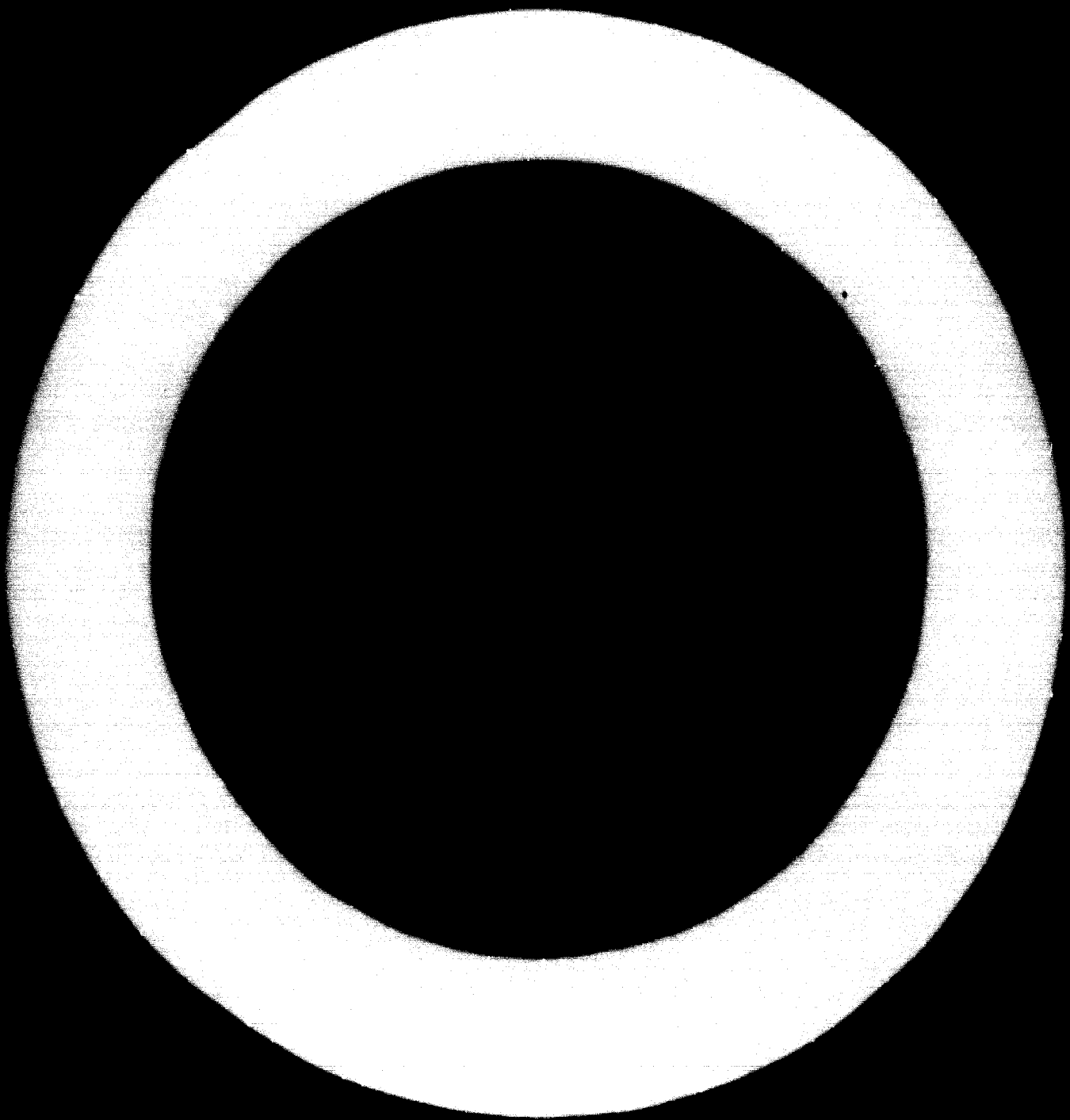

NORTH AFRICA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	3,000	1,700	5,000	6,000
	Production	-	-	-	-
	Deficit	3,000	1,700	5,000	200,000
	Surplus	-	-	-	194,000
P_2O_5	Consumption	1,500	2,500	4,000	8,000
	Production	-	-	-	-
	Deficit	1,500	2,500	4,000	8,000
	Surplus	-	-	-	-
K_2O	Consumption	400	400	500	1,000
	Production	-	-	-	-
	Deficit	400	400	500	1,000
	Surplus	-	-	-	-

General

Libya covers an area of 1,750,000 km^2 with a population estimated at 1,682,000 in 1966. The annual rate of growth is approximately 3.7 per cent. About 70 per cent of the population is employed in agriculture. The oil and manufacturing industries employ a relatively small proportion of the available labour force.

The discovery of large deposits of oil in 1959 has transformed the economy of the country. Within the last six years the balance of trade has changed from a permanent deficit, which had to be subsidized by foreign aid to a large and continuously increasing surplus. For example, the trade balance in 1963 was about $100 million, increasing in 1966 to about $600 million. In 1967 the estimated revenue by the Government from oil has risen to about $480 million. As a result of this boom, the per capita income increased considerably, the standard of living of the urban population was raised and there is a growing shortage of skilled labour and a steady drift of the rural population into the urban areas.

A five-year plan was launched in 1963, concentrating on improvements in the public works, agriculture, communications and social sectors. This included improvements of the ports of Benghazi and Tripoli, and to the road network and completion of a new steel rolling mill and cement works. Projects in hand at present include extensions to the electric power supply and the construction of a sugar refinery.

LIBYA

A new five-year plan commencing in 1968 gives full priority to agricultural development. About 70 per cent of the oil revenues are now being allocated to development.

Agriculture

About 90 per cent of the total area of the country consists of almost barren sand and rock deserts. The coastal regions of Tripolitania and part of the Cyrenaica are relatively fertile and are the most important agricultural and horticultural production areas of the country. It has been estimated that in Tripolitania, out of about one million ha of potentially productive land, about 800,000 ha are only suitable for grazing, and the actual cultivated area under some form of irrigation is about 100,000 ha. In Cyrenaica, out of 4 million ha of productive land, 3.6 million ha are suitable for grazing and shifting cultivation of cereals, 170,000 ha are forested, and 2,000 ha are irrigated. In Fezzan the irrigated land in the oases totals about 2,800 ha. As there are no permanent rivers in Libya and rainfall is scarce, crop failures are very common. There is, therefore, great need for improving the irrigation facilities in the country.

The most important crops are wheat (approximately 60,000 tons/year), barley (about 100,000 tons/year), potatoes, dates, olives, ground-nuts, vegetables and fruits.

Because of soil erosion, primitive farming methods, lack of irrigation and a continuous drift of population to the urban areas, the country is a net importer of food (mainly wheat and animal products). It is believed, however, that the country could become self-supporting in food, with a surplus available for export, providing that full use is made of agricultural techniques and increased farming inputs such as fertilizers, pesticides, irrigation facilities and credits to the farmers. This is now being fully recognized by the Government and is reflected in the budget allocations for the second five-year plan.

Natural resources and industry

The Libyan oil fields are exploited by a number of major oil companies, and reserves increased fourfold to 2,305.5 million m^3 in 1966 as compared to 556.5 in 1961. As regards natural gas, reserves have been estimated at 420,000 million m^3 in 1967 (about 68 per cent of this is associated gas).

Except for a small quantity needed for the 8,000 b/d refinery, the crude oil is exported. In 1967 the export of oil accounted for 98 per cent of all Libyan exports. In terms of volume, this was 95 million m^3, and was 114 times higher than in 1961. The major proportion of crude oil exports goes to western European countries, mainly to the Federal Republic of Germany and to the United Kingdom. Since the closure of the Suez Canal there is an increasing demand for Libyan crude oil. An LNG liquefaction

plant at Marsa el Brega has been commissioned by Esso Libya Inc. and an agreement has recently been concluded for supplies of LNG to Italy. Up to now the gas has been flared. It is understood that reinjection of the gas is not considered but it is expected that by 1970 a gas pipeline will connect a number of the more important gas fields. Analyses of the associated gas found at Amal and Dahra Hutra show a low CO_2 and H_2S content and a C_{2+} content of 20 to 35 per cent (this has a good potential for olefins manufacture).

The significance of oil to the economy of the country is evident. In 1967/1968 oil contributed $476 million to the national income or about $280 per capita as compared to $64 million or $42 per capita in 1963/1964.

The future outlook of petroleum resources in Libya seems to be bright. Indications are that reserves may hit their maximum by 1970/1975 declining to 2,580 million m^3 crude oil and 565,000 million m^3 natural gas by 1980. It appears that the crude oil output will follow a similar pattern falling to 160 million m^3 in 1980, whereas the output of natural gas will reach its maximum for the period by 1980 (70 billion m^3). A good part of the gas will be commercialized. There are two petroleum refineries: the Esso Sirte plant at Marsa El Brega with an annual capacity of 400,000 tons and the Oasis Petroleum plant at Dahra with a capacity of 100,000 tons of crude.

Apart from oil and gas, the country has relatively large deposits of potassium salts. At present no large-scale commercial exploitation is taking place, but they are of potential importance to the economy of the country, because they are likely to influence the home demand for potassium fertilizers. There are three different deposits: carnallite north of Marada, estimated in 1939 by the Italian company SA Industriale Libica to contain about 1.6 million tons of potassium salts and 7.5 million tons of magnesium chloride. Some mineral was mined and exported to Italy; potassium salts at Busida, 150 km west of Tripoli which, according to the US Operation Mission that investigated the deposit, has considerable potential reserves of potash; and potash at Idry, 150 km west of Brak in Fezzan. This deposit has not been exploited, due to transportation difficulties.

Fertilizer manufacture

To date several projects have been considered by a number of companies for the setting up of plants for fertilizer intermediates and finished products such as ammonia and urea. It is believed that one of these projects will materialize by 1975. A great part of the production of this plant, based on a production of 350,000 tons of ammonia per year, will be exported, the main customer being Tunisia since the two countries have recently reached an agreement to this effect. The rated capacity of the urea plant

LIBYA

also proposed will be 140,000 tons/year and that of the ammonium nitrate plant 175,000 tons/year. A plant to produce annually about 150,000 tons of nitric acid is also planned.

Present and projected fertilizer consumption

The consumption of fertilizers in Libya during 1966/1967 was as low as about 3,500 tons of nitrogen, 3,000 tons of P_2O_5 and 500 tons of K_2O (FAO). The demand for 1970 and 1975 is difficult to predict since it depends on the purchasing power of the farmer, which is relatively high, and on the market stimulation by establishment of a local fertilizer industry. The projected fertilizer consumption made by ECA in 1966 and by the Ministry of Agriculture are shown below in tons of nutrients:

	1970			1975		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	3,000	2,000	1,000	7,000	5,000	3,000
Ministry of Agriculture	5,000	4,000	500	6,000	8,000	1,000

The above estimates although divergent, show a limited home market for fertilizers during the next few years. Consumption of fertilizers has already overtaken the ECA projections for 1970, the more recent estimates by the Libyan Ministry of Agriculture appear to be more realistic and have been used for the purpose of this study. It is probable that after the establishment of the nitrogenous fertilizer plant at Port Brega, the home demand for fertilizers, especially for nitrogen fertilizers, will grow at a much faster rate. Still, the output of the projected nitrogen complex will have to be largely directed to export markets. For the purpose of this study it has been assumed that the plant will be working on average at about 70 per cent of its capacity in 1975. It has also been assumed that the potash deposits will not become commercially exploited at this stage.

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NORTH AFRICA

MOROCCO

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	9,200	18,200	42,000	68,000
	Production	-	-	-	-
	Deficit	9,200	18,200	42,000	68,000
	Surplus	-	-	-	-
P_2O_5	Consumption	17,400	22,500	46,000	75,000
	Production	14,300	41,500	150,000	150,000
	Deficit	3,100	-	-	-
	Surplus	-	19,000	104,000	75,000
K_2O	Consumption	6,300	8,800	28,000	45,000
	Production	-	-	-	-
	Deficit	6,300	8,800	28,000	45,000
	Surplus	-	-	-	-

General

Morocco covers an area of about 450,000 km^2 and has a population of approximately 13.7 million with an annual rate of growth of about 3.2 per cent.

Morocco became an independent kingdom in 1956, incorporating the Spanish Protectorate in the north and the French Protectorate in the south. The country is mainly agricultural, 70 per cent of the population depending on this sector for their living. Agricultural production accounts for about 40 per cent of the country's exports and contributes 35 per cent to the GDP. The mining sector, however, is of prime importance to the economy of the country, the most important product being phosphate rock, which accounts for 25 per cent of the total Moroccan exports. The approximate per capita income is about $180 and Morocco compares favourably with a lot of its neighbours. The growth of output of about 2 per cent is well below the growth of population and the economy of the country is heavily dependent on overseas loans and grants. As a member of the franc zone, Morocco has close financial and commercial ties with France. Aid from France decreased in 1966, but financial assistance was received from Iran, Italy, the United States and the USSR. The Development Plan covering the period 1965-1967 provided for an expenditure of about $600 million, 35 per cent of which was allocated to agriculture, other priorities being given to

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tourist trade and to education. The new Development Plan for the years 1968-1972 provides for further development of agriculture and a second phase of industrial expansion.

The future prosperity of the country, however, depends very largely on the success of the agricultural development under the Plan, on the reduction of imports of food-stuffs (approximately 25 per cent of the total imports, amounting to about $125 million in 1966), and on a solution to the serious unemployment problem in the rural areas.

Agriculture

The traditional sector is primarily subsistence agriculture based on small holdings with inefficient farming methods. The modern sector, formerly French-owned but now partly nationalized, comprises only about 20 per cent of the total agricultural area but produces about 60 per cent of total agricultural exports. Mechanization and modern farming techniques are generally employed in this sector and the productivity is high. It is hoped that in the near future Morocco will become self-sufficient in food-stuffs with a surplus for export. The main crops to be developed with the help of the World Bank are cereals, citrus fruit, cane and beet sugar and cotton.

Projects for flood control are planned to increase the area of irrigated land from the present 150,000 ha to about 1 million ha.

At present about 7.8 million ha are cultivated (roughly 17 per cent of the total area of the country). The production of cereals is the most important. Wheat is cultivated on about 1.7 million ha with an annual production of about 1.3 million tons. The output of barley is approximately 1.2 million tons/year from some 1.7 million ha. Maize is grown on about 450,000 ha, producing approximately 300,000 tons/year, followed by oats (23,000 ha and 18,000 tons/year), millet, sorghum, rice, sugar-beet and rye. Other crops grown in the country are citrus fruit, vegetables, cocoa and cotton.

Natural resources and industry

Morocco is one of the world's biggest producers and exporters of phosphate rock. It produces about 10 million tons of phosphate rock yearly, i.e. 16 per cent of the world production in 1965. Almost the whole production is exported; in 1965 it represented about 25 per cent of the total value of the country's exports. The mining centres are in Khouribga and Youssoufia. Khouribga is situated on a high plateau 125 km south-east of Casablanca, and is connected with this port by railroad. The mining was commenced in 1921 and the present capacity is about 40,000 tons per day of raw rock, upgraded into 25,000 tons per day of marketable phosphate at a grade of 75 per cent of tricalcium phosphate and 3,000 tons at the grade

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of 72 per cent BPL. This represents an annual rate of production of 8.5 million tons of phosphates. A special grade of phosphates is treated in a washing plant having an annual capacity of one million tons. The product contains 81 per cent tricalcium phosphate. The Youssoufia centre, opened for production in 1931, is situated 70 km east of the port of Safi. Its capacity is 2.5 million tons a year. The product contains 70 per cent of tricalcium phosphate. The fertilizer plant at Safi is capable of processing about 500,000 tons per year of this rock. The surplus is exported. Reserves of crude oil amounting to 448,000 tons in 1964 have been reduced to 185,000 tons in 1967. As regards natural gas, Morocco with its reserve of 500 to 550 million m^3 appears to be better placed in this respect than Tunisia.

Production of crude has been falling steadily since 1963 to 120,000 m^3 in 1967. On the average it represents about 10 per cent of the domestic demand. As regards natural gas, just the reverse has happened; the annual output rose from 7.5 to over 11 million m^3 in the period 1962-1967.

There are two refineries, one at Mohammedia equally owned by the Government and by ENI of Italy, with an annual capacity of 1.3 million tons/year of crude oil, and a small refinery at Sidi-Kacem owned by the Société Cherifienne de Petroles, with a capacity of 0.4 million tons/year both using mainly crude from Algeria, Libya and the USSR.

At present there is no production of potassium ores in Morocco. Recently, however, discoveries of carnallite at Khemisset and of sylvinite west of Khemisset, have been made. The reserves of the latter deposit are estimated at 50 million tons of ore, with an average content of 11 per cent K_2O. Exploitation of this deposit is being considered.

In the mineral mining sector, lead and zinc production is the second most important product in terms of value. Both minerals are usually found in the same deposit. The main reserves are located near Oujda on the Algerian border, near Midelt in the mountains of central Morocco and near Ksar es Souk in the High Atlas. During the period 1963-1965 the production of lead and zinc ores was about 200,000 tons/year. A lead smelter plant is also in operation.

The main manganese deposits are located at Imini in the Atlas mountains and at Bonaifa in eastern Morocco. The latter mine is connected by rail to the Algerian port of Nemours, whereas production at Imini is handicapped by high transport costs. Both metallurgical and chemical manganese is produced and exported, the total output during the period 1964 to 1965 being about 330,000 tons.

There is a pyrites deposit at Kettara with 31 to 33 per cent sulphur content.

There are also several reserves of iron ore, the most important deposits at present being worked are at Nador on the eastern Mediterranean coast. Production has been declining since 1960 due to a decreasing demand on export markets and was about 800,000 tons in 1965.

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Other mineral products exploited in Morocco are bauxite (90,000 tons/year), fullers earth (30,000 tons/year), cobalt (15,000 tons/year) and copper. Coal (anthracite) is produced by the Charbonnages Nord-Atrigains at Djerada, about 50 km south of Oujda with reserves of about 95 million tons, the annual production during the last years being about 400,000 tons.

The most important Moroccan industries include metalworking, iron foundries, textiles, cement, food-processing and construction and a limited production of chemicals including fertilizers, pulp and paper and pharmaceuticals.

Fertilizer manufacture

Apart from the production of phosphate rock, there is a limited production of fertilizers, mainly based on phosphate rock. A complex owned and operated by the Office Chérifien des Phosphates near the port of Safi and the phosphate mines at Youssoufia and the pyrrhotine mines at Kettara, was completed in 1966. The complex includes a sulphuric acid plant based on pyrrhotine ore roasting with a rated capacity of 429,000 tons/year of H_2SO_4, a phosphoric acid plant with a rated capacity of 150,000 tons/year of P_2O_5, a triple superphosphate (45 per cent P_2O_5) plant with a capacity of 400,000 tons/year and an ammonium phosphate plant with a capacity of 300,000 tons/year of DAP. The latter two plants can give the variations of: (a) 200,000 tons TSP and 150,000 tons of DAP (18:48:0); (b) 400,000 tons TSP; (c) 300,000 tons DAP.

There is also an old single superphosphate (16 per cent P_2O_5) plant built in 1923 and operated by the Société Chérifienne d'Engrais et Produits Chimiques at Ain-Sebaa, rated at 150,000 tons/year with 55,000 tons/year of sulphuric acid using imported sulphur, but operating at a much lower level. There are also phosphate rock calcining plants at Safi, Kenitra and Berrechid with a total capacity of 100,000 tons/year of product (28 per cent P_2O_5), operated by the Société Marocaine d'Engrais Pulvérisés.

A total of ten fertilizer blending plants are operating with a total rated capacity of 130,000 tons/year and an actual production of 45,000 tons (1965).

There are no definite plans at present for expansion in the fertilizer industry in Morocco. The Office Cherifien des Phosphates are considering doubling the capacity of their plants at Safi, possibly after 1975.

The total present annual fertilizer production capacity in Morocco is therefore:

Sulphuric acid	485,000 tons
Phosphoric acid	150,000 tons (P_2O_5)
Calcined phosphates	100,000 tons (25% P_2O_5)

MOROCCO

Single superphosphate	150,000 tons (16% P_2O_5)
Triple superphosphate	400,000 tons (45% P_2O_5)
DAP	300,000 tons (18:48:0)

There is no production of nitrogen intermediates in Morocco.

However, the actual production of fertilizers at present is much less than shown above. In 1966/1967 the production and consumption of fertilizers in Morocco was in tons of nutrients:

	N	P_2O_5	K_2O
Production	-	105,000	-
Consumption	25,000	20,000	12,000
Net surplus (deficit)	(25,000)	85,000	(12,000)

It is apparent that during the next few years the production of phosphatic fertilizers will be mainly supported by export markets.

Present and projected fertilizer consumption

At present the fertilizer consumption is still relatively low at an average of about 7.3 kg of nutrients/ha of arable land, taken as 7.8 million ha in 1966/1967. The corresponding N:P:K ratio was about 1:0.8:0.48. From the statistical data available it can be seen that the N:P ratio was steadily decreasing from about 1.9 in 1960 to 0.8 in 1966/1967. The projected fertilizer demand for 1970 and 1975 as estimated by ECA is shown below, compared with the actual consumption in 1966/1967, in tons of nutrients:

	Actual consumption	Projected demand	
	1966/1967	1970	1975
N	25,000	28,000	50,000
P_2O_5	20,000	40,000	60,000
K_2O	12,000	16,000	28,000

It will be seen that the consumption of nitrogen in 1966/1967 is already approaching the corresponding projection for 1970 as estimated by ECA some time ago. On the other hand, the consumption of P_2O_5 during 1964-1967 was relatively static but consequently has increased at a high rate.

Similarly the rate of growth of K_2O consumption was showing a steady increase during the last 2 to 3 years.

MOROCCO

For the purpose of this study the following projected fertilizer nutrient demand has been adopted, based on data supplied by the Moroccan Government:

	1970	1975
N	42,000	68,000
P_2O_5	46,000	75,000
K_2O	28,000	45,000

It has been assumed that the production of phosphate fertilizers in 1970 and 1975 will be about 75 per cent of the total rated capacity and that there will be no production of nitrogen fertilizer intermediates, ammonia continuing to be imported.

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NORTH AFRICA

SPANISH SAHARA

General

An overseas province of Spain, Spanish Sahara is situated on the low desert Atlantic coast of North West Africa, covering an area of about 266,000 km^2. In 1960 the population was estimated to be about 23,793, most of the people being Berbers.

The country is barren, and there is almost no agriculture. Along the coast there are occasional cliffs and sand-dunes (some rocks have unsuccessfully been prospected for oil).

Natural resources and industry

Rich phosphate deposits have recently been discovered in the country, and Spanish authorities have decided to begin large-scale exploitation. The mineral zone was discovered in 1963 and a pilot plant for experimental exploitation has been operating for some years now. Full-scale exploitation is expected to start in 1968/1969. Reserves are estimated to be about 600 million tons with a 48 per cent BPL content.

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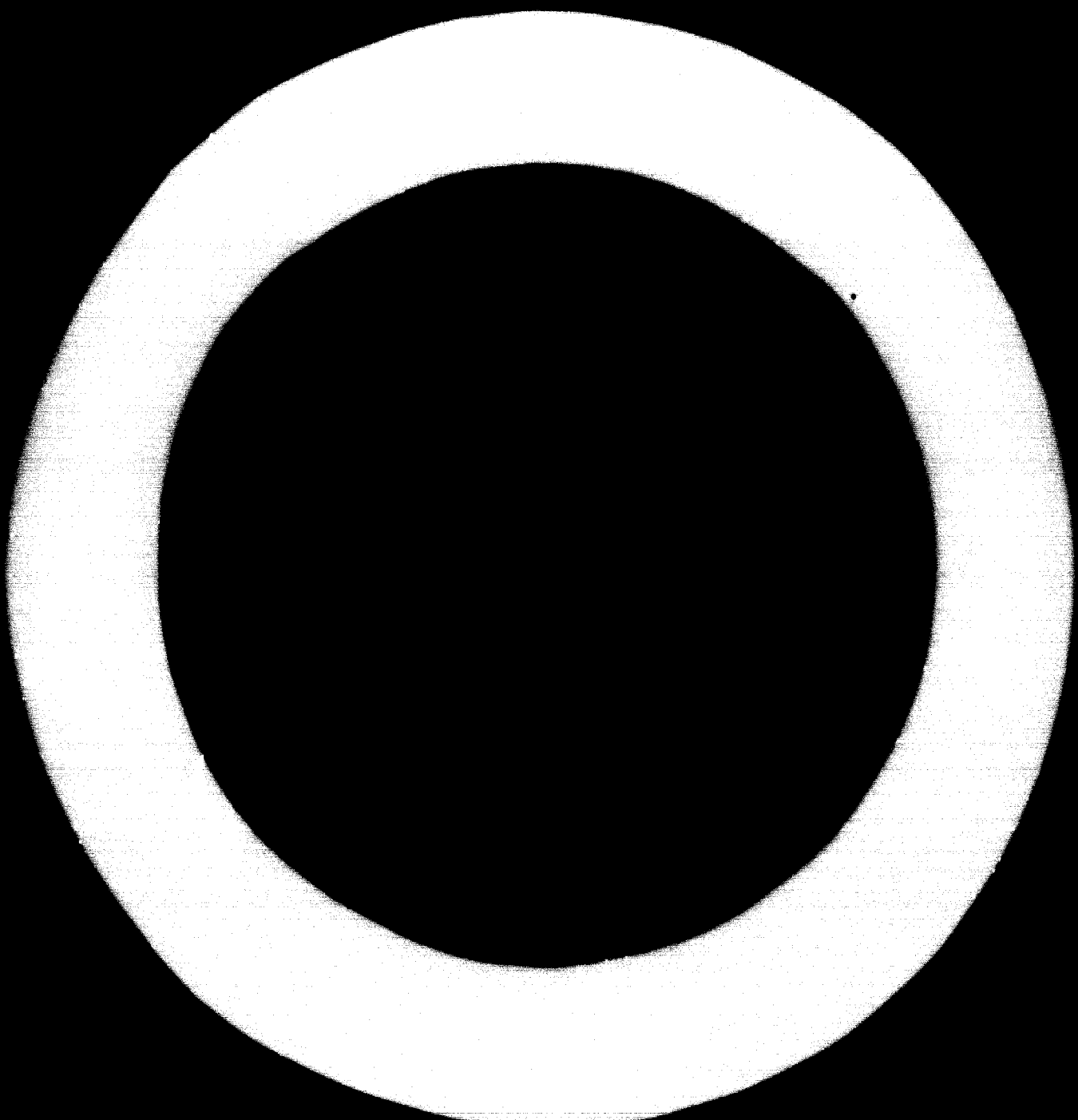

NORTH AFRICA

SUDAN

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	18,575	23,500	50,000	80,000
	Production	-	-	-	110,000
	Deficit	18,575	23,500	50,000	-
	Surplus	-	-	-	30,000
P_2O_5	Consumption	300	500	5,000	15,000
	Production	-	-	-	-
	Deficit	300	500	5,000	15,000
	Surplus	-	-	-	-
K_2O	Consumption	360	8,000	13,500	20,000
	Production	-	-	-	-
	Deficit	360	8,000	13,500	20,000
	Surplus	-	-	-	-

General

The Sudan covers an area of about 2.5 million km^2 and has a population of approximately 13 million. The annual rate of growth is about 2.8 per cent, and out of the total population some 75 per cent are employed in agriculture. The per capita GDP is $90 on average, but no reliable figures are available for the GDP as a whole.

The country's economy is based on agriculture. For many years the major emphasis has been on the development of irrigation schemes, using the Nile waters and only railway transport to serve both irrigated and rainfed agriculture. The main irrigated crop is cotton, providing about 50 per cent of the export earnings. Subsidiary exports are ground-nuts, sesame, sorghum and gum arabic. The Sudan is self-sufficient in most food-stuffs, but imports of wheat have been increasing. Apart from the processing of agricultural products, manufacture is largely confined to the production of consumer goods and building materials.

Practically no mineral resources have yet been discovered, and the present mining of copper, manganese and chromium ores hardly seems profitable. The same applies to gypsum and limestone deposits.

SUDAN

Agriculture

Irrigated cotton production accounts for the greater part of Sudan's total cotton production. Over the last 30 years production has grown at an average rate of about 3.5 per cent/year largely as a result of expansion of the area under irrigation. The 1961/1962 crop of 614,000 tons of seed cotton has been a record up to date. Annual production is about 550,000 tons, and the projected 1970 figure is 600,000 tons. The production of cotton lint is 200,000 tons/year, and this is expected to increase to 230,000 tons by 1970.

The volume of production of cereals (based on estimates of cropped acreage) has increased slowly over the years since 1962/1963. The 1967/1968 production of sorghum was 1.84 million tons, and is expected to drop to about 1.5 million tons by 1970. The production of millet was 353,000 tons and it is expected to remain at this level. Wheat production totalled 124,000 tons.

Among the oil seeds, production of cotton seed and ground-nuts has shown impressive increase. In 1967/1968 the production of cotton seed was 380,000 tons, and projected figures for 1970 are 420,000 tons, ground-nuts 200,000-230,000 tons, and sesame 160,000-170,000 tons.

Cotton accounted for about 50 per cent of the total exports of Sudan in 1966/1967 with about 164,000 tons. Oil seeds and related products accounted for nearly 31 per cent (12,900 tons of cotton seed was exported, 111,900 tons of ground-nuts, 76,900 tons of sesame, 7,900 tons of cotton seed oil and 160,300 tons of oil cake). Gum arabic export accounted for another 12 per cent (55,700 tons).

Natural resources and industry

To meet the demand for petroleum products a petroleum refinery was erected in Port Sudan by Royal Dutch Shell and BP with a capacity of 1 million tons (using imported crude). Prospecting for petroleum is now carried out on a large scale, particularly in the neighbourhood of the Red Sea, the concession holders being a subsidiary of the Italian ENI (total area 8,500 km^2). Up to the present time no worthwhile strikes have been made.

Fertilizer manufacture

The Sudan at present imports nearly 55,000 tons of urea yearly but it is estimated that by the early 1970s the demand will have increased to the equivalent of about 100,000 tons of urea. An investigation of the technical and economic feasibility of establishing a fertilizer industry was therefore carried out recently by the Sudan Industrial Research Institute and an expert of UNIDO. Port Sudan has been suggested as a possible site for this plant which is to produce urea based on naphtha. For a urea production of

SUDAN

100,000 tons/year about 43,000 tons of naphtha will be required, and should be supplied continuously over 11 months of the year, i.e. at the approximate rate of 1,000 tons per week. If the project is sanctioned by the Government, the probable date of commissioning is expected to be 1975 and the rated capacities of the plants might be 140,000 tons/year of urea, 175,000 tons/year of ammonium nitrate, 170,000 tons/year of ammonia and 150,000 tons/year of nitric acid.

Present and projected fertilizer consumption

The consumption of fertilizers in Sudan during the year 1966/1967 was showing a great improvement as compared with the previous years at about 40,000 tons/year nitrogen, 650 tons/year of P_2O_5 and 10,000 tons/year of K_2O.

The estimated growth of consumption of fertilizer, 1970 to 1980 as projected in 1968 by ECA in tons of nutrients is as follows:

	1970	1975	1980
N	50,000	80,000	120,000
P_2O_5	5,000	15,000	30,000
K_2O	1,000	5,000	12,000

The preference for the use of nitrogenous fertilizers is likely to continue during the next few years, especially if the development of a fertilizer industry in Sudan is to be limited to the production of nitrogen fertilizers in the foreseeable future. Therefore, it appears that the above projections are realistic with the exception of the estimates relating to future K_2O demand, which already in 1966/1967 was about 10,000 tons/year.

For this reason it has been assumed that the rate of growth of potash consumption during the period 1966/1975 will be approximately 7 per cent/year resulting in projected consumption for the years 1970 and 1975 of 13,500 tons/year K_2O and 20,000 tons/year respectively.

It has also been assumed that the projected nitrogen fertilizer plant will be operating at an average of 75 per cent throughout 1975, i.e. producing the equivalent of 110,000 tons/year of nitrogen.

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NORTH AFRICA

TUNISIA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	3,000	6,000	12,000	21,000
	Production	-	-	30,000	35,000
	Deficit	3,000	6,000	-	-
	Surplus	-	-	18,000	14,000
P_2O_5	Consumption	10,000	13,400	30,000	40,000
	Production	66,000	141,200	225,000	225,000
	Deficit	-	-	-	-
	Surplus	56,000	127,800	195,000	185,000
K_2O	Consumption	2,200	2,500	6,000	11,000
	Production	-	-	-	-
	Deficit	2,200	2,500	6,000	11,000
	Surplus	-	-	-	-

General

The country covers an area of 125,000 km^2 and consists mainly of vast plains with a few mountainous zones. The population of the country is estimated at about 4.7 million with a rate of growth of 2 per cent/year.

Tunisia is the smallest of the North African Republics and is relatively limited in natural resources, which consist mainly of some mineral deposits and a soil and climate which can support agriculture on about 50 per cent of its area at varying degrees of intensity.

Tunisia has achieved independence in 1957. During the period 1960/1965 the economic growth rate was increased to about 6 per cent/year and the GDP at factor cost in 1967 was about $220 million, with the contribution of agriculture and mining industry of about 18 per cent each. The per capita GNP at market prices was about $216 in 1967. During the more recent years, however, Tunisia suffered severe financial difficulties, aggravated by crop failures in 1966 and 1967, and worsening of external trade.

The increase in foreign currency earnings from crude oil, tourism and phosphatic fertilizers were offset by growing imports of food-stuffs, mainly cereals and soya oil. The Government's activities in promoting investment has increased the country's independence from foreign investors and a degree of

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structural reform in agriculture and commerce has been achieved. The Government is now considering a new plan for 1969-1972. Due to the burden of servicing of debts in the near future, Tunisia's economy will have to continue to depend on receiving substantial foreign aid on very favourable terms. Assistance is received from the Federal Republic of Germany, France, Italy, the United States, the USSR, the United Nations and others.

Agriculture

Agriculture is the most important economic activity in the country, providing a living for about 75 per cent of the population. More than one quarter of the total area of Tunisia cannot be cultivated, since only the northern and central regions are fertile. The total arable area is understood to cover about 5 million ha. Cereals are by far the most extensively cultivated crop, the main products being hard wheat (550,000 tons in 1965 and 380,000 tons in 1967), soft wheat (110,000 tons in 1965 and 55,000 tons in 1967), barley (250,000 tons in 1965 and 100,000 tons in 1967). Other important crops are olives (440,000 tons in 1965 and 90,000 tons in 1967), wine grapes (140,000 to 230,000 tons/year), citrus fruit (about 100,000 tons/year), fruits, vegetables and potatoes. The main agricultural exports of the country are olive oil (6 to 10 per cent of total exports), wine (4 to 10 per cent) and cereals (hard wheat).

Natural resources and industry

The most important mining and extraction activity is based on the phosphate rock deposits in the central region of the country around Gafsa and Kalaa Djerda and Metlaoui with reserves of 600 million tons of ore with an average grade of 60 to 70 per cent BPL. These deposits are exploited by three companies:

Compagnie des Phosphates et du Chemin de Fer de Gafsa,

Compagnie Nouvelle des Phosphates du Djebel M'Dilla, and

Société Tunisienne d'Exploitations Phosphatières.

The phosphates from the first two companies are transported by railroad to Sfax at a distance of 250 km. The phosphates produced by the last one are transported to the port, La Goulette, near Tunis by railroad. The production of phosphate rock during the period 1965-1967 was about 3 million tons/year, most of the output being destined for export. The first company mentioned above is the largest, accounting for about 70 per cent of the country's production. It is estimated that by 1980 the production will be raised to 10 million tons/year.

The prospect for hydrocarbon resources in Tunisia is relatively modest. Reserves in 1967 amounted to 48 million m^3 crude oil and about 100 million m^3 gas. If exploited at the 1967 (2.2 million m^3 crude) and

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1966 (8.4 million m^3 gas) rates, these reserves will last for 20 and 12 years respectively. If they are not replenished substantially by new discoveries, the prospects for the hydrocarbon resources are not encouraging. Up to and including 1966 Tunisia imported part of her crude oil requirements. Since 1967 it has turned to be a net exporter. In 1967 all refinery requirements were met from domestic sources, that is, about 70 per cent of the output is exported, and the balance is refined in the refinery at Bizerte at a rate of about 1 million tons/year (using local crude and imports from Libya and Iraq).

Tunisia is also a producer of iron ore, the production rising from about 760,000 tons/year in the early 1960s to around 1.2 million tons/year during the period 1965-1967. However, the ore has a relatively low Fe content which impairs the profitability of the operations. Tunisia also produced relatively smaller quantities of lead and zinc concentrates (25,000 and 6,000 tons/year respectively). Deposits of fluorspar around Hammam-Zrita are being developed. A deposit of potash at Zarzis has been discovered but it has not yet been evaluated.

The industrial sector also includes the manufacture of phosphate fertilizers, the processing of agricultural produce, such as oil pressing, sugar refining and paper pulp production, and textiles production.

Fertilizer manufacture

The country is a producer and net exporter of phosphate fertilizers based on Gafsa phosphate rock production. The plants in operation include Société Industrielle d'Acide Phosphorique et d'Engrais (SIAPE), controlled by the Government, at Sfax, with capacities of: sulphuric acid - 180,000 tons/year using imported sulphur, phosphoric acid - 40,000 tons/year, and triple superphosphates capacity about 100,000 tons/year. Both of the latter plants use Gafsa rock with a production of about 70 per cent of rated capacity, destined mainly for export.

NPK Engrais also at Sfax (Swedish owned) with the following production capacities: sulphuric acid - 150,000 tons/year using imported sulphur, phosphoric acid - 60,000 tons/year P_2O_5, and triple superphosphate - 150,000 tons/year using Gafsa rock. The plant has been commissioned in 1966 and operates at about 90 per cent of capacity supplying both home and export markets.

Société Algérienne de Produits Chimiques et d'Engrais (SAPCE) with a plant near Tunis with a capacity of about 60,000 tons/year of single superphosphate using the Kallaa Djerda rock, and sulphuric acid - 30,000 tons/year using imported sulphur. The plant is operating at about 70 per cent of rated capacity and supplies local market.

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STEP (Société Tunisienne d'Engrais Pulverisés) at Sfax, again government controlled, with a production capacity of about 150,000 tons/year of calcined phosphate rock (25 per cent P_2O_5), using Gafsa rock, built in 1930 but producing only about 10,000 tons/year.

The total production of mixed fertilizers in the country is believed to be about 150,000 tons/year.

The projects described in the following paragraphs are either in construction or at a planning stage.

A project at an advanced stage by the Industries Chimiques Maghrebines at Gabès, to produce by 1970, 200,000 tons/year of di-ammonium phosphate and 50,000 tons/year of ammonia, 100,000 tons/year of phosphoric acid and 300,000 tons/year H_2SO_4, based on imported sulphur and local phosphate rock.

It is also planned to increase the production capacity of this complex by adding ammonium nitrate and urea production facilities at a much later stage (probably after 1975).

It is understood, however, that Tunisia has recently reached an agreement with Libya not to produce nitrogen fertilizers but to purchase their requirements from Libya, in exchange supplying Libya with their phosphate needs. The significance of this agreement in relation to the project by the Industries Chimiques Maghrebines is not clear.

Work is in hand to increase the production capacity at SIAPE plant in Sfax by adding the following units: (a) 70,000 tons/year of sulphuric acid; (b) 40,000 tons/year of phosphoric acid (as P_2O_5); (c) 100,000 tons/year of triple superphosphate. It is understood that the plant should be in operation by 1970.

Other projects in hand include production of 25,000 tons/year of tripolyphosphate and 100,000 tons/year of dicalcium phosphate presumably not for fertilizer use.

Taking the above into consideration the present fertilizer (finished product and intermediates) installed capacity is as follows:

Sulphuric acid	360,000 tons/year
Phosphoric acid	100,000 tons/year of P_2O_5
Calcined rock	150,000 tons/year (25 per cent P_2O_5)
Single superphosphate	60,000 tons/year
Triple superphosphate	250,000 tons/year (45 per cent P_2O_5)

Total P_2O_5 production capacity is 160,000 tons/year. There are no nitrogen production facilities.

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By 1970 this capacity should be increased by:

Sulphuric acid	370,000 tons/year
Phosphoric acid	140,000 tons/year (as P_2O_5)
Ammonia	50,000 tons/year
Di-ammonium phosphate	200,000 tons/year
Triple superphosphate	100,000 tons/year (45 per cent P_2O_5)

If no plants are scrapped, the total P_2O_5 production capacity in 1970 will be 300,000 tons/year.

For the purpose of this study it is assumed that the above plants will be operating at an average of 75 per cent of rated capacity. It is possible that, because of the agreement with Libya referred to above, the plans for further expansion by ICM at Gabès will be shelved, and therefore they have been disregarded at this stage. In 1966/1967 the production and consumption of phosphatic fertilizers was as follows:

	N	P_2O_5	K_2O
Production, tons of nutrients	-	145,300	-
Consumption, tons of nutrients	7,000	14,300	3,000
Net excess (deficit), tons of nutrients	(7,000)	131,000	(3,000)

It is evident from the above figures that the excess production of phosphate fertilizers in Tunisia will be supported primarily by the export markets for many years to come.

Present and projected fertilizer consumption

The present consumption of fertilizers in the country remains low at about 4.9 kg of nutrients/ha of total arable land (taken as 5 million ha). Because of the existence of phosphate rock mining and processing facilities in Tunisia, the N:P:K ratio of 1:2.1:0.43 shows a strong preference for phosphate fertilizers. This tendency is expected to continue in the near future though to a lesser extent.

The estimated future demand for fertilizers in the country, as projected by ECA and as based on unofficial estimates by the Ministry of Agriculture, in tons of nutrients is as follows:

	1970			1976		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	9,000	27,000	6,000	15,000	37,000	11,000
Ministry of Agriculture	48,000	52,000	5,000	70,000	65,000	7,000

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It would not appear realistic to expect the nitrogen consumption in Tunisia to increase to 48,000 tons/year by 1970. Similarly the P_2O_5 consumption target of 52,000 tons by 1970 seems to be optimistic. Therefore, although the projections for 1970 carried out by ECA may at first appear pessimistic, they have been taken as a basis for the present study, with slight adjustment upwards as follows:

N	12,000 tons/year (rate of growth 1966-1970 at 10 per cent/year)
P_2O_5	30,000 tons/year
K_2O	6,000 tons/year

For 1975 it has been assumed that the nitrogen consumption will continue to increase at the rate of 11 per cent/year (ECA) and similarly the P_2O_5 and K_2O projections have been based on the rate of growth of 6 per cent and 12 per cent/year respectively, during the period 1970-1975 (ECA). This gives a projected consumption of fertilizers in 1975 as:

N	21,000 tons/year
P_2O_5	40,000 tons/year
K_2O	11,000 tons/year

This would give an N:P:K ratio of 1:1.9:0.5.

The above projections may however be affected by stimulation of the domestic nitrogen fertilizer market resulting from the setting up of the production facilities at Gabès and from the bilateral agreement with Libya on fertilizer trade. The extent of this is difficult to quantify at the present time.

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NORTH AFRICA

UNITED ARAB REPUBLIC

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	176,600	285,200	375,000	518,000
	Production	55,000	154,000	220,000	460,000
	Deficit	121,600	131,200	155,000	58,000
	Surplus	-	-	-	-
P_2O_5	Consumption	36,000	54,700	120,000	205,000
	Production	28,500	44,000	86,000	180,000
	Deficit	7,500	10,700	34,000	25,000
	Surplus	-	-	-	-
K_2O	Consumption	3,250	600	5,000	20,000
	Production	-	-	-	-
	Deficit	3,250	600	5,000	20,000
	Surplus	-	-	-	-

General

The United Arab Republic covers an area of about 1 million km^2, and has a population of approximately 30.9 million (1965 census). The rate of growth of the population is estimated at 2.8 per cent/year. Out of the 30.9 million population about 57 per cent were agriculturally employed.

The United Arab Republic is the most important and steadily growing producer of fertilizers in the whole African region. The Government of the United Arab Republic attaches high priority to the development of the agricultural sector of the national economy and has created all possible prerequisites to this effect. It first gave priority to the full control of the River Nile and maximum utilization of its waters. This effort resulted in the creation of a central storage reservoir by the construction of a High Dam at Aswan to store and control all the waters of the Nile, including the flood waters. In this way an annual quantity of 32 billion m^3 of water from waste into the Mediterranean is saved. As soon as the Aswan High Dam is completed there will be available a new cultivable area of about 800,000 ha under perennial irrigation. This would represent an increase of 30 per cent of the total cultivable area in 1952. Besides getting new land under plough, there will be other important ancillary benefits. Among these are the lowering of the underground water level, a substantial increase of the area under rice cultivation, improvement of navigation conditions along the Nile.

UNITED ARAB REPUBLIC

In addition the dam will provide hydroelectric power generation to the amount of 10 billion kWh/year to be used for industrial and agricultural development. The benefits derived from the construction of Aswan High Dam are expected to increase the United Arab Republic's national income by about $560 million/year.

Work on the hydroelectric power station is progressing satisfactorily and all twelve power generating units were planned to be completed and commissioned early in 1969. Parallel to the work on the hydro-electric power station, the construction of the first 500 kW high tension transmission line linking Aswan and Cairo was completed and commissioned early in January 1968. The second 500 kW transmission line will be completed in 1969 with the interconnexion to the already built H.V. Network covering the Nile Delta.

Such an important infrastructure will to a great extent enable the development of the fertilizer industry in the United Arab Republic to ensure the supply of all local requirements and eventually a surplus for export, especially in phosphatic fertilizers. The United Arab Republic will be able to use the local deposits of phosphate rock, crude oil and natural gas and gradually limit its dependence on fertilizers imports, thus saving scarce foreign exchange.

Agriculture

Agriculture, although one of the main sectors of the economy, is confined to only about 3.5 per cent of the total area of the country, i.e. the Nile Valley and the Delta (the balance of Egypt being barren desert). Land reclamation efforts by the United Arab Republic during the five years 1960-1965 have brought some 215,000 ha of previously arid land under cultivation. Some additional 170,000 ha will be ready for cultivation in the area south of Port Said by 1970 (this and other land reclamation projects will utilize water available from the Aswan High Dam). Expansion of the cultivated area combined with increased yields resulting from improved agricultural methods such as increased use of fertilizer and more effective plant protection, are expected to increase the nation's agricultural output by 22 per cent by 1970.

Ninety-two per cent of the total cultivated area is under field crops, 6 per cent under vegetables and 2 per cent under fruit.

The principal cash crop and export product is cotton. Exports of this go chiefly to the countries with centrally planned economies (cotton has roughly a 70 per cent share of the country's total exports).

Field crops are grown on a three-year rotation pattern. Wheat and berseem are winter crops, cotton is planted in February and harvested in September, and rice, corn and millet are summer crops. There is a special difficulty with wheat. The country is faced with increasing demands for wheat, which cannot be met under the present cropping pattern so that substantial quantities of wheat and flour have to be

imported. The production is shifting gradually away from cereals, particularly wheat, towards cotton and fruit. Wheat cannot compete economically with other crops, but the law requires it to be planted on at least one third of each owner's land.

In 1965, cotton production was about 500,000 tons from 700,000 ha, wheat 1,580 tons from 577,000 ha, maize 2,141,000 tons from 672,000 ha, rice 2,300,000 tons from 445,000 ha. Sugar cane production came to 6,000,000 tons, and dates about 400,000 tons and millet about 850,000 tons.

Natural resources and industry

Total mineral production of the United Arab Republic in 1965 was $100 million, of which 75 per cent was crude oil and the balance mine and quarry production.

The United Arab Republic was not considered an important oil producing country until some time ago. Because of recent discoveries its future outlook is brighter. Crude oil reserves are expected to increase from 300 million m^3 in 1967 to about 700 million m^3 in 1980. The corresponding figures for natural gas are 21 billion m^3 and 400 billion m^3. The importance of these reserves is to be reflected in the corresponding increases in production over 1967: a fourfold increase to 40 million m^3 crude oil in 1973, tenfold to 20 billion m^3 gas in 1980.

There are three petroleum refineries in operation, one at El Kasr using local crude with a capacity of 4.5 million tons/year, one at Suez also using local crude, with a capacity of 3 million tons/year and a third at Alexandria at present using crude from the USSR, with a capacity of 1.4 million tons/year.

In addition, new oil strikes by Pan American Petroleum Corporation in the Gulf of Suez, and by Phillips Petroleum Company in the Western Desert south of El Alamein indicate the presence of further untapped reserves.

From the import/export statistics of the first half of this decade it appears that the United Arab Republic has been a net importer of crude oil to the extent of 1 to 2 million tons/year. With the new discoveries and exploitation of some fields and sharp increase in production to 12 million tons in 1968 (according to Marchés tropicaux et méditerranéens, August 1968) the situation reversed as early as 1968 making the country a net exporter.

Development of the country's other mineral resources is progressing at a slower pace, though there are several considerable deposits. Total production of the quarry and mine products was valued a little over $24 million in 1965. Export sales, mainly manganese, phosphate, salt and talc were valued at just under $6 million.

UNITED ARAB REPUBLIC

Iron ore reserves of over 200 million tons are reported in the region of the Baharia Oasis in the Western Desert. A $100 million project was drawn up in 1960 to construct a railroad linking the Baharia Oasis with the Helwan steel plant just outside Cairo. In the absence of the railroad it is not feasible to undertake mining operations at the remote desert oasis site. (Meanwhile the Helwan steel plant continues to be supplied by the overburdened rail and river barge links running up the Nile to the iron ore fields at Aswan.)

Coal deposits in the Maghara area, south-west of El Arish, are estimated at about 50 million tons. Limited mining operations currently yield some 20,000 tons annually and large-scale expansion is planned, but delays have been occasioned by doubts about whether the quality of coal is high enough for coking. Unsuitability for coking would make the coal unusable for the Helwan steel plant, which currently imports its supply of coking coal. A further obstacle to the development of the Maghara field is the lack of transport facilities adequate to move the coal in the required volume from Maghara to Helwan. Additional coal deposits are known to exist along the western coast of the Sinai Peninsula, but surface water and other problems would require special engineering techniques for access and extraction.

Phosphates in the United Arab Republic are extracted in two regions: (a) the Red Sea District near the ports of Quseir and Saphaga, and (b) the Nile Valley area at Sibalya near Luxor. The phosphates in the former district lie 500 metres below the surface. The product after washing and calcination contains about 64 per cent tricalcium phosphate. As the distance from the ports is only 20 to 25 km, it is exported. The phosphate deposit in the Nile Valley lies shallow and is extracted mainly by open pit mining. It is then sent for processing to superphosphate without washing. The production of these two regions is almost equal. Geological reserves of phosphates are estimated at 200 million tons. No relative details on the breakdown of these reserves are available. According to the United Nations Statistical Handbook, the production has fluctuated from 570,000 tons in 1960 and 627,000 tons in 1961 to 594,000 tons in 1965. (According to other estimates production from the Nile Valley area alone was 660,000 tons in 1966/1967.)

Considerable emphasis is placed on expanding phosphate production, both to meet growing export demand and to meet increasing internal requirements for fertilizer production. There are several projects considered. Exploration of deposits at Wadi Nile and Saphaga or Hamrdwin (both on the Red Sea) is being projected. According to ECA the total capacity of existing mines will be about 600,000 tons/year in 1970 and 700,000 tons/year in 1980. It is expected that the Wadi Nile mine will be in production at about 750,000 tons/year by 1975 increasing to about 1 million tons/year by 1980, and that either the Saphaga or the Hamrdwin will be in operation by 1980 at about 600,000 tons/year. The total production by 1980 is therefore expected to be about 2.3 million tons/year.

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Exports of phosphate rock from the United Arab Republic during the last few years has been about 370,500 tons/year.

Manganese deposits are estimated at several million tons and are located at Abu Zenima on the west coast of the Sinai Peninsula, where 182,000 tons of manganese ore was mined in 1965, most of which was exported. A ferromanganese smelter is under construction at the site to make greater use of the lower grade ore, the higher grade ore being exported.

Large quantities of ilmenite are known to be present in the sand dune area of the Nile Delta. As an important source of titanium dioxide used in the production of paint, the ilmenite resources of the area are being assessed as the possible basis of new export earnings in the world markets.

Gypsum has been found on the Sinai Peninsula at several localities. It is planned to use gypsum instead of sulphur as the raw material for production at a new sulphuric acid factory at Suez, thus saving foreign currency on the import of sulphur. On average about 400,000 tons/year of gypsum are produced.

Since 1958 small quantities of sulphur are being mined at Ras Gemsa on the Red Sea Coast (about 5,000 tons/year). This sulphur is used for the production of sulphuric acid. About 30,000 tons/year of by-product sulphur is recovered from waste gases at two refineries.

Limestone occurs at many places, and is used for the production of fertilizers (calcium-ammonium nitrate).

There have also been reports that the clays of the Aswan High Dam is rich enough in nepholine ore to permit exploitation.

Fertilizer manufacture

There are several fertilizer plants in operation in the United Arab Republic, and more are planned to be on stream by 1970.

The plants operating at present are as follows:

(a) The Fertilizer and Chemical Company has a plant in Abou Zabaal with a rated capacity of 40,000 tons/year of H_2SO_4, and 260,000 tons/year SSP (15 per cent P_2O_5) which was limited by the capacity of the sulphuric acid plant to about 100,000 tons/year of SSP;

(b) The Société Financière et Industrielle d'Egypte, situated at Kafr El Zayat, with a rated capacity of 100,000 tons/year H_2SO_4 and 300,000 tons/year SSP (15 per cent P_2O_5). Production of SSP has been limited by the availability of sulphuric acid;

UNITED ARAB REPUBLIC

(c) Nitrogen fertilizers production at present is limited to the plants of El Nasr d'Engrais et d'Industries Chimiques at Suez and the Egyptian Chemical Industries "Kima" at Aswan with the following capacity:

(i) Société El Nasr at Suez:

Ammonia	85,000 tons/year based on refinery gases from the El Nasr refinery at Suez
Sulphuric acid	100,000 tons/year
Nitric acid	198,000 tons/year
Calcium nitrate	270,000 tons/year (15.5 per cent N)
Ammonium sulphate	100,000 tons/year (20.6 per cent N)

Total capacity of the complex is equivalent to about 62,000 tons/year of N.

(ii) Egyptian Chemical Industries "Kima" at Aswan:

Ammonia	138,000 tons/year based on electrolytic hydrogen from the world's biggest plant of its type
Nitric acid	247,000 tons/year
Calcium ammonium nitrate	550,000 tons/year (20.5 per cent N)

The total capacity of the complex is equivalent to about 110,000 tons/year of N.

The total present fertilizer production capacity in the United Arab Republic is therefore as follows:

	Tons/year
Sulphuric acid	240,000
Single superphosphate	560,000 (if enough H_2SO_4 available)
Ammonia	223,000
Nitric acid	445,000
Ammonium sulphate	100,000
Calcium nitrate	270,000
Calcium ammonium nitrate	550,000

The total production capacity is therefore equivalent to 170,000 tons of nitrogen and 80,000 tons/year of P_2O_5.

Phosphoric acid is not at present produced in the United Arab Republic. It is needed for the production of sodium phosphates used in the synthetic detergents industry, triple superphosphate fertilizers and pharmaceuticals. A project for the installation of a phosphorus complex within the Kima works at Aswan was included in the recent five-year plan. Hydroelectric power generated from the High Dam power station will be used, and the phosphate rock obtained from the Sibaiya mines in the Nile Valley. The phosphorus complex will include an electric furnace with a rating of 35,000 kva to produce elemental phosphorus from phosphate rock. All the phosphorus will be converted into phosphoric acid (75,000 to 110,000 tons/year of

P_2O_5), which will be used for the manufacture of the following end-products: (a) 100,000 to 220,000 tons/year triple superphosphate; (b) 8,000 tons/year tetrasodium pyrophosphate; (c) 8,000 tons/year sodium tripolyphosphate.

As the project is still under consideration, the lower of the above production capacities have been assumed for the purpose of this study. In addition a feed grade dicalcium phosphate plant with a capacity of 12,000 tons/year is to be included, without corresponding facilities for acid production. It is understood that the plants should be commissioned some time after 1970.

There are five other plants under construction that should be commissioned by 1970:

(a) At Abou Zabaal by the Fertilizers and Chemical Co. to produce an additional 100,000 tons/year of sulphuric acid to utilize the full rate capacity of the single superphosphate plant of 260,000 tons/year;

(b) At Kafr El Zayat by the Société Financière et Industrielle d'Egypte. Additional plant to produce sulphuric acid with rated capacity of 40,000 tons/year;

(c) At Assyût also by the above company with production capacities of 83,000 tons of sulphuric acid and 200,000 tons/year of single superphosphate (15 per cent);

(d) The Société El Nasr d'Engrais et d'Industries Chimiques at Suez with production capacities of 130,000 tons/year of ammonia, 198,000 tons/year of (55 per cent) nitric acid, and 370,000 tons/year of calcium ammonium nitrate (20.5 per cent N) using refinery gas as ammonia feedstock;

(e) The El Nasr Coke and Heavy Chemical Company at Helwan with capacities to produce 52,000 tons/year of ammonia, 95,000 tons/year of nitric acid and 200,000 tons/year of calcium ammonium nitrate (20.5 per cent N).

From the above, the total fertilizer production capacity in the United Arab Republic will then be:

	Tons/year
Sulphuric acid	470,000
Single superphosphate	760,000
Ammonia	400,000
Nitric acid	740,000
Ammonium sulphate	100,000
Calcium nitrate	270,000
Calcium ammonium nitrate	1,120,000

The total fertilizer production capacity will therefore be equivalent to 290,000 tons/year of nitrogen and 115,000 tons/year of P_2O_5. For the purpose of this study it has been assumed that the average fertilizer production in 1970 will be 75 per cent of the total rated capacity, i.e. the equivalent of 220,000 tons/year of nitrogen and 86,000 tons/year of P_2O_5.

UNITED ARAB REPUBLIC

The following additional fertilizer capacity is planned for installation by 1975 in addition to the extensions by Egyptian Chemical Industries "Kima", already discussed:

(a) El Nasr at Suez with the following additional capacities:

Sulphuric acid	200,000 tons/year
Phosphoric acid	75,000 tons/year P_2O_5
Triple superphosphate	200,000 tons/year (45 per cent P_2O_5)

(b) Egyptian General Organization for Chemicals at Suez:

Ammonia	250,000 tons/year
Urea	400,000 tons/year

(c) El Nasr Coke and Heavy Chemical Co. at Helwan:

Ammonia	110,000 tons/year
Nitric acid	110,000 tons/year
Calcium ammonium nitrate	200,000 tons/year (20.5 per cent N)
Urea	95,000 tons/year

(d) New Petrochemical Complex at Alexandria:

Ammonia	110,000 tons/year
Nitric acid	110,000 tons/year
Calcium ammonium nitrate	200,000 tons/year (20.5 per cent N)
Urea	95,000 tons/year

(e) Production of about 5,200 tons/year of potassium sulphate is envisaged based on alcohol distillery. Owing to uncertainty regarding the status of implementation of this project, it has not been included in the list of plants in production in 1975.

If the above materializes, the additional production capacity will then be:

Sulphuric acid	200,000 tons/year
Phosphoric acid	150,000 tons/year P_2O_5
Triple superphosphate	300,000 tons/year
Ammonia	470,000 tons/year
Nitric acid	220,000 tons/year
Calcium ammonium nitrate	400,000 tons/year
Urea	590,000 tons/year

If all the above plans materialize by 1975, the total fertilizer production capacity in the United Arab Republic will become equivalent to 640,000 tons/year of nitrogen and 250,000 tons/year of P_2O_5.

For the purpose of this study it is assumed that in 1975 the over-all fertilizer production in the United Arab Republic will be 85 per cent of the rated capacity totalled by 1970 and 60 per cent of the additional capacity planned to be installed between 1970 and 1975, i.e. a total of 460,000 tons/year of nitrogen and 180,000 tons/year of P_2O_5.

UNITED ARAB REPUBLIC

There is no production of potash in the country because of lack of indigenous reserves.

Present and projected fertilizer consumption

In 1966 the production and consumption of fertilizer was as follows, expressed in tons of nutrients:

	N	P_2O_5	K_2O
Production	163,000	47,000	-
Consumption	250,000	55,000	1,000
Net surplus (deficit)	(87,000)	(8,000)	(1,000)

In 1966/1967 the total fertilizer nutrient consumption was about 100 kg/ha of arable land, taken as 3 million ha. During 1965/1966 the fertilizer consumption was in fact higher at about 113 kg of nutrients/ha. These figures show clearly that the state of development of agriculture in the United Arab Republic is much more advanced than elsewhere in Africa. This is mainly due to the need to maximize production from a very limited area under cultivation to support a growing population.

Various official and unofficial estimates of the projected fertilizer consumption in 1970 and 1975 have been prepared. The estimates prepared by ECA and by an expert are shown below in tons of nutrients:

	1970			1975		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	375,000	120,000	5,000	515,000	205,000	20,000
Expert	344,000	140,000	1,000	512,000	180,000	1,000

The ECA projections are based on the rate of growth of fertilizer consumption during the period 1965-1975 of 6.5 per cent/year for nitrogen, 11.1 per cent/year for P_2O_5 and 29.2 per cent/year for K_2O. According to ECA estimates the over-all N:P:K ratio will change from 1:0.22:0 in 1966/1967 to 1:0.32:0.01 in 1970 and to 1:0.4:0.04 in 1975.

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WEST AFRICA

DAHOMEY

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	100	100	1,500	3,000
	Production	-	-	-	-
	Deficit	100	100	1,500	3,000
	Surplus	-	-	-	-
P_2O_5	Consumption	100	100	500	1,500
	Production	-	-	-	-
	Deficit	100	100	500	1,500
	Surplus	-	-	-	-
K_2O	Consumption	270	600	1,000	3,000
	Production	-	-	-	-
	Deficit	270	600	1,000	3,000
	Surplus	-	-	-	-

General

Consisting of a narrow strip of land Dahomey covers an area of about 112,800 km^2, and has an estimated population of 2.2 million (1964) with an annual rate of growth of approximately 2.8 per cent. Density of population varies from region to region. In the south, where about 5 per cent of the population is concentrated, the average density is about 970/km^2. The population is predominantly rural with only 11 per cent living in cities. The country's GDP is about $180 million and the per capita income between $71 and $100.

Agriculture

There are no European farmers, and the size of African farms varies from 12.5 ha in the north to about 25 ha in the south. Dahomey has very low agricultural yields mainly due to primitive methods of cultivation, lack of adequate tools and equipment and absence of animal power. The Government has recently encouraged the creation of co-operatives, some of which have been organized and managed by a Swiss co-operative union and by Israeli advisers. The area under subsistence food crops (cassava, yams, sorghum and millet) accounts for about 70 per cent of the total cultivated area. The arable area is approximately 3.6 million ha, all of which is now irrigated. The actual cultivated area is about 800,000 ha.

DAHOMEY

The main commercial agricultural products accounting for about 90 per cent of the country's agricultural exports are palm kernels, palm oil, ground-nuts and coffee.

Natural resources and industry

At present the known indigenous resources in Dahomey are very limited. There are no coal deposits. Oil exploration has been carried out since 1964 by a subsidiary of Union Oil of California who have been awarded the rights for the whole of the coastal sedimentary basin. Early in 1968 favourable indications of crude oil off shore were discovered, resulting in a production well with an initial flow rate of 1400 b/d.

Exploration work for mineral deposits has resulted in the following discoveries:

(a) Limestone deposits near Arlan with indicated reserves of 9 million tons of 80 per cent calcium carbonate.

(b) Phosphate rock deposits near Lomé (Togo) and Pohé, which are extensions of the Togo deposit. It is believed that these deposits are insufficient to justify commercial exploration.

(c) Extensive iron reserves estimated at 1 billion tons of goethite (45 per cent Fe) at Kandi. It is believed that the ore can be upgraded to 52 per cent but because of the remote location an economic exploration of this deposit will be adversely affected by high transport costs.

(d) There are also indications of alluvial gold deposits, chrome and nickel at Bontomo.

(e) The manufacturing industry in the country consists of food, natural fibre and vegetable processing plants, textiles, cement, and light engineering assembly plants. There is no basic chemical industry in the country.

Fertilizer manufacture

There is no production of fertilizers in the country and because of the limited market potential and the lack of suitable raw materials this situation is unlikely to change in the near future. It is expected that the country's needs of phosphatic fertilizers can be supplied by the plant projected in Togo.

Present and projected fertilizer consumption

The present consumption of fertilizer nutrients in Dahomey is insignificant at about 100 tons of nitrogen, 150 tons of P_2O_5 and 700 tons of K_2O in 1966/1967 or 1.2 kg/ha of total cultivated land taken as 0.8 million ha.

DAHOMEY

The projected fertilizer consumption in 1970 and 1975 as estimated by ECA and FAO is given below in tons of nutrients:

	1970			1975		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	500	500	1,000	1,500	1,500	3,000
FAO	-	-	-	850	500	900

The FAO estimates are projected from 1962 data, based on an assumed rate of growth of the contribution by the agricultural sector to the gross domestic product at market prices of 3 per cent/year or 0.7 per cent/year expressed per head of population.

It is expected that most of the fertilizers will be used on cash crops (oil seeds) followed by cereals.

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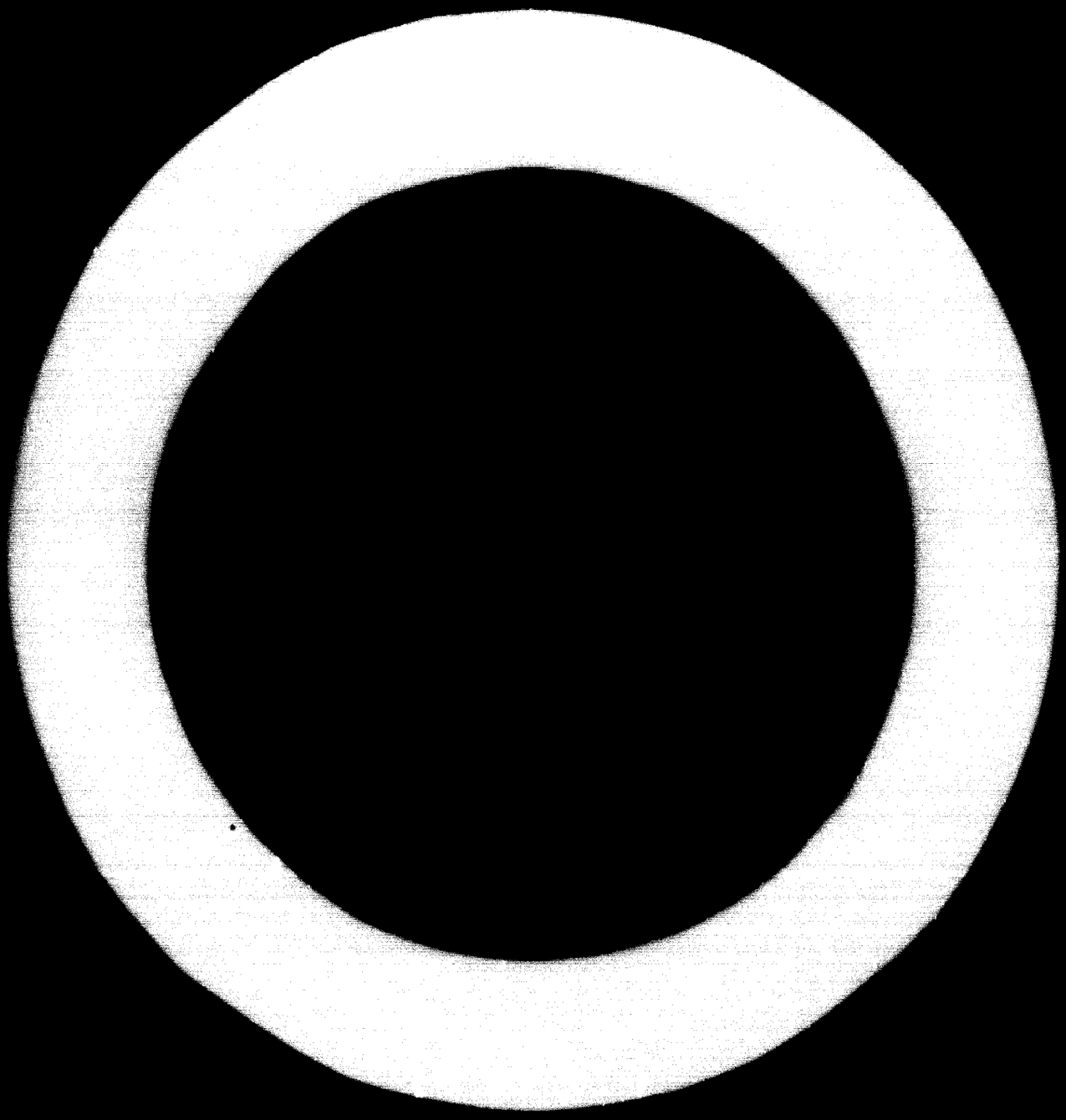

WEST AFRICA

GAMBIA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	negl.	negl.	300	600
	Production	-	-	-	-
	Deficit	negl.	negl.	300	600
	Surplus	-	-	-	-
P_2O_5	Consumption	negl.	300	600	1,400
	Production	-	-	-	-
	Deficit	negl.	300	600	1,400
	Surplus	-	-	-	-
K_2O	Consumption	negl.	negl.	300	600
	Production	-	-	-	-
	Deficit	negl.	negl.	300	600
	Surplus	-	-	-	-

General

Gambia consists of a narrow strip of land, in parts only 48 km wide, and covers an area of about 1,400 km^2. The population is approximately 340,000 with an annual rate of growth estimated to be 3 per cent.

The territory is mainly low-lying and consists largely of creeks and swamps and open savannah. Bathurst, the capital, has one of the best ports in western Africa and handles some trade for the neighbouring ports of Senegal. The former British colony gained independence within the Commonwealth in 1965.

Over 90 per cent of the population are agriculturally employed on a subsistence level, with an annual income of $70 or less. (Per capita GDP has risen from $81.3 in 1964 to about $95.1 in 1967.) Economically the country is fairly stable and increased exports of peanuts is hoped to close the present narrow trade gap. The present five-year plan, 1967-1971, aims to consolidate the progress made under the previous 1964-1967 plan and a 5 per cent annual increase in GDP is envisaged.

The mainstay of Gambia's economy is peanuts. This crop provides over 90 per cent of the country's total exports (about $14.3 million's worth annually), which mainly go to the United Kingdom and Portugal.

GAMBIA

The current yields are about 80,000 tons annually and production is rising. The only export commodity of any significance besides ground-nuts are palm kernels, exports of which are normally valued at less than $280,000 annually.

Principal sources of imports are the United Kingdom and Japan, with $7 million and $2.8 million respectively. The dependence of the country on foreign sources for food-stuffs has induced the Government to launch a drive to achieve self-sufficiency through increased home production. There are plans to increase rice cultivation, develop fisheries and provide for a new infrastructure. The major economic problem is that of one-crop economy. That, together with the small number of consumers, make any industrialization scheme very difficult to realize.

The Government is receiving substantial financial aid from the United Kingdom in the form of a 25-year interest-free loan for development. Gambia has also applied for membership of the International Monetary Fund and the World Bank, but so far the application has not been accepted.

In April 1967 Gambia made an agreement pact with Senegal to promote economic co-operation in all fields. The two countries have already combined in a joint development of Gambia's River Basin. Experts consider that if dams were built on the Upper River in Senegal, they would not only supply hydroelectric power but conserve water for the irrigation of large areas.

Agriculture

This sector occupies a very minor part in the country's economy. The only really fertile regions of the country are the valley areas, which are built up of alluvium and an area known as bantō farras, and which are liable to flood during the rains. The total arable area is estimated at 400,000 ha, all of which is non-irrigated. The actual cultivated area is about 50 per cent of this.

Only crops suited to the drier tropics will flourish in Gambia. Subsistence crops include millet, maize and rice.

All peanuts and oilseeds are bought from the Gambia Oilseeds Marketing Board and its profits go to a "farmer's fund" applied to improving the rural water supplies and pest control and research.

Rice growing was greatly developed in the country between 1948 and 1958, mainly in the mangrove swamps of the middle river area and is now the main crop for local consumption. Yield averages from 1,572 to 2,245 kg/ha.

Gambia fishing grounds are very rich in tunny, shark and crayfish, prawns and oysters.

GAMBIA

Natural resources and industry

The country is practically unexplored from the geological point of view and in consequence there are very few proven mineral resources. Ilmenite was mined for three years on the Atlantic coast but because of too high costs this operation was discontinued in 1959. Exploration for crude oil is being carried out and there are favourable indications off shore. The country has no hydroelectric power potential.

There is little or no industrial development in Gambia due to the very limited home market.

Fertilizer manufacture

There is no prospect for a fertilizer industry in Gambia in the foreseeable future.

Present and projected fertilizer consumption

The present consumption of fertilizers in Gambia is very low at about 50 tons of nitrogen and 500 tons of P_2O_5 in 1966/1967 or an average of about 2.8 kg nutrients/ha of total cultivated land taken as 200,000 ha. The projected fertilizer consumption in 1970 and 1975 as estimated by ECA and FAO is given below in tons of nutrients:

	1970			1975		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	300	300	300	600	600	600
FAO	-	-	-	850	1,400	500

The FAO estimates are projected from 1962 data based on an assumed rate of growth of the contribution of the agricultural sector to the GDP at market prices of 3.7 per cent/year or 0.8 per cent/year expressed per head of population.

The estimates carried out by ECA have been based on a recent thorough study of the conditions in the country and they have been adopted for the purpose of this study with the exception of projections for the consumption of P_2O_5. In this case the actual consumption has already overtaken the estimate for 1970 and for this reason the following figures have been taken as the likely consumption for 1970 and 1975: 600 tons/year P_2O_5 in 1970 and 1,400 tons/year P_2O_5 in 1975. It is expected that most of the fertilizers will be used on cash crops (peanuts) followed by cereals.

GAMBIA

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WEST AFRICA

GHANA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	253	1,800	6,600	13,000
	Production	-	-	-	9,000
	Deficit	253	1,800	6,600	4,000
	Surplus	-	-	-	-
P_2O_5	Consumption	75	1,400	8,700	16,000
	Production	-	-	-	9,000
	Deficit	75	1,400	8,700	7,000
	Surplus				
K_2O	Consumption	139	2,500	6,700	13,000
	Production	-	-	-	9,000
	Deficit	139	2,500	6,700	4,000
	Surplus	-	-	-	-

General

Ghana has an area of 236,000 km^2, out of which 22 per cent is agricultural land. About one third of this area is in cocoa production accounting for about 40 per cent of the total world supply.

The population of Ghana is estimated to be 8 million, with an annual growth of 2.7 per cent. About 70 per cent of the population are in the southern part of the country, mainly along the coast, and 10 per cent in the upper region in the extreme north. The density is 34/km^2. Urban population is now over 20 per cent and is growing rapidly.

The *per capita* income at 1965 prices was estimated in 1966 at $285/year and the GDP was $2,500 million at current market prices. The total budgetary deficit, before all foreign aid, was estimated to be $125 million in 1966, and gross outstanding debt $680 million.

The economy of the country is predominantly agricultural, this sector being the chief source of national income and participant to the extent of 70 per cent in the balance of trade. Nearly all production is carried out on small holdings in the hands of a large number of native farmers. Their main activity apart from growing cocoa is production of subsistence crops as corn, sorghum, millet, yams and plantains. Despite the large proportion of its population engaged in agriculture and the availability of

GHANA

arable land, Ghana has been a traditional importer of food-stuffs and live animals valued in 1965 at $50 million. Even if not yet satisfactorily developed, forestry and fishing are important sources of employment and are contributing increasingly to the national product.

After independence, Ghana embarked upon ambitious programmes, both in social and industrial development. Great emphasis was laid on extensive infrastructure, which is presently ahead of needs of the country but which will serve as a basis for expanded economy in the years to come. It was expected that the great strain on the balance of payment could be met by accumulated foreign exchange reserves (about $530 million at independence) plus increased cocoa earnings until return from industrialization could support a diversification of agriculture. However, while the cocoa yields increased, production in other parts of the world also had a big rise. As a consequence, cocoa prices experienced a long decline and anticipated revenues failed to materialize, causing large budget deficits. Recently, in collaboration with the IMF and IBRD, the Government has adopted a stabilization programme, a part of which was the devaluation of the currency by about 40 per cent in July 1967.

Agriculture

There are natural conditions favourable for a high-yielding agriculture in Ghana if suitable inputs in the form of human efforts and material supplies are applied. Among the latter, application of fertilizers is considered as one of the decisive factors. Since 1961 the FAO Freedom from Hunger Campaign (FFHC) fertilizer programme has had as the main objective the introduction of the right type and quantity of fertilizer into the practical agriculture of subsistence crops to ensure sufficient nutrition for the ever-increasing population and at the same time to decrease the importation of food-stuffs which account for considerable foreign exchange expenditures. The results of this campaign of research and demonstration have shown that the over-all response of the best fertilizer treatment is 50 per cent of the unfertilized yields. The compound fertilizers (N-P-K), at a level of 22.5-22.5-22.5 kg/ha gave the best results from the point of view of both physical increases and economic returns for cereals and tuber crops. On legumes (mainly ground-nuts and beans), phosphate at a level between 20 and 40 kg/ha gave the best response, sometimes in combination with potassium. It is thus apparent that 20 kg/ha of one plant nutrient seem to be the minimum for fertilizer application in practice. With continuous cultivation and intensive land use (vegetables and fruit), usually the double dose (40 kg/ha) is recommended.

The above facts were taken into account for the technical and economic set-up of the proposed compound fertilizer plant, the manufacturing programme of which has to reflect the primary needs of fertilizers in Ghana.

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Natural resources and industry

The country is relatively rich in natural resources and is the most developed of the western African states. There are, however, no known indigenous fuel resources. Oil exploration has indicated traces of crude oil in the Volta region but it appears that drilling was discontinued in April 1968 (off-shore drilling continues). The petroleum refinery at Tema owned by Ghana-Italian Petroleum Co. Ltd. (GHAIP) with a capacity of 1.25 million tons/year of crude is using imported feedstocks. The Volta River Project at Akosombo with a dam and a hydroelectric power station was completed in 1966 with a capacity reported at 384 MW and has effectively taken over the country's electricity supply. It is planned that the installed capacity will be increased in stages to 880 MW by 1976. It is planned to supply electricity from this project to Dahomey and Togo in the near future. This project will undoubtedly add impetus to the further industrial development of Ghana.

Mining is the major industry in Ghana and follows agriculture as a source of foreign exchange. Gold is produced from a number of areas including Obuasi, Tarkwa, Prestea, Bibiani, Dunkwa and Bondaye. The total production in 1967 was about 760,000 troy oz, planned to increase to about 1.1 million troy oz by 1969.

Manganese ore is produced at present by the African Manganese Co. Ltd. from the Nsuta deposits at a rate of about 500,000 tons/year of 48 to 52 per cent mineral. The reserves, however, are nearly exhausted. There are reserves estimated at about 50 million tons of 30 to 40 per cent mineral, which can be upgraded. There are in addition deposits at Yakou (10 million tons of 40 to 50 per cent ore), Kalimbi and Gonija. It is planned to increase the production to 700,000 tons by 1970.

There are several bauxite depots at Kanoyerebo, Yenahin, Awaso-Miawso and Kibi with total reserves of 400 to 500 millions tons of 47 per cent alumina ore. Bauxite production was started in 1941 by the British Aluminium Co. Ltd. from the Kanoyerebo deposit. The total production of bauxite was about 350,000 tons in 1967 and it is planned to produce 400,000 tons in 1969. A smelter of the Volta Aluminium Co. was commissioned in 1967 and reached its rated capacity of 100,000 tons/year of metal. The electric power is supplied by the Volta River project.

The other important sector is the production of diamonds (2.5 million carats in 1967 was planned to increase to 5 million carats by 1969).

Salt is produced, at present at a small scale at Daboya and along the coast at Sakumo Lagoon, Weija, Apam and Elmina. A project for the production of 100,000 tons/year of salt rising to 250,000 tons/year by solar evaporation is being studied. Other deposits, the full potential of which has to be evaluated include limestone (at Bulpe with reserves of 16 million tons in addition to about 100 million tons of

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dolomite, at Nauli and elsewhere), kaolin, berylium, tantalum-columbite, mercury, ilmenite, graphite and lithium. The manufacturing industry of the country is relatively developed and includes food, fibre and wood processing, textiles, light engineering including electrical engineering, glass, tires, soap, paints and cement production.

There is no basic chemicals industry at present, but a project for a production of 100,000 tons of electrolytic caustic soda and about 90,000 tons/year of chlorine is being studied.

Fertilizer manufacture

There is no fertilizer industry in the country. There are, however, plans to have an NPK compounding plant in Ghana in the future, as soon as local market for fertilizers grows correspondingly. As Ghana does not possess significant raw materials or intermediates for fertilizer manufacture, the import of raw materials was considered.

It was suggested that the future plant in Ghana would produce 60,000 tons/year of the granular compound fertilizers NPK (15:15:15). The production would be based on imported ammonia, phosphate rock and potash.

This product has been chosen as basic production target following the results of FAO Fertilizer Programme carried out under the Freedom from Hunger Campaign.

If the above plans are finalized, it is expected that the plant will be in operation in the early 1970s.

Present and projected fertilizer consumption

The consumption of fertilizers in 1966/1967 in Ghana was about 300 tons of nitrogen (compared with 1,800 tons/year in 1965/1966) 1,500 tons/year P_2O_5 and 3,500 tons/year K_2O, or on an average 1.8 kg of nutrients/ha of cultivated land taken as 3 million ha (as compared with total agricultural land estimated at about 8 million ha).

A number of official and unofficial estimates of projected fertilizer consumption for 1970 and 1975 have been carried out in the past. Estimates by ECA and FAO are given below in tons of nutrients:

	1970			1975		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	6,600	8,700	6,700	13,000	16,000	13,000
FAO	-	-	-	3,500	4,500	5,000

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The estimates carried out by ECA are based on a thorough study of the conditions in the country during 1965/1966. The FAO estimates are based on an assumed rate of growth of the contribution by the agricultural sector to the GDP of 48 per cent/year during the period 1965-1975.

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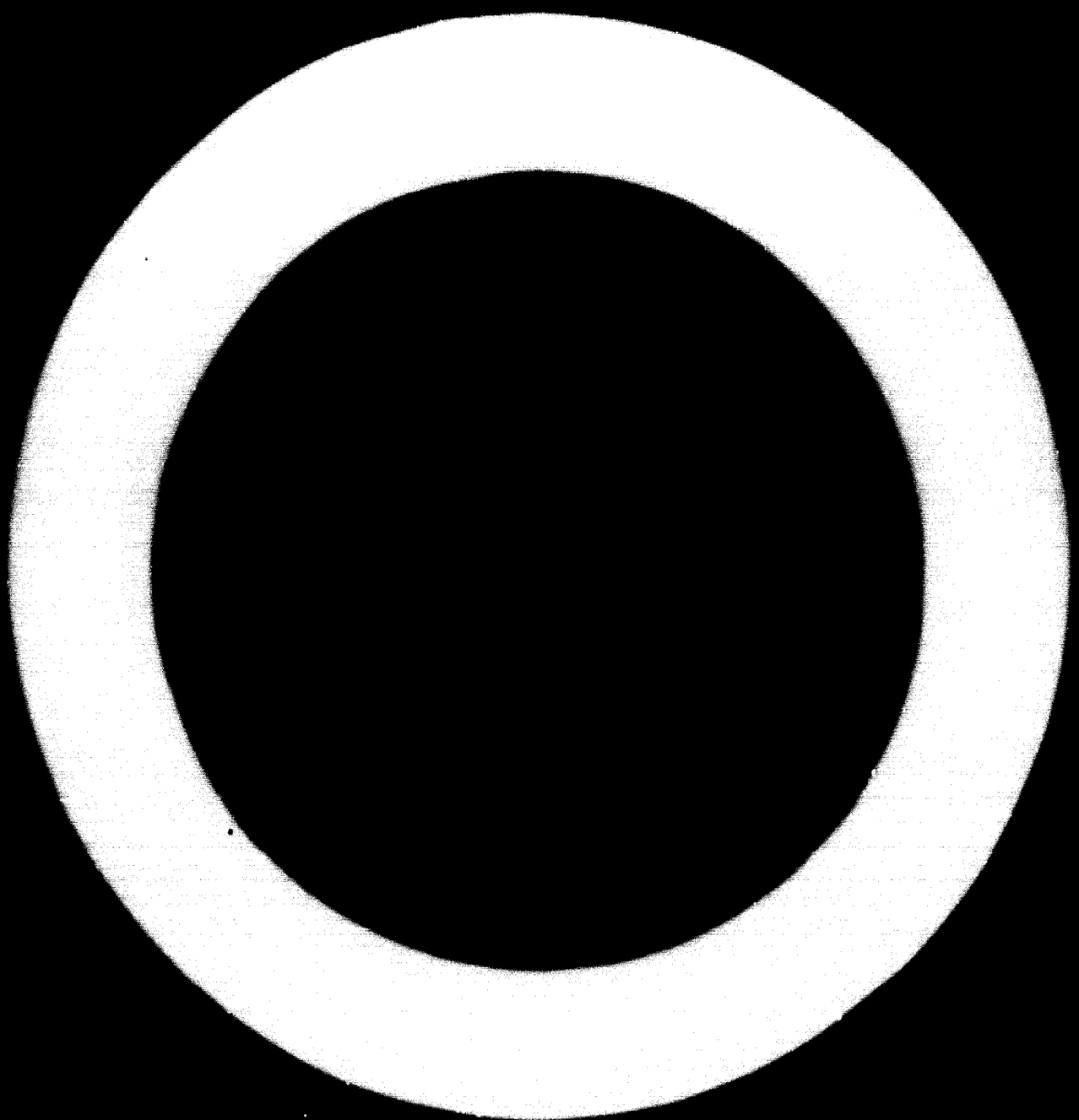

WEST AFRICA

GUINEA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	300	500	5,500	11,000
	Production	-	-	-	-
	Deficit	300	500	5,500	11,000
	Surplus	-	-	-	-
P_2O_5	Consumption	2,500	5,000	9,000	15,000
	Production	-	-	-	-
	Deficit	2,500	5,000	9,000	15,000
	Surplus	-	-	-	-
K_2O	Consumption	500	2,000	3,000	6,000
	Production	-	-	-	-
	Deficit	500	2,000	3,000	6,000
	Surplus	-	-	-	-

General

The Republic of Guinea covers an area of about 246,000 km^2, and has a population of approximately 4 million (1967), with an annual rate of growth of between 2.5 and 3 per cent, and a population density of about 14/km^2.

The population is largely rural, at least 80 per cent of the inhabitants being employed in agriculture. Agriculture contributes some 50 per cent to the GDP of the country, which was $240 million in 1964. The per capita income was between $71 and $100 during the last few years.

Guinea, one of the territories comprising the former French West Africa, became independent in 1958; it is receiving financial aid from various countries, including the United States, France, and Eastern European countries, and loans for projects have been granted by foreign governments and by the World Bank. No recent figures of exports and imports are available, but in 1964 these amounted to about $50 million and $46 million respectively.

Guinea is importing large quantities of food, e.g. rice (about 40,000 tons in 1964), sugar, fats, dairy products and wheat flour. The main exports are: alumina (amounting to more than half of the country's export earnings), followed by iron ore, bauxite, palm kernels, coffee, bananas, pineapples, diamonds and hides.

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The development of the country's resources is currently subject of the Government's Seven-Year Plan covering the period 1964-1971. The main priorities under this plan are hydroelectric power generation (construction of a dam and a generating station on the Konkome river financed by the USSR, and a second plant built with Yugoslav aid), improvements of the inadequate roadworks, further exploitation of the country's mineral deposits, and agriculture.

Agriculture

The country is dominated by a mountainous plateau and as there are four distinct geographical regions in the country with widely differing climates, there is a great variety of crops.

In lower Guinea rice, oil palm, bananas and other tropical fruits are grown. In the forest region production is principally coffee, oil palm and tobacco. In upper Guinea grain production is predominant and stock raising is of prime importance in the Fouta Djalon. The total grain production in the country is believed to be 1 to 1.4 million tons/year, the production of rice stagnating at about 350,000 tons/year (the yield being very low, varying between 2 tons/ha for lowland and 0.8 tons/ha for upland rice). Other crops of importance include maize (about 3 million ha yielding about 1 ton/ha, fonio, cassava, millet and ground-nuts.

Main cash crops are robusta coffee (production and exports varying from 6,000 to 16,000 tons/year during the last few years), bananas, oil palms and pineapples. The Government is embarking upon the extension and improvement of the cultivation of coffee and sugar-cane near the Sierra Leone border, cotton in upper Guinea, and tea and tobacco in the forest area. The biggest problems that have to be overcome, are the primitive methods of farming, enormous transport difficulties and lack of credit facilities for the farmers.

According to FAO, the over-all N:P:K ratio of 1:1:1 has proved suitable, subject to local variations with respect to differences in soil and crop requirements, and it can be taken as a guideline for the further increase in fertilizer use in the country.

Natural resources and industry

There are no known reserves of indigenous fuels in Guinea. The hydroelectric potential of the country is relatively high, estimated at 63 billion kWh; the resources are at Konkowe, Bofing and Haute Niger and account for about two thirds of this potential which has still to be developed. A petroleum refinery with a capacity of 750,000 tons/year of crude is under construction at Kapa.o.

The country's most important resources of raw materials are the huge bauxite deposits, the largest in Africa. Mining has been in progress for a long time, and output is chiefly for export to Europe and the United States. The Kassa deposits near Conakry have been mined from 1952 to 1961 by the Compagnie des Bauxites du Midi, controlled by Canadian interests, at a rate of 300,000 to 660,000 tons/year of 60 per cent ore. After nationalization in 1961 the production dropped and the reserves are now practically exhausted.

With a second deposit at Fria, with reserves estimated at 150 million tons of 40 to 45 per cent ore, operations to mine and upgrade the ore and process it to alumina were commenced in 1960. This exploitation is carried out by a consortium consisting of Olin Mathieson, Pechiney, Ugine, British Aluminium, Alusuisse and VAW of Federal Republic of Germany, and operating under a 75-year convention with the Government. The production rate was about 500,000 tons/year of alumina and it is believed that this rate was recently increased by about 10 to 15 per cent by further investment.

A larger deposit (with reserves estimated at about 1 billion tons of 52 to 57 per cent ore) is at Boké. At present this deposit is being developed for mining and upgrading of bauxite at a level of about 2.5 million tons/year by Beauxites de Guinée of which Harvey Aluminium Co. of the United States owns 51 per cent.

A plant for the manufacture of a wide range of aluminium products has started operations, using imported metal until the completion of an aluminium production project financed by the USSR.

There are three deposits of iron ore in the country. One at Kaloun with estimated reserves of about 900 million tons, is being exploited by the Compagnie Minière de Conakry, with an output of about 700,000 to 1 million tons/year (due to high chrome content the ore could for a long time be smelted only in the United States; possibilities exist now in the Federal Republic of Germany).

The other two deposits of high grade ore lie in the forest region at Mount Nimba and in the Dimondou range. Neither is being commercially exploited at present due to high capital investment necessary and transport problems.

There are deposits of limestone at Siguiri (about 670 km from Conakry, with estimated reserves of about 50 million tons), of manganese and of marble. These are not exploited. A deposit of leucite has been discovered on the Loos islands near Conakry. This consists of aluminium and potassium silicates of volcanic origin corresponding to the formula 4 $SiO_2 . Al_2O_3 . K_2O$ and probably containing 4 to 12 per cent K_2O. The potential of this deposit and the best methods of exploitation still have to be evaluated.

The manufacturing industry in the country consists mainly of food and vegetable oil processing, building materials and aluminium processing. There is no production of basic chemicals and fertilizer

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In the country. However, there are plans for the production of electrolytic caustic soda and chlorine, since there is a significant consumption of the former chemical for alumina processing, which is at present imported. This development would depend upon the supply of cheap electric power, probably from the rooted Konkurédam.

Fertilizer manufacture

There is no fertilizer industry in the country at present and due to the lack of natural resources and low potential market demand it is not likely that the position will change in the near future.

The project for the composting of town waste at Conakry, which would produce some 24,000 tons/year of compost is being considered. In terms of fertilizer nutrients this would not be significant as it would only provide the equivalent of about: 280 tons of N; 300 tons of P_2O_5; and 300 tons of K_2O.

Present and projected fertilizer consumption

The present consumption of fertilizers in Guinea is still relatively low at about 3,600 tons of nitrogen, 6,500 tons of P_2O_5 and 2,000 tons of K_2O in 1966/1967; the projected fertilizer consumption in 1970 and 1975 as estimated by ECA is given below in tons of nutrients:

1970			1975		
N	P_2O_5	K_2O	N	P_2O_5	K_2O
3,000	3,500	3,000	6,000	6,000	6,000

Whereas the total consumption of nitrogen in Guinea increased dramatically from 500 tons/year in 1965/1966 to 3,600 tons/year in 1966/1967, the consumption of K_2O remained static at 1,800 to 2,000 tons/year during 1964-1966/1967.

The consumption of P_2O_5 increased from about 4,000 tons/year in 1964/1965 to 6,500 tons in 1967/1968. For this reason the above projections have been adjusted based on 1966/1967 data and the rate of growth of demand as taken by ECA, i.e. 15 per cent/year for nitrogen, 11 per cent/year for P_2O_5 and 15 per cent/year for K_2O. Estimates derived this way and adopted for the present study are given below in terms of nutrients:

1970			1975		
N	P_2O_5	K_2O	N	P_2O_5	K_2O
5,500	9,000	3,000	11,000	15,000	6,000

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It is expected that most of the fertilizers will be used on cash crops (bananas, pineapple and cotton) followed at a later stage by grain crops and coffee.

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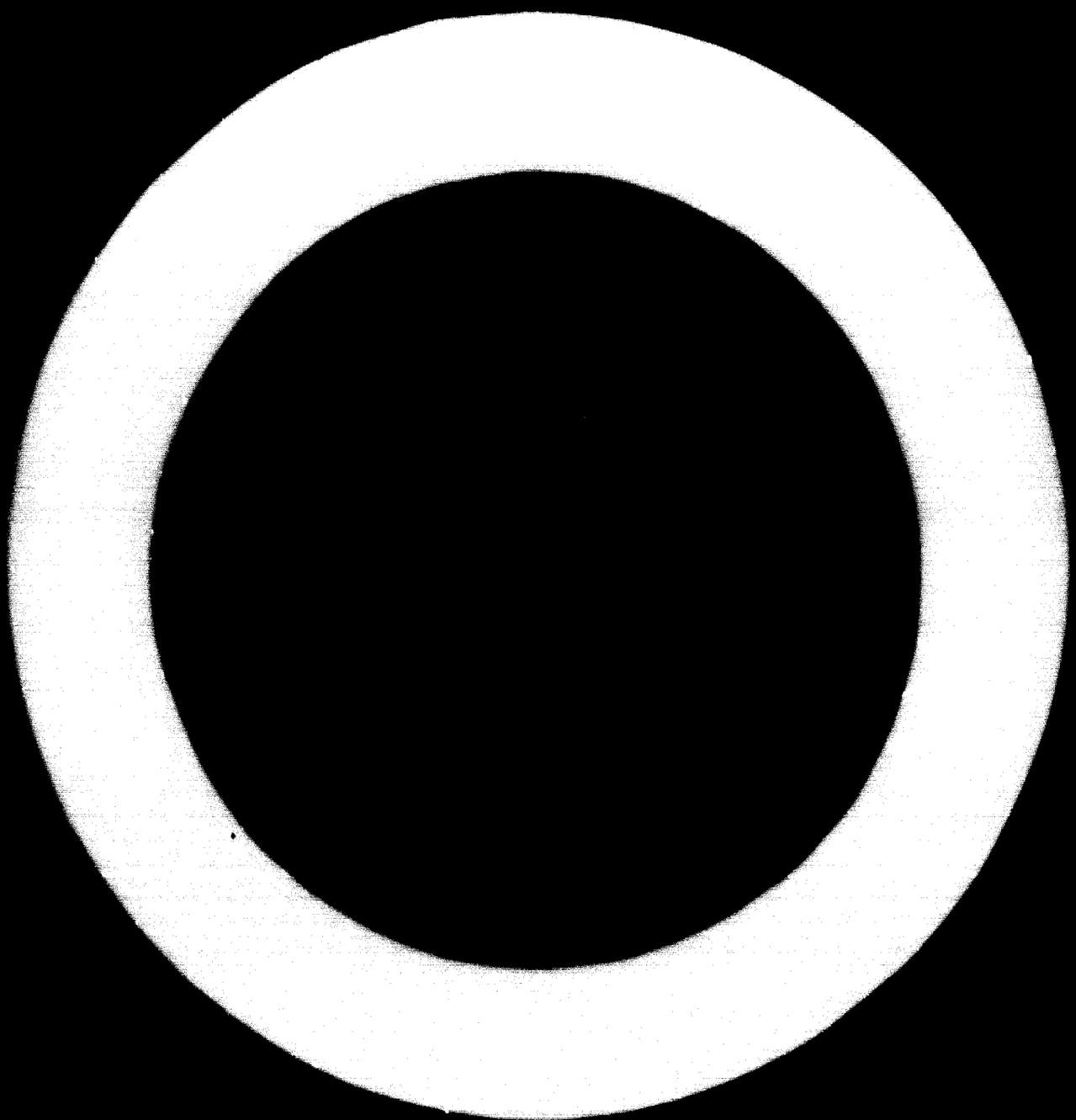

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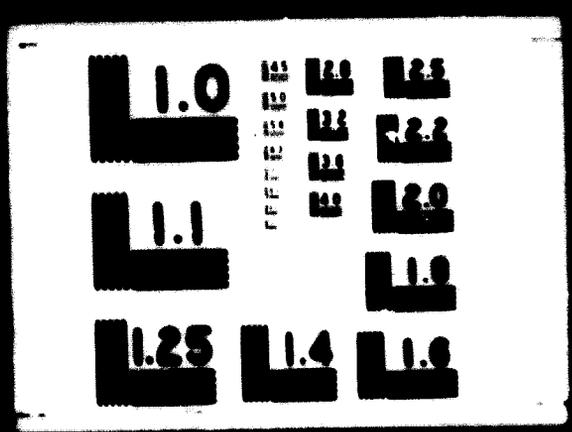

WEST AFRICA

IVORY COAST

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	1,200	3,800	9,000	17,000
	Production	-	-	-	12,000
	Deficit	1,200	3,800	9,000	5,000
	Surplus	-	-	-	-
P_2O_5	Consumption	600	1,900	7,000	13,000
	Production	-	-	-	5,000-6,000
	Deficit	600	1,900	7,000	7,000-8,000
	Surplus	-	-	-	-
K_2O	Consumption	3,900	6,000	13,000	23,000
	Production	-	-	-	-
	Deficit	3,900	6,000	13,000	23,000
	Surplus	-	-	-	-

General

The country covers an area of about 322,000 km^2, and has a population of approximately 3.5 million, with an annual rate of growth estimated at 2.6 per cent. The capital and main port is Abidjan with about 400,000 inhabitants.

The country can be divided into two main regions: the forest region covering about 40 per cent of the total area and savannah covering the rest of the country.

Ivory Coast became independent in 1960 and has since maintained close economic ties with France. Ivory Coast is also playing a major role in encouraging regional political and economic co-operation and is a founder member of the Entente (Ivory Coast, Dahomey, Upper Volta and Togo) and establishing a Solidarity Fund to promote regional development. The country is also a member of the West African Customs Union and OCAM.

Ivory Coast is one of the richest and most advanced countries in French speaking Western Africa and its economy is primarily based on agriculture and foreign trade. The production is oriented towards the export market and most consumer goods are imported. The export trade of the country is based primarily on coffee, wood and cocoa, less important export goods being bananas, pineapples and kola nuts. The

IVORY COAST

relative importance of the mining sector to the economy is not as great as in some of the other countries of the region.

The country's GDP in 1966 was estimated at $1.1 billion or about $266 per head. Exports in the same year totalled about $310 million and imports $260 million. The present development plan for the years 1967/1970 is designed to overcome existing shortcomings with 30 per cent being allocated to agricultural development and 39 per cent to infrastructure.

Agriculture

The main crop grown in the country is coffee, Ivory Coast being the world's third largest producer with an output of about 250,000 tons (on 650,000 to 750,000 ha of cultivated area). Owing to the depressed world market, the Government is trying to improve the quality and cultivation methods, reduce costs in an attempt to dispose of its total production. Cocoa with a cultivated area of about 300,000 ha and a production of about 140,000 tons is the second most important export crop. In 1962 Ivory Coast entered into an agreement with the other main producers of cocoa (i.e. Ghana, Nigeria, Cameroon and Brazil) to regulate the tonnages and prices of the product. Other important export crops are bananas (200,000 tons), pineapples, cotton (it is expected to produce 50,000 tons of seed from about 100,000 acres by 1968/1969, coconut and oil palm).

About 200,000 tons of maize, 290,000 tons of rice and 750,000 tons of cassava is the production of the major food crops. At present there is a deficit of rice, amounting to about 90,000 tons/year, which is made good by imports, but the Government is hoping to improve the situation by expanding the production to about 400,000 tons/year by 1970. Under a crop diversification programme natural rubber production is being promoted. About 12,000 ha have now been planted, about one quarter of this being already in production. It is anticipated that by 1970 the production of latex will reach 10,000 tons/year.

Natural resources and industry

The country has no known fuel resources but has a limited hydrological potential. Two hydroelectric power stations (Ayamé 1 and 2 with a total installed capacity of about 50,000 kW) are in operation and plans are being made for a dam across the river Badama (the Kosson Dam), and a power station capable of producing about 500 million kW/year. A 700,000 tons/year refinery came on stream in Abidjan in 1965. The refinery is owned and operated by the Société Ivoirienne de Raffinage and the crude oil is imported from Algeria, Gabon and ultimately Nigeria. The surplus refined products are exported mainly to Mali and Upper Volta.

IVORY COAST

Forestry is an important sector of the economy, about 1 million ha of the country being covered by exploitable forests. Log production in 1966 reached 2.6 million m^3. There are 70 saw mills in operation. The main mineral resources exploited at present are diamonds (in 1968 production reached 180,000 carats), and manganese ore produced at a mine at Grand-Lahou by the Compagnie de Mokta. The production in 1966 was about 170,000 tons of 45 per cent ore and the known reserves are estimated to be sufficient for about fifteen years.

Other recently discovered deposits not yet exploited include gold (at Ity, Mont Flotovo and Labo River), bauxite (near Divo-Lakota, Oumé-Tonmodi and Bongouannou), titanium (near Lahou and Jacqueville), mercury, tungsten, copper, chromium, uranium and other metals.

The manufacturing industry was showing a fast rate of growth, mainly in the food and wood processing, textiles, construction materials, soap and light engineering sectors. There is no production of basic chemicals or fertilizers.

Fertilizer manufacture

The probable fertilizer consumption in the country is likely to be too low to justify production of fertilizer intermediates on any appreciable scale unless there are possibilities for export to the neighbouring countries. There are no known reserves of suitable feedstocks to support such a production. Two years ago however, the Société Ivoirienne d'Engrais (SIVENG) was set up with a capital of CFA francs 600 million ($2.5 million), and having the following equity participation: the state - 33 per cent, Société Tropicale d'Engrais et de Produits Chimiques - 28 per cent, Salzderfurth AG - 20 per cent, DEG - 8 per cent, ENSA - 5 per cent and other smaller participants.

Plans for the manufacture of 6,000 tons single superphosphates, 20,000 tons/year of ammonium sulphate and 35,000 tons/year of compound NPK fertilizers are well advanced. The production would be based on imported feedstocks (including ammonia, phosphate from Togo, sulphur and potash - probably KCl). It is believed that the plant will be in operation in 1971.

Present and projected fertilizer consumption

The consumption of fertilizers in 1966/1967 was about 4,000 tons of nitrogen, 2,000 tons of P_2O_5 and 6,500 tons of K_2O or about 8.3 kg/ha of nutrients, on cultivated land taken as 1.5 million ha (out of

IVORY COAST

about 5.5 million ha of arable land). The projected fertilizer consumption in 1970 and 1975 as estimated by ECA and FAO are given below in tons of nutrients:

	1970			1975		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	9,000	7,000	13,000	17,000	13,000	23,000
FAO	-	-	-	18,000	15,000	24,000

It will be seen that the estimates by ECA and FAO are very close.

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WEST AFRICA

LIBERIA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	negl.	600	1,000	2,000
	Production	-	-	-	-
	Deficit	negl.	600	1,000	2,000
	Surplus	-	-	-	-
P_2O_5	Consumption	negl.	600	1,000	2,000
	Production	-	-	-	-
	Deficit	negl.	600	1,000	2,000
	Surplus	-	-	-	-
K_2O	Consumption	negl.	500	1,000	2,000
	Production	-	-	-	-
	Deficit	negl.	500	1,000	2,000
	Surplus	-	-	-	-

General

Liberia covers an area of about 110,000 km^2, and has a population of approximately 1.1 million (1967 estimate), with an annual rate of growth of about 1.5 per cent. The most important city and port is the capital Monrovia with 100,000 inhabitants.

Geographically the country can be divided into a narrow strip of coastal plain with creeks and marshes, a central area consisting of a number of plateaux and valleys covered with high rain forest, and finally the Nimba and Wuto mountain ranges with elevations of up to 1,600 m.

Liberia is the oldest independent republic in Africa, established in 1847 with a tradition of friendly relations with the United States.

The GDP of current market prices of the country in 1966 was about $317 million. The main source of wealth at present, contributing about 40 to 50 per cent to the GDP, and most of the exports, are rubber and iron ore. The mining and quarrying sector (as part of the monetary sector) contributes 29 per cent to GDP, and agriculture (including forestry, hunting and fishing) about 19 per cent. Subsistence agriculture only contributes some 11 per cent.

LIBERIA

Although the per capita GDP at about $290 for 1966 is one of the highest in Africa, the standard of living in the country is low because of concentration of wealth. Foreign aid from a number of sources, mainly from the United States (through AID and other agencies), but also from the United Nations, the International Bank for Reconstruction and Development, the Federal Republic of Germany, the United Kingdom and other countries has been received. There was no comprehensive economic planning in the country until 1966 when the Department of Planning and Economic Affairs was established by UNDP, a National Development Plan, covering the period 1967-1970 was prepared. During the foreseeable future, Liberia will be heavily dependent on foreign trade, mainly iron ore, rubber, timber and coffee.

Agriculture

It is estimated that about 75 per cent of Liberia's labour force of about 450,000 depend on agriculture for their living. About 20 per cent of the country's total land area is used for agricultural purposes, but it is thought that this could be increased to about 50 per cent. The main agricultural regions in Liberia are concentrated in the central plateaux. Because of conditions of soil climate, tree crops are generally better suited than field crops. It has been estimated that about 800,000 ha in valleys and seasonal swamps are suitable for cultivation of feed and food crops such as rice, cassava, maize and vegetables, while about 200,000 ha on foot-hills are suitable for tree crops, but could also support field crops under intensive cultivation. Despite technical assistance from a number of countries including the United States, a large part of the agricultural sector is still primitive and low yielding.

The main food crops are rice, cassava, sweet potatoes, yams, bananas and plantains. The production of rice, at about 150,000 to 180,000 tons/year of unmilled rice is still insufficient to cover the country's needs. In 1967 about $7.5 million worth of rice had to be imported. The Government is encouraging foreign concessionaries (e.g. Uniroyal and Firestone) to assist in the agricultural development of the country with special emphasis on the production of rice. The production of cassava at about 200,000 to 230,000 tons/year is considered to cover the country's requirements. The production of bananas and plantains is about 50,000 to 55,000 tons/year and 20,000 to 25,000 tons/year respectively.

The main cash crop grown in Liberia is rubber. The production in 1967 was estimated to be about 60,000 tons of crude rubber and the Government is planning to augment this by about 25 per cent in 1970. In 1966 Liberia's rubber exports amounted to about $27 million, but the industry is suffering from low yields and a depressed world market. The main foreign concessionaries in this field are Firestone, Uniroyal and Goodrich.

LIBERIA

Other export crops include coffee (3,000 to 4,000 tons), palm kernels and cocoa. Very little local processing of agricultural produce is carried out with the exception of rubber processing plants; the Liberian Development Corporation, aided by the United States (AID) is actively promoting investment in this sector.

Another potential source of wealth is forestry, as forests cover about 40 per cent of the total area of Liberia.

Natural resources and industry

Mining is the most important sector in Liberian economy, iron ore being the principal export commodity (73 per cent of total exports in 1967).

Liberia is currently the tenth largest iron ore producer in the world and contributes about 40 per cent of the total African output. At present there are five large deposits being exploited or developed:

(a) The first field, opened in the country in 1951, is at Bomi Hills, about 70 km north of Monrovia, with estimated reserves of 200 million tons of ore and a production of about 2.5 million tons of concentrates/year. The mine is operated by Liberia Mining Co. (LMC owned by Republic Steel Corporation, and other United States interests). This deposit will probably be depleted in about ten years and the company is opening up a low-grade deposit of 40 per cent ore at nearby Cobee Mountains in about five years;

(b) The largest iron-ore mining operation was opened up in 1963 at Nimba Mountains by the Liberian-American-Swedish Minerals Co. (LAMCO) owned by the Liberian Government and a group of United States (Bethlehem Steel), Swedish, Canadian and Liberian interests. The estimated reserves are about 300 million tons of 60 per cent ore and the production is now estimated at about 10 million tons/year;

(c) Another deposit near the Nano River, close to the Sierra Leone frontier, with estimated reserves of 50 million of 55 to 60 per cent is operated by the National Iron Ore Co. owned by the Liberian Government, LMC, the United States and private Liberian interests. It is planned to increase the production to about 1.2 to 1.5 million tons/year;

(d) A mine in the Bong Hills was opened up in 1965 and is operated by DELIMCO. (Owned by the Government and a consortium of interests of Federal Republic of Germany and Italy. (There are two deposits, one with total estimated reserves of 300 million tons. The annual production is about 3.5 million tons of 62 to 65 per cent concentrate;

(e) A deposit at Kitoma with estimated reserves of 750 million tons of 40 to 60 per cent ore is being developed. The Kitoma Mining and Trading Co. (owned by United States interests, including the Hanna Mining Co.).

Other natural resources exploited in Liberia include diamonds and gold. A geological survey started in 1965 indicated deposits of manganese, bauxite, lead, columbite, tantalite, corundum and graphite. These deposits still have to be evaluated. Apart from wood there are no known indigenous sources of fuel.

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an ambitious development programme. Financial aid is received from AID, the European Development Fund, France and USSR. Agricultural production is at present the most likely means by which the balance of payments deficit may be corrected. Mali's principal trading partners are the franc area (48 per cent of Malian exports, 44 per cent of imports in 1964), the countries with centrally planned economies (accounting for 40 per cent of exports, 39 per cent of imports). The dollar area accounted for roughly 5 per cent of both exports and imports (the chief imports are textiles, motor vehicles, food products, machinery and metal products). Peanuts are the largest single export commodity, but livestock, preserved fish and cotton are also exported. In 1964 Mali's imports were valued at $36 million and exports amounted to $18.3 million.

Agriculture

About 90 per cent of the population are agriculturally employed, on a subsistence level. (But this accounts for only just over one half of GDP.) The average cultivated area is 1.8 million ha, of which only about 50,000 ha are under regular irrigation system (supporting a population of about 30,000, producing 850,000 tons of cereals which, together with rice form the staple food).

Ground-nuts and cotton are the principal cash crops. The production of ground-nuts seems to have remained fairly static at about 110,000 tons over the last five years, with an average yield of 610 kg/ha but the proportion exported has fallen from a peak of 60,000 tons in 1958, to just over 40,000 in 1962-1964, and 25,000 tons in 1965, whereas domestic consumption has increased accordingly.

In 1964 some attempt was made to import and distribute seeds, fertilizers, insecticides and equipment. If this assistance is really forthcoming, increase in output of some 7 to 8 per cent or more/year should be possible by 1970. Markets are thought to exist in eastern Europe for increased exports of some 80,000 to 100,000 tons of shelled nuts, with a possibility of exporting again substantial tonnages to France.

Production of cotton under irrigation by old Office du Niger, increased from 5,000 tons in 1960/1961 to over 9,000 tons in 1963-1964. Owing to poor quality, production fell to 2,000 tons in 1965/1966. Total output is planned to reach about 80,000 tons by 1970, of which 52,000 tons would be exported.

Production of millet and sorghum amounted to about 1 million tons in 1965 and is expected to increase at an annual rate of about 2 to 3 per cent in line with population requirements.

Production of rice was 185,000 tons in 1964 and is expected to increase only slightly with increased acreage and yields. Minor basic food crops including maize and cassava are expected to increase at the rates of 2 to 5 per cent/year. (At the moment output is as follows: maize - 65,000 tons, fonio - 20,000 tons, wheat - 1,400 tons.)

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There are also a number of schemes for the production of fruits and vegetables, mainly with a view to supplying a new canning factory. The output is estimated at about 30,000 tons.

Natural resources and industry

At present there are no significant indigenous fuel resources in the country. There are, however, favourable indications of crude oil between Gao and Tombouctou.

There are several known mineral deposits in Mali, which are not being exploited at present. These include:

(a) Deposits of salt at Taoudéni, which are being worked at the rate of about 10,000 tons/year;

(b) Deposits of phosphate rock at Tilemsi with reserves estimated at about 2.5 million tons of mineral with 26 to 28 per cent P_2O_5. It is doubtful whether an economic exploitation of this deposit would be possible;

(c) Bauxite deposits with total reserves estimated at 150 million tons of 46 per cent alumina were discovered at Kenieba. The long distance of this region from the coast may preclude the economic exploitation of these deposits. There are also known deposits of manganese (at Ansongo with reserves of about 3 million tons), copper (at Tessalit, Adrar des Iffaras), gypsum (Adrar des Iffaras), iron (Niaro-Kayes), gold (Kelboro) and other metals.

In general, all these deposits are handicapped by long distances from the coast; even given the possibility of a source of cheap electricity (Gonina), it is difficult to see how Mali can compete with deposits located near the coast in neighbouring countries.

Industry is still in embryonic stage. Cement and brick are produced locally and there is a limited food-processing industry.

The country has a limited hydrological potential. A hydroelectric power station at Sotuba has a capacity of about 35 x 106 kWh/year. An ambitious scheme of the Gonina dam over the Senegal river is being studied.

Fertilizer manufacture

At present the fertilizer consumption in Mali is not significant due to transport costs and lack of foreign exchange. The Government is studying the possibility of constructing a calcined phosphate and superphosphate plant at Bourene near the phosphate deposits. It is estimated that these plans will produce 20,000 tons/year of calcined phosphate and 25,000 tons/year of triple superphosphate.

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Present and projected fertilizer consumption

The present consumption of fertilizer in Mali is very low at about 900 tons/year of nitrogen, 1,000 tons/year of P_2O_5, and 1,500 tons/year of K_2O in 1966/1967, or an average of 1.9 kg of nutrients per ha of cultivated land taken as 1.8 million ha.

The projected fertilizer consumption in 1970 and 1975 as estimated by ECA and FAO is given below in tons of nutrients:

	1970			1975		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	1,500	1,200	800	3,000	2,400	1,800
FAO	-	-	-	1,150	2,000	500

The FAO estimates have been projected from 1962 data based on an assumed rate of growth of the contribution by the agricultural sector to the GDP at market prices of 3 per cent/year, or 0.7 per cent/year per capita. The estimates carried out by ECA have been based on a more recent thorough study of the agricultural sector and the economy of the country and have been adopted for the purpose of this study with the exception of the projected K_2O consumption. This has already been exceeded so the probable demand for 1970 and 1975 is taken as 2,000 and 3,000 tons/year respectively.

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MAURITANIA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	negl.	400	750	1,500
	Production	-	-	-	-
	Deficit	negl.	400	750	1,500
	Surplus	-	-	-	-
P_2O_5	Consumption	negl.	negl.	100	300
	Production	-	-	-	-
	Deficit	negl.	negl.	100	300
	Surplus	-	-	-	-
K_2O	Consumption	negl.	negl.	100	300
	Production	-	-	-	-
	Deficit	negl.	negl.	100	300
	Surplus	-	-	-	-

General

The country covers an area of 419 km^2, and has a population of about 1.1 million (1968), with an annual rate of growth estimated at 1.7 per cent. The density of population is approximately 3/km^2 (among the lowest in Africa). About 11 per cent of the population live in urban areas, and about 70 per cent are agriculturally employed on a subsistence level. The valley of the Senegal River is inhabited by agricultural tribes, the rest of the inhabitants being short- or long-distance nomads.

The country became independent in 1960, formerly being part of the West African Union together with French Sudan, Niger, Senegal and Upper Volta.

Lying in the northern tropical zone, Mauritania does not have favourable conditions for agriculture; livestock raising forms the major traditional economic activity.

The GDP of the country at current market prices in 1966 was $170 million. Iron ore has represented the bulk of Mauritania's exports since 1963, and changed it from a trade deficit to a trade surplus country. The ore goes mainly to the United Kingdom, the Federal Republic of Germany, France and Italy. Livestock exports go mainly to Mali and Senegal. Other traditional exports include fish, salt and gum arabic. Imports are mainly machinery, usually for iron and copper ore projects, and come principally

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from France. (Change is from deficit $29 million in 1961 to surplus $46 million in 1966. Export of iron ore rose from nil in 1961 to $62 million in 1967, and imports fell from $31 million in 1961 to $23 million in 1966.)

Agriculture

Only 36 per cent of the country's land is considered suitable for agriculture, and less than 1 per cent is arable. This area is largely confined to the Senegal River valley along the south-western border with Senegal. Some farming is also done in the oases in the northern desert region and in the mountain regions.

Most of Mauritania's agricultural production is provided by the settler farmers in the south. The principal food crops are millet, rice, corn, sweet potatoes and peanuts. In the mountainous Adra, Assaba and Affolé regions stored rain-water is used to irrigate date palm groves and tuck gardens, which produce grain, tobacco and henna. Gum arabic is collected from the acacia trees of southern Mauritania for export. Production in 1966 was as follows: millet - 100,000 tons (additional millet has to be imported to make up for the deficit in local production), niebe - 11,000 tons, wheat and barley - 325 tons, maize - 4,000 tons, rice - 650 tons, ground-nuts - 800 tons, sweet potatoes - 2,000 tons, dates - 15,000 tons and gum arabic - 3,051 tons in 1966, and 4,068 tons in 1967.

Natural resources and industry

Mauritania has no known indigenous fuel resources apart from wood and has no hydroelectric power potential. Exploration of crude oil and gas has been unsuccessfully carried out for a number of years and has now been extended to off-shore areas.

The country is, however, relatively rich in mineral resources, the most important ones being iron and copper. Iron ore is the principal export, its production contributing about 25 per cent to the GDP. Large deposits at Fort Gourand with reserves of hematite (65 per cent Fe) estimated at about 125 million tons have been mined by MIFERMA since 1963. The production in 1967 was about 7.5 million tons, all of which was exported. There are also less rich deposits containing 30 to 45 per cent Fe.

A copper deposit exists at Akjoujt about 270 km from Nouakchott with reserves estimated at 9 million tons of oxides (2 to 2.5 per cent copper) and 18 million tons of sulphides (1.5 per cent copper). A project was inaugurated in 1968 to exploit this deposit with an initial output of 27,000 tons/year of copper.

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Deposits of phosphate rock have been discovered along the Senegal River between Matam and Boghé. These consist of a number of small deposits with total indicated reserves of about 70 million tons of 50 to 70 BPL. It is believed that small-scale opencast exploitation of these deposits would be economically feasible.

Deposits of gypsum (85 to 92 per cent) near Nouakchott are being evaluated. Deposits of limestone have also been discovered underlying the above gypsum reserves. Small quantities of salt are produced from salines at Trarza and Adrar. There are also deposits of ilmenite-containing sands, tungsten and gold (with copper at Fort Gourand) and there are indications of chromium, nickel, beryllium, molybdenum and tin.

The manufacturing industry is very limited and consists mainly of food-processing, including fish products. A study was recently carried out recommending establishment of an iron and steel plant based on local ores to supply about 350,000 tons of semi-finished products mainly for the western African market (in possible competition with a similar proposal made in Liberia).

Fertilizer manufacture

There are no prospects for the establishing of a fertilizer industry in Mauritania in the foreseeable future.

Present and projected fertilizer consumption

The present consumption of fertilizers in Mauritania remains very low. The estimated demand in 1970 and 1975 as projected by ECA is given below in tons of nutrients:

1970			1975		
N	P_2O_5	K_2O	N	P_2O_5	K_2O
750	100	100	1,500	300	300

It appears that the demand for fertilizers in Mauritania will remain low for a number of years.

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NIGER

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	negl.	100	500	1,500
	Production	-	-	-	-
	Deficit	negl.	100	500	1,500
	Surplus	-	-	-	-
P_2O_5	Consumption	negl.	negl.	1,000	3,000
	Production	-	-	-	-
	Deficit	negl.	negl.	1,000	3,000
	Surplus	-	-	-	-
K_2O	Consumption	negl.	negl.	500	1,500
	Production	-	-	-	-
	Deficit	negl.	negl.	500	1,500
	Surplus	-	-	-	-

General

Niger covers an area of 1.3 million km^2, and has a population of about 3.5 million with an annual rate of growth estimated to be 2.7 per cent. The average density of population is 2.3/km^2.

The country consists of a large desolate plateau, partly rock, partly sand (nine-tenths of the country is desert).

The greater part of the population is engaged in agriculture. Only about 2.6 per cent of the total land area is cultivated, whereas about 12 per cent is considered cultivable. Land used for inter-cropping does not exceed 2 per cent of the total area.

Food crops represent seven eighths of total agricultural production, 70 per cent of which is cereal grains, especially millet. Ground-nuts are exported in large quantities to France and Nigeria - in 1966 production was 311,905 tons. Smaller quantities of other crops are produced, i.e. sorghum, maize and rice. Cotton production has increased considerably from 218 tons in 1956 to 6,980 tons in 1965. In the region of Gourné, rubber is produced, of which 130 tons were exported in 1964.

Although the Niger River is over 4,000 km long, only 500 km of its course crosses the country; thus the country owes only a minor part of natural assets to the presence of the river Niger. To make it useful

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for irrigation purposes, several technical and economic problems would have to be solved. The hydroelectric power potential is enormous, but not suited to a reduced economic scale.

During the period preceding independence, the real growth of GDP was practically nil, but about 32 per cent between 1960-1966. The GDP at current market prices was in 1964/1965 about $260 million.

The 1961-1974 "perspective Décennale" was prepared immediately after independence. The first three-year plan has already proved realistic, as after extension of one more year to 1964, nearly 80 per cent of original public expenditure target had been realized. For 1968-1971 the investment in agriculture is budgeted at 8.5 per cent and in industry 1.4 per cent. The level of traditional exports by 1974 is forecast at about 20 per cent above the 1966 level, and 33 per cent above the average for 1965-1966.

Natural resources and industry

The country has a number of mineral deposits, most of which appear limited. Oil exploration has been carried out over a number of years, mainly in the Nadaona sedimentary basin in the western part of the country, so far without uncovering any significant reserves. Coal deposits have been discovered some years ago and are being evaluated. The hydrological potential of the country is also being studied.

Up to 1966 the only mineral exploited was tin ore (cassiterite) on a relatively small scale from the deposits at El Meelui and Tarroudji in the Air mountains. The production in 1964-1966 was 75,000 to 85,000 tons/year of 70 per cent concentrate, which was exported to Nigeria.

In 1968 a company was formed (SOMAIR, with Niger and French participation) to exploit the uranium deposits at Arlit. The estimated reserves are equivalent to 15,000 to 20,000 tons of metal, which is more than the Gabon deposits; the average grade of the ore is about 2.5 per cent. It is expected that by 1970 the production will be at the rate of 200 tons/year of metal as 65 per cent concentrates and will be increased to the equivalent of 1,000 tons/year of metal by 1973-1974.

There are also deposits of gypsum, clay, salt and silica, which are being worked to a limited extent. There are indications of iron, copper, tungsten and other metals in small quantities.

The manufacturing industry is as yet not well developed and consists mainly of food, leather tanning and cement manufacture. There is no chemical industry and it is unlikely to be developed in the near future.

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Fertilizer manufacture

As the potential fertilizer consumption in the near future is unlikely to be significant and Niger is lacking suitable raw materials, there is no prospect of the establishment of a fertilizer industry at this stage of the country's development.

Present and projected fertilizer consumption

The present consumption of fertilizers in Niger remains very low. The estimated fertilizer consumption in 1970 and 1975 as projected by ECA is given below in tons of nutrients:

1970			1975		
N	P_2O_5	K_2O	N	P_2O_5	K_2O
500	1,000	500	1,500	3,000	1,500

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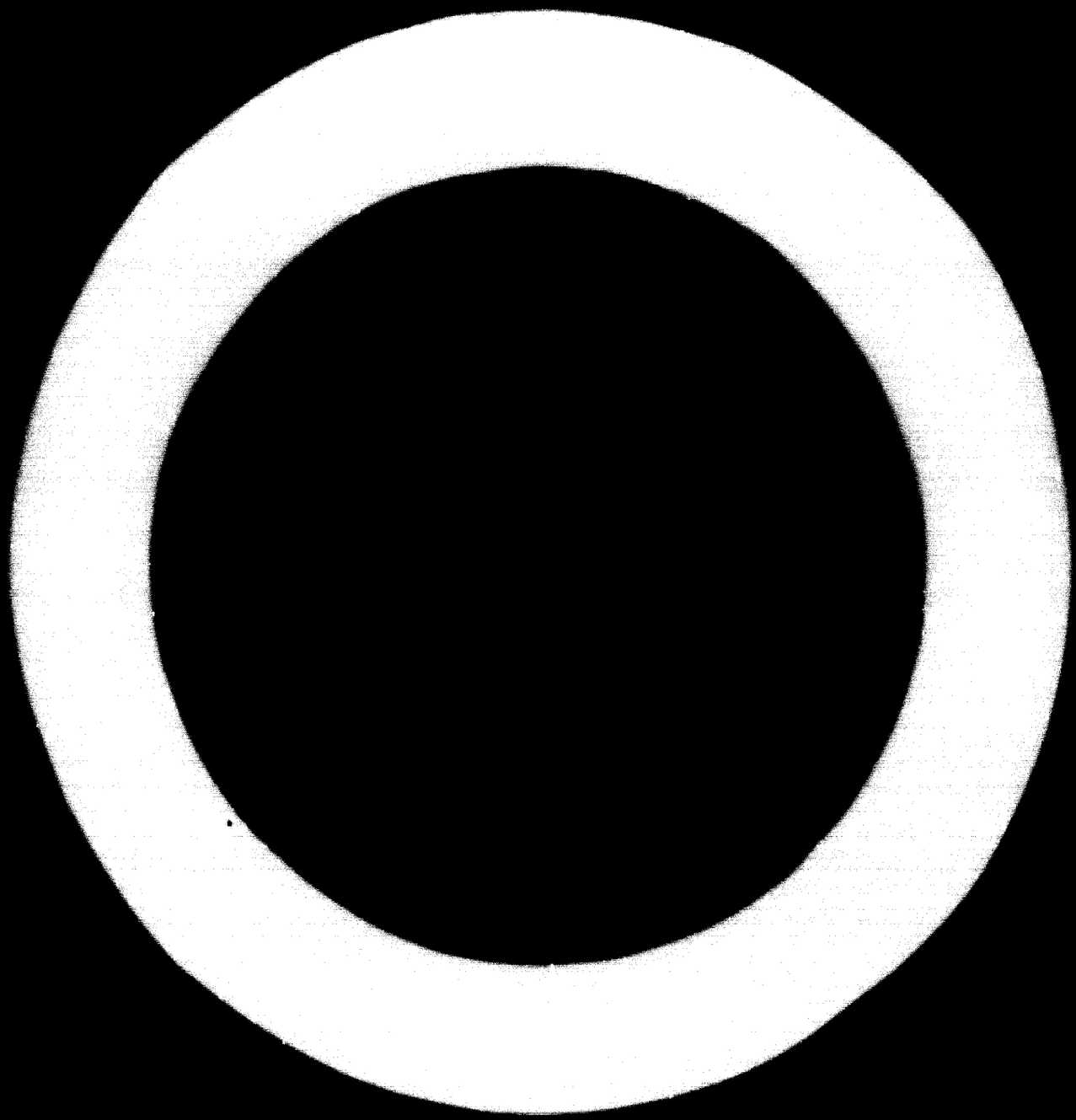

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Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	900	1,700	8,200	27,000
	Production	-	-	-	-
	Deficit	900	1,700	8,200	27,000
	Surplus	-	-	-	-
P_2O_5	Consumption	700	1,400	11,000	34,000
	Production	-	-	-	8,000
	Deficit	700	1,400	11,000	26,000
	Surplus	-	-	-	-
K_2O	Consumption	1,700	800	2,900	19,000
	Production	-	-	-	-
	Deficit	1,700	800	2,900	19,000
	Surplus	-	-	-	-

General

The country covers an area of about 912,000 km^2, and has a population of approximately 58 million with a rate of growth estimated at 2.5 per cent/year.

The country can be divided into eleven natural regions, agriculturally the most important ones being the alluvial areas, the drift plains and the southern and northern basement complex areas.

Nigeria became independent within the British Commonwealth in 1960. As the result of the Civil War, the economy of the country has suffered severely due to destruction of national assets, disruption of internal and external trade, reduction of the rate of exploitation of the country's natural resources and heavy war expenditure. Investment in the industrial sector decreased sharply. An exodus of about 1.5 million Ibos from the north and Lagos disrupted the rail and road services. Before the eruption of the hostilities, Nigeria was enjoying a period of economic growth, between 1962 and 1965 the GDP growing at a rate of about 4 per cent/year, reaching in 1966/1967 $4,500 million current factor cost. Agriculture contributed about 58 per cent to the GDP while the share of the mining and manufacturing sectors was 11 per cent. At the time the major exports of the country included cash crops such as palm products, rubber, cocoa and ground-nuts, but these have been overtaken as foreign exchange earners by crude petroleum, and all the agricultural products including rubber. These sectors accounted for [illegible] per cent and

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51 per cent respectively of total exports of the country amounting to about $800 million. In 1966 Nigeria achieved a trade surplus for the first time since 1955 due to a great increase in petroleum exports and reduction in imports.

The Six-Year-Development Plan 1962-1968 with a planned expenditure of about $3,000 million was abandoned in 1967. It is planned to introduce a second plan after a two-year period to repair the war damage. Financial and technical assistance has been received from a number of sources including Japan, Kuwait, the United Kingdom, the USSR, the United Nations and the World Bank.

Agriculture

Eighty per cent of the total labour force is still engaged in agriculture. It is estimated that about 25 million ha are cultivated. There are no reliable details regarding the present performance of the agricultural sector but the following data relating to the period immediately prior to the Civil War should be representative.

Millet and sorghum production was about 4.3 million tons/year from 7 million ha followed by Guinea corn, cultivated on 5 million ha and producing about 3.5 million tons/year. The production of yams was about 13 million tons/year from 1.8 million ha while the area under cultivation of cassava was about 1.5 million ha. The country's production of the main cash crops was as follows: cocoa - 260,000 tons/year, ground-nuts - 1 million tons/year, cotton seed - 150,000 tons/year, palm kernels - 200,000 tons/year, and palm oil - 6,000 tons/year.

Natural resources and industry

There are considerable reserves of crude oil and natural gas on and off shore in the former eastern region and the mid-west state. The crude oil reserves in the region of Port Harcourt were estimated in 1966 at 330 million tons. The reserves of natural gas in the region round Port Harcourt, Enugu and Ughelli have been estimated at about 2,500 billion Nm^3 of gas having an average content of 75 to 80 per cent methane. It is believed that the true total oil and gas reserves in the country are in fact considerably higher.

The production of crude oil commenced in 1957 reaching about 21 million tons in 1966. About 65 per cent of this output was produced from east of the river Niger. The crude output reached in 1967 an average of 580,000 b/d but in July 1967 the production in the eastern states came to a standstill. Out of a number of international oil companies including BP, Shell and Gulf Oil, only the operations of Gulf Oil from their off-shore fields producing about 50,000 to 60,000 b/d were not disrupted. The total production of crude

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oil in 1967 was about 70 per cent of that in 1966. By the end of 1967, however, a number of companies in the mid-west were able to resume production. Shipments of crude from stocks in the eastern area were resumed through Port Harcourt in September 1968. It is now estimated that the Nigerian crude production will reach the level of 1 million b/d in 1970. Terminal facilities are being expanded. Shell and BP are building a crude pipeline to be completed later in 1969, joining Port Harcourt and Port of Forcades where oil terminal facilities are being constructed to handle 200,000 ton tankers.

The local consumption of crude oil is relatively low at about 1 million tons/year processed at the Alesa Eleme (Port Harcourt) refinery of the Nigerian Petroleum Refining Co. (constructed in 1965 with an annual capacity of 2 million tons crude). Consequently Nigeria is already the world's tenth largest exporter of crude oil, about 65 per cent of which was delivered in 1966 to the Federal Republic of Germany, France and the United Kingdom. The crude oil exports during that year contributed about 33 per cent to the country's total revenue from exports.

The total production of associated natural gas was also showing a steady increase reaching about 3 billion Nm^3/year in 1966 and about 1.4 billion Nm^3 during the period January-April 1967. The gas consumption (as fuel), however, was relatively very low at about 170 million Nm^3 during 1966. Plans for the production and export of LNG had to be shelved because of the war.

Nigeria has important deposits of coal with total reserves estimated at about 350 million tons in the following areas: Enugu (55 million tons), Ezeme (47 million tons), Orukpa (58 million tons), Okaba (74 million tons), Ogboyoga (109 million tons), Otti and Iuyi. Coal is mined by the Nigerian Coal Corporation in the Enugu region at a rate of 600,000 to 650,000 tons/year. At Asaba there are also reserves of lignite estimated at about 70 million tons. The country is also a producer of tin ore (12,000 to 13,000 tons/year during 1965-1967), columbite and gold.

There are several deposits of limestone with total estimated reserves of more than 100 million tons. The deposits at Abeokuta and Ogeja are currently being worked with a production reaching 1 million tons/year.

The manufacturing industry includes textiles, building materials (e.g. bricks and cement), light engineering, food processing, soap, paper, leather tanning, a steel rolling mill and pharmaceuticals.

There is no basic chemicals or fertilizer manufacture at present.

Fertilizer manufacture

At present there is no production of fertilizers in the country, although in future Nigeria is the only country in the region where the size of the potential fertilizer market is such as to be able to support local manufacture with a possibility of exporting the excess.

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Although there are indefinite plans for the installation of a large nitrogen production plant based on a 1,000 tons/day ammonia unit, this would have to serve mainly an export market during the immediate future and such plans can be discounted at the present time.

There are, however, more definite and more immediate plans for the production of fertilizers in Nigeria:

(a) A plant for the production of 50,000 tons/year of single superphosphate to be erected near Kano or Kaduna, based on phosphate rock imported from Togo. It is understood that plans are well advanced and the project has a good chance of being implemented;

(b) A project for the production of 50,000 tons/year of calcium ammonium nitrate, based on a small ammonia plant (using natural gas), nitric acid plant and local limestone, possibly to be located at Port Harcourt.

For the purposes of this study it has been assumed that:

(a) A plant to produce 50,000 tons/year of single superphosphate will be in operation by 1975 operating at 85 per cent capacity;

(b) The idea of constructing a 50,000 tons/year calcium ammonium nitrate plant based on locally produced ammonia (the required capacity being about 12,000 to 15,000 tons/year) and nitric acid may be difficult to justify on commercial grounds. It has been assumed therefore that this plant will not materialize by 1975;

(c) It is highly probable that in due course the natural gas readily available in Nigeria will be used for production of petrochemicals including ammonia on a relatively large scale. This could then give rise to production of nitrogen fertilizers on a commercial scale. It is assumed that such developments will take place after 1975.

Present and projected fertilizer consumption

There is an enormous potential for fertilizer market growth in Nigeria. The consumption of fertilizers in 1966/1967 was about 4,600 tons of nitrogen, 1,800 tons of P_2O_5 and 1,000 tons of K_2O. This is equivalent to an average of about 0.3 kg nutrients/ha of cultivated land taken as 25 million ha.

A number of official and unofficial estimates of the projected fertilizer consumption for the period up to 1980 have been carried out in the past, some of them being widely divergent, and most will be adversely affected by the effects of war.

The estimates made by FAO and Shell International Chemical Co. Ltd., and others have been used by ECA as a basis for more recent projections. These are shown below, together with unofficial information supplied during a recent visit to Nigeria by a UNIDO consultant, in tons of nutrients:

	1970			1975		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	12,900	15,000	9,500	27,400	34,000	19,400
UNIDO	8,200	11,000	2,900	-	-	-

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It is believed that at this stage it is more realistic to adopt the recent estimates obtained by UNIDO consultant for 1970, but to use the original ECA projections for 1975 (reduced to the nearest 1,000 tons) because of the enormous market potential in Nigeria.

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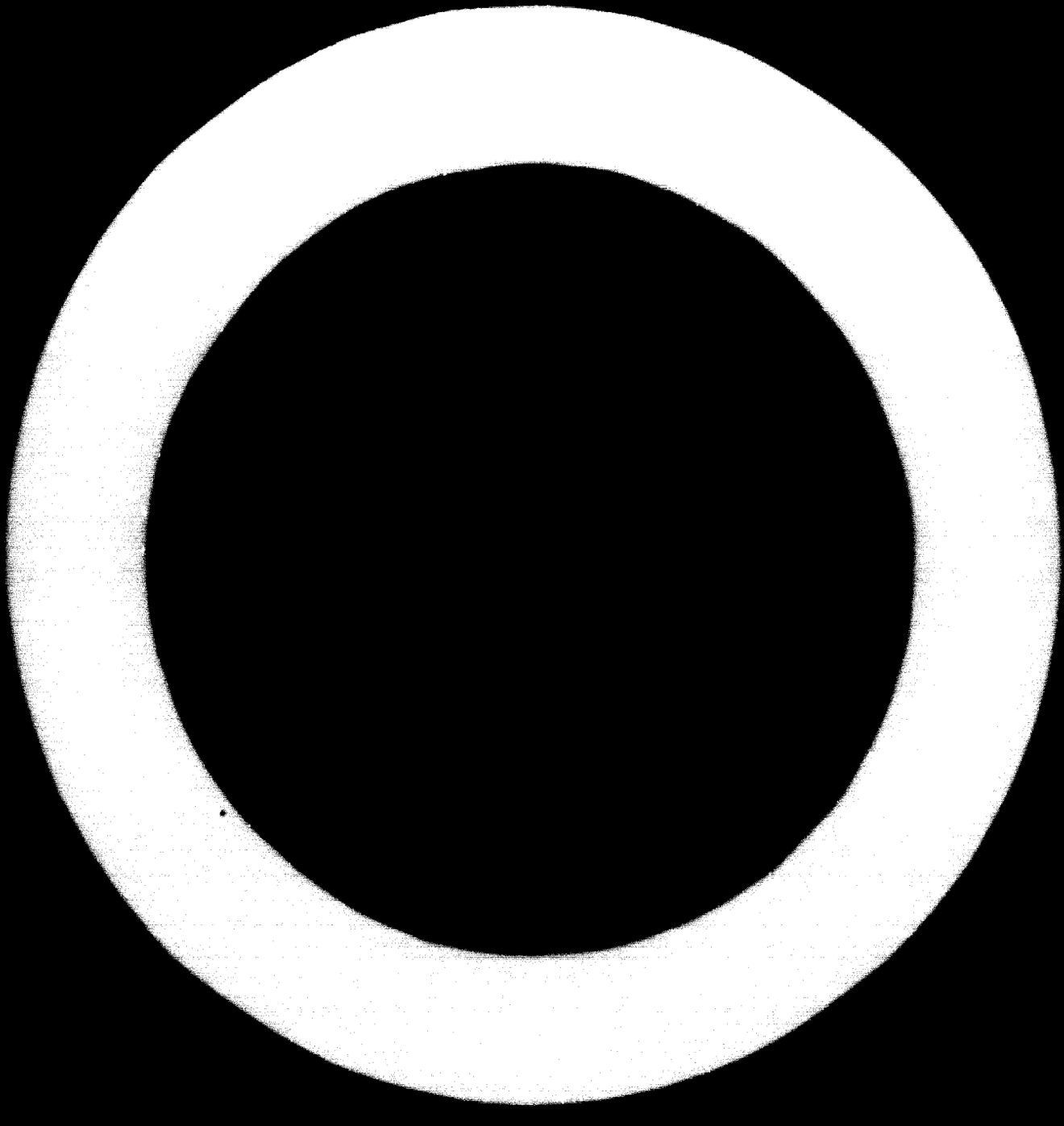

WEST AFRICA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	negl.	negl.	100	300
	Production	-	-	-	-
	Deficit	negl.	negl.	100	300
	Surplus	-	-	-	-
P_2O_5	Consumption	negl.	negl.	100	300
	Production	-	-	-	-
	Deficit	negl.	negl.	100	300
	Surplus	-	-	-	-
K_2O	Consumption	negl.	negl.	100	300
	Production	-	-	-	-
	Deficit	negl.	negl.	100	300
	Surplus	-	-	-	-

General

A Portuguese overseas province on the west African coast, which became a separate colony in 1879, Portuguese Guinea covers an area of about 36,125 km^2. At the 1960 census the population was 521,336. The rate of growth is estimated at about 2 per cent/year.

Almost the whole country is lowland, with many swamps and pools. The coast is heavily indented by deep inlets or gulfs. Off the coast there are many islands, which are only separated from the mainland by creeks. The leading port is Bissau. The economy of the country is based on agriculture.

Agriculture

The development of this sector of the economy has been gradual. The chief products are native crops such as peanuts - about 45,000 tons/year, palm nuts - 15,000 tons/year, palm oil - 1,000 tons/year and rice - 60,000 tons/year. Only a relatively small proportion of the land is cultivable, as the coastal regions and islands are covered by forests and palm trees, and the valleys are swampy. Main trees found are cotton trees, and African mahagony; timber production totals 10,000 tons/year.

PORTUGUESE GUINEA

Some livestock raising is carried out, mainly pigs and goats.

There is no industry of commercial value in existence. There is, however, some palm-oil processing, rice milling and pottery manufacture. Trade is largely with Portugal.

In the early 1960s exports (chiefly peanuts, palm oil, nuts and timber) were valued at about 200 million escudos/year, and imports (i.e. cotton, piece goods, wines and food-stuffs) at more than 250 million escudos.

Natural resources and industry

There are no minerals of commercial value recorded in Portuguese Guinea.

Fertilizer manufacture

There is no fertilizer production in the country.

There are no data available regarding fertilizer consumption in Portuguese Guinea for the years 1963-1964 and 1964-1965.

Estimated fertilizer requirements in Portuguese Guinea for the period 1970-1981 in tons are as follows:

	1970-1971	1975-1976	1980-1981
N	100	305	930
P_2O_5	100	305	930
K_2O	100	305	930

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WEST AFRICA

SENEGAL

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	1,500	3,200	8,000	16,000
	Production	-	-	6,500	7,000
	Deficit	1,500	3,200	1,500	9,000
	Surplus	-	-	-	-
P_2O_5	Consumption	2,700	6,400	12,000	24,000
	Production	-	-	12,000	13,000
	Deficit	2,700	6,400	-	11,000
	Surplus	-	-	-	-
K_2O	Consumption	1,500	4,000	8,000	16,000
	Production	-	-	-	-
	Deficit	1,500	4,000	8,000	16,000
	Surplus	-	-	-	-

General

The country covers an area of about 200,000 km^2, and has a population of approximately 3.5 million (including some 50,000 non-Africans), with an annual rate of growth estimated at 2.5 per cent.

Senegal gained independence in 1960. Agriculture and livestock have priority in the economy of the country, this sector contributing 36 per cent to GDP. (Ground-nuts are the main source of wealth with more than 950,000 tons/year.) The commercial sector contributes 37 per cent to GDP and plans to expand this sector are under way. The GDP of current market prices in 1966 was about $800 million. Construction of a fertilizer plant is under consideration for the near future. Among existing works of importance is gold, which is being mined in Falémémand. Important salt mines have been exploited for some time around St. Louis and Louga, and considerable deposits of calcium phosphate have been discovered in the region of Thiès and Taiba, and are being exploited.

Senegal is receiving substantial amounts of foreign aid, mainly from France, but also from the United States, the Federal Republic of Germany and Canada. The country does not have a satisfactory balance of payments statistics as yet. Ground-nuts and its products remain the largest single component of exports. France is the biggest buyer with 61 per cent. Exports of calcium phosphate also rose substantially until 1965, with the opening of a new mine. Imports reached a peak in 1964, but have declined since.

SENEGAL

Agriculture

Senegal is predominantly an agricultural country, and more than 70 per cent of the active population derives its livelihood from this sector.

Because of climatic conditions agricultural possibilities are restricted to a few crops. Traditional agriculture was based on millet, some cassava and local cotton. Ground-nuts have been introduced only recently. Of the total agricultural production livestock accounts for about 10 per cent, forestry for about 1 per cent and agriculture proper for about 90 per cent (ground-nuts alone were about half of the total output). As yet there is little cotton production, but in a project for 1968/1969 a total of about 3,600 tons (on 4,000 ha) was expected. Cotton is planned to become a profitable product in future.

During the eight years 1959-1966, agricultural production increased at a rate of about 4 per cent/year due to the extension of cultivated area. Yields have increased very slowly. Use of fertilizer was unknown until very recently, and the over-all production has increased in line with the total area from about 450,000 to 600,000 tons in 1947/1955 to about 950,000 to 1.15 million tons in 1963-1966. Palm oil production with 5,000 tons is for domestic consumption only. It is hoped that the domestic demand for bananas, i.e. about 7,000 tons, will be met by 1969. The production of sugar-cane for 1970 is estimated at 285,000 tons (on 4,500 ha). The production of rice and millet for domestic consumption could still be increased. In 1966 the following imports had to be made to meet the country's grain requirements: rice - 159,300 tons, wheat - 76,000 tons, maize - 10,000 tons, millet and sorghum - 3,100 tons, and other cereals - 4,800 tons.

Production estimates for 1966 for the main crops were as follows: millet - 400,000 tons, paddy rice - 100,000 tons, maize - 40,000 tons, manioc - 150,000 tons, ground-nuts - 800,000 tons. Figures for cotton are not available. Of the exported ground-nuts, shelled ground-nuts accounted for 151,800 tons, crude oil - 120,000 tons, refined oil - 24,100 tons and ground-nutsmeal for 193,100 tons.

Natural resources and industry

At present there is no commercial exploitation of crude oil or gas in Senegal. Exploration work was resumed in 1966 by Total, mainly off shore along the Gambia-Senegal coastline, in the Casamance region, and near Dakar. Encouraging indications of crude have been found and the work is continuing. There are also indications of natural gas near Soki Kotane. A petroleum refinery at M'Bao near Dakar was commissioned in 1964 by the Société Africaine de Raffinage. The capacity of the refinery is about 600,000 tons/year of crude with a possibility of expansion to about 900,000 tons/year, and the production is based on imported crudes, mainly from Gabon or the Sahara.

There are several deposits of phosphate rock. At Taïba, about 110 km from Dakar there is a calcium phosphate deposit, with estimated total reserves of about 110,000 tons of ore of an average grade of 57 per cent tricalcium phosphate. The recoverable reserves have been expressed as 30 to 40 million tons of 82 per cent rock (i.e. about 37.5 per cent P_2O_5 and 52 to 54 per cent CaO). The mine is owned and operated by the Compagnie Sénégalaise de Phosphates de Taïba. In addition there are reserves of about 100 million tons of run of mine mineral at a depth of more than 30 m. The deposits are worked by opencast mining, and then the run of mine ore is upgraded by washing, floatation and drying in rotary driers to about 2 per cent free water content. The present capacity is about 1.2 million tons/year of upgraded rock and it was hoped to increase this to about 1.8 million tons/year by 1970. Owing to mining and upgrading difficulties, however, this expansion is now uncertain, and a large investment is needed to maintain the present rate of production, which in 1967 reached about 1.1 million tons as compared with about 680,000 tons in 1964. Additional deposits of calcium phosphate rock exist at:

Lam-Lam near Thiès, with reserves of about 3.5 million tons of mineral containing 18 per cent P_2O_5 and 10 per cent Fe_2O_3. The production has been limited by the ore's high iron content and a small quantity is ground and sold locally for use as fertilizer under the name of Balyphos.

Deposits at Sebikatane and Pointe Sarène with rock averaging 20 to 25 per cent P_2O_5 and 12 to 15 per cent P_2O_5. Because of the high iron content these deposits have not been exploited.

Reserves of about 1 million tons of phosphate rock at Civé near the Mauritania border have been worked since 1957 but are now abandoned.

A deposit of aluminium phosphate at Pallo near Thiès is owned and exploited by the Société Sénégalaise des Phosphates de Thiès. The reserves have been estimated in 1966 at about 40 million tons of mineral averaging 28 to 30 per cent P_2O_5, 27 to 32 per cent Al_2O_3, 6 to 10 per cent Fe_2O_3, 8 to 11 per cent CaO, 1 to 7 per cent SiO_2, and 2 per cent TiO_2. There are additional reserves of less rich ore estimated at about 60 million tons. Because of the composition the ore has a number of limitations for processing as fertilizer. The rock is mined by opencast methods and ground. Part of the output is further treated by calcination at 500°C, increasing the P_2O_5 content to 35 per cent (citrate soluble P_2O_5 content of about 23 per cent), 9 per cent CaO and 25 per cent Al_2O_3. The annual production of crude aluminium phosphate was 105,000 tons in 1960, 120,000 tons in 1964 and 160,000 tons in 1967, while the production of calcined rock was 24,000 tons in 1960, and 50,000 tons in 1966.

Limestone is produced from the deposits at Bargny near Thiès, the mine capacity having been increased to about 300,000 tons/year in 1966. It is used for the manufacture of cement, some of which is exported to Mali, Mauritania and the Ivory Coast.

Ilmenite, rutile and zircon are found in the "black sands" along the coast (containing on average 2 to 10 per cent ilmenite, 2 per cent or less of zircon and some rutile). The total available reserves

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of ilmenite are estimated at about 1.3 million tons with about 100,000 tons of zircon and 30,000 tons of rutile). These deposits are worked by the Société Minière Graziello (SOMICA). There is also a limited production of salt from the Saloum salines (with a capacity of 70,000 tons/year, limited by the handling facilities at the port of Kaolack). There are also reserves of iron (Kenieba), clays (Thiès and Kaotach), gold (Falenie and Tinkisso), lead and molybdenum (Tinkolo) and columbium (at Diambolaye). Further mineral exploration is being carried out mainly in eastern Senegal.

The industrial development of the country is limited, apart from the market considerations, by the total lack of indigenous sources of fuel and power. The manufacturing industry consists mainly of food and vegetable oil processing, textiles, cement and bricks, oil refining, light engineering, soap, and since May 1968 fertilizer production.

Apart from sulphuric acid no basic chemicals are produced at present.

Fertilizer manufacture

Until recently production of fertilizers in the country was limited to small tonnages of phosphal (calcined and ground aluminium phosphate from the Pallo deposit with about 34 per cent total P_2O_5 and 26 per cent citrate soluble P_2O_5) and of Balyphos (ground, dried phosphate rock with 30 to 33 per cent P_2O_5).

In May 1968 a fertilizer plant has been commissioned at M'Bao near Dakar. This plant is owned and operated by the Société Industrielle d'Engrais au Sénégal.

The capacity of the plant is 110,000 to 130,000 tons of single or triple superphosphates and mixed fertilizers, the production pattern depending on market considerations. It is anticipated that at its maximum rate of production the plant will be using the following quantities of raw materials: phosphate rock - 50,000 tons/year, sulphur - 12,000 tons/year, ammonia - 10,000 tons/year and potassium chloride - 15,000 to 20,000 tons/year. All these materials with the exception of phosphate rock will be imported. The total output in 1968 and 1969 was expected to be about 25,000 tons and 67,000 tons respectively. No other plans for the manufacture of basic chemicals and fertilizers are known.

For the purpose of this study it is assumed that the fertilizer plant at M'Bao will be operated at 80 per cent capacity in 1970 and 90 per cent capacity in 1975. This is equivalent to a production of 6,500 tons/year of nitrogen, 12,000 tons/year of P_2O_5 and 7,000 tons/year of K_2O in 1970 and 7,000 tons/year of nitrogen, 13,000 tons/year of P_2O_5 and 8,000 tons/year of K_2O in 1975. All the raw materials however will be imported.

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Present and projected fertilizer consumption

The consumption of fertilizers in 1966/1967 remained relatively low at about 4,000 tons of nitrogen, 8,000 tons of P_2O_5 and 5,500 tons of K_2O, or the equivalent to about 8.8 kg of nutrients/ha of cultivated land taken as 2 million ha.

A number of very divergent official and unofficial estimates of the projected fertilizer consumption for the period up to 1980 have been carried out in the past. A number of these projections have been summarized by ECA, who after considering these various points of view and the conditions prevalent in the country prepared its own projections of fertilizer demand for 1970-1980. These projections are shown below in tons of nutrients together with FAO estimates, based on an assumed rate of growth of the contribution of the agricultural sector to the GDP at market prices of 3.6 per cent/year during 1962-1975. An estimate obtained from the Ministry of Agriculture during a recent visit to Senegal is also given:

	1970			1975		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	8,000	12,000	8,000	16,000	24,000	16,000
FAO	-	-	-	5,700	7,900	6,200
Ministry of Agriculture	9,500	9,500	7,500	-	-	-

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WEST AFRICA

SIERRA LEONE

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	negl.	100	1,000	2,000
	Production	-	-	-	-
	Deficit	negl.	100	1,000	2,000
	Surplus	-	-	-	-
P_2O_5	Consumption	150	500	1,000	2,000
	Production	-	-	-	-
	Deficit	150	500	1,000	2,000
	Surplus	-	-	-	-
K_2O	Consumption	negl.	100	1,000	2,000
	Production	-	-	-	-
	Deficit	negl.	100	1,000	2,000
	Surplus	-	-	-	-

General

Sierra Leone covers an area of about 72,300 km^2, and has a population of 2.2 million, with an annual rate of growth estimated to be 1.1 per cent.

Sierra Leone became independent within the British Commonwealth in 1961. The per capita income of the country is high as compared with other African developing countries at about $120. This is due largely to a growing mining industry which contributes about 23 per cent to a GDP estimated for 1964 to be approximately $270 million. Agriculture contributes about 40 per cent to GDP (at least 80 per cent of active population is engaged in this sector, mainly on a subsistence level) although a number of cash crops are grown for export.

The response to the Government's ten-year plan covering the period 1962-1971 has been initially disappointing. However, to date the country has received considerable sums in overseas aid, including assistance from Canada, the Federal Republic of Germany, Israel, Sweden, the United Kingdom, the United States and the World Bank. The main problem facing the country is a restricted domestic market and a solution to this may be found in membership of a larger economic community, e.g. the West African Economic Community. In 1967 Sierra Leone refused articles of association in Accra with eleven neighbouring countries, but this move has still to be developed. A National Development Bank is being set up with a share

SIERRA LEONE

capital of $500,000, 49 per cent of which is to be subscribed by foreign investors. The object of the Bank will be to finance new agricultural and industrial projects. In the short term, however, the outlook of the economy of the country is not bleak as it does not depend on primary products and the demand for the products of the mining sector, e.g. iron ore, bauxite, diamonds, etc. is not likely to diminish.

Agriculture

The main agricultural area in Sierra Leone is the western part of the country, and the main staple food crop is rice, supplemented by cassava, millet, maize, sweet potatoes, coco and cola nuts, bananas and citrus fruit. The agricultural sector suffered from shifting of population from the farming areas into the mining industry, especially diamond digging in the 1950s. From that time grain and other food imports increased considerably. Imports of rice for example, rose from nil in 1953 to 43,000 tons in 1960, and 34,500 tons in 1966. The production of rice on a harvested area of about 290,000 ha is about 400,000 tons, the yield varying between 900 kg/ha of upland rice to 1,600 kg/ha of lowland rice. The production of cassava is about 60,000 tons/year, the yield being low at about 400 kg/ha. The production of maize is about 10,000 tons/year.

The country is also producing a number of export crops including palm kernels (export in 1964 amounting to some 50,000 tons), cocoa - 3,000 tons, coffee - 6,000 tons, and other minor crops such as cola, ginger and piassava. All exports are marketed by the Sierra Leone Produce Marketing Board.

Sierra Leone is very deficient in livestock which is mainly of inferior breed, the cattle (about 200,000 head) being held mainly by nomadic tribesmen in the north. The FAO are to conduct shortly a survey of the agricultural sector and a plan for its development.

Natural resources and industry

Mining is the largest industry of the monetary sector. Diamond mining is the most important (12 per cent of the world's production in 1964 was supplied by Sierra Leone). Diamonds are produced in the British owned Sierra Leone Selection Trust Ltd. and by private licensees of the Alluvial Diamond Scheme, which sells its output to the Government Diamond Office, indirectly managed by the de Beers Group (through Diamond Corporation West Africa Ltd.). Due to exhausting of the rich diamond-bearing fields and illegal mining, the country's production of diamonds is expected to drop from 1.65 million carats in 1964.

The second important mineral produced in the country is iron ore. This is produced by British owned Sierra Leone Development Co. Ltd. from an open pit mine at Marampa at a rate of about 2 million tons/year of 65 per cent concentrate. A second deposit with reserves of about 100 million tons has been found at Loukoliti near the Guinea border. This is unlikely to be exploited in the near future.

Bauxite deposits discovered in 1960 at Mokayi Hills are being exploited by the Swiss owned Sierra Leone Ore and Metal Company at a rate reported to be about 300,000 tons/year of 55 per cent concentrate. There is also a deposit of chromite and a newly discovered rutile reserve (estimated to be the largest in the world) is being worked at an initial rate of 30,000 tons/year. Exploration for molybdenum is under way.

The country does not have any known commercial sources of fuel, apart from wood. The small deposit of coal is reported to be uneconomical to exploit.

The manufacturing industry in the country is in its infancy, but is undergoing some expansion. Projects in hand include building the King Town power station and a 10,000 b/d refinery near Free Town based on imported crude.

Fertilizer manufacture

The production of fertilizers in the country is non-existent at present, and because of low potential domestic requirements this situation is unlikely to change in the near future.

Present and projected fertilizer consumption

The present fertilizer consumption in the country is low at about 100 tons of nitrogen and 500 tons of P_2O_5 in 1966/1967.

The projected fertilizer consumption in 1970 and 1975 as estimated by ECA is given below in tons of nutrients:

1970			1975		
N	P_2O_5	K_2O	N	P_2O_5	K_2O
1,000	1,000	1,000	2,000	2,000	2,000

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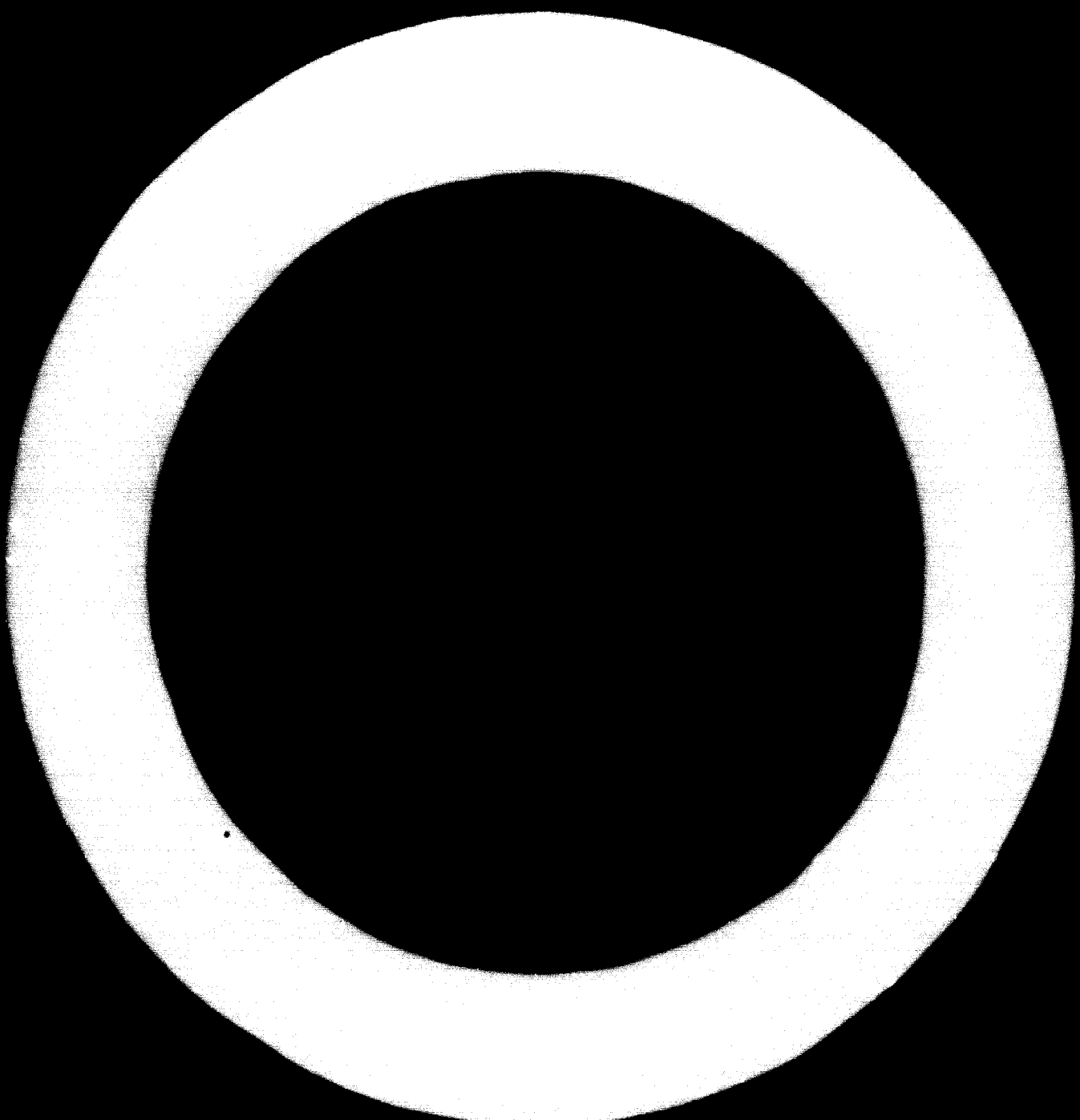

WEST AFRICA

TOGO

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	...	200	900	2,100
	Production	...	-	-	-
	Deficit	...	200	900	2,100
	Surplus	...	-	-	-
P_2O_5	Consumption	...	300	900	2,100
	Production	...	-	-	2,100
	Deficit	...	300	900	-
	Surplus	...	-	-	-
K_2O	Consumption	...	200	600	1,200
	Production	...	-	-	-
	Deficit	...	200	600	1,200
	Surplus	...	-	-	-

General

The Republic of Togo covers an area of 56,000 km^2, and has a population of about 1.7 million with an estimated rate of growth of 2.6 per cent/year. The average density of population is 28/km^2.

Togo is basically an agricultural country with well over three quarters of the active population and one half of GDP in this sector. Since independence, it has strongly developed the non-agricultural sector. In particular the country has put into exploitation very rich phosphate deposits, started a few industries and engaged in major infrastructural works. In spite of the accelerated growth of GDP, the per capita GDP is still relatively low at $95. In 1965 the GDP at market prices was $175 million, to which agriculture contributed 49 per cent, industry 15 per cent and commerce 18 per cent.

Agriculture

Out of the total of 5.66 million ha an estimated 870,400 ha are being cropped. Apart from this area 483,000 ha are left temporarily fallow. Thus the total arable land was 1,353,000 ha in 1967. Shifting cultivation is still the predominant form of agriculture. Subsistence farming prevails although the amount and value of marketed crops are increasing.

TOGO

Food crops account for 80 per cent of agricultural output. Among these the most important are: sorghum - 280,000 ha, producing about 168,000 tons; maize - 180,000 ha, producing 126,000 tons; cassava - 130,000 ha, producing 780,000 tons; and yam - 100,000 ha with 800,000 tons yield on average. Rice, beans and peas are also grown.

The main industrial crops are ground-nuts on 39,000 ha, producing about 23,400 tons, cotton on 57,000 ha, producing 17,100 tons, cocoa on 16,500 ha, producing 8,250 tons and coffee on 20,000 ha, producing about 10,400 tons. Oil palms and coconut are also fairly important, growing on 8,000 ha and 4,200 ha respectively.

Natural resources and industry

There are no known sources of indigenous fuel. Off-shore oil exploration is being carried out, but so far no discoveries have been made. The main industrial activity is concerned with the exploitation of the phosphate rock deposits near Kpemé near the coast. The discoveries were made in 1952 and commercial exploitation by the Compagnie Togolaise des Mines du Bouin (with a 20 per cent participation of the Togolese fort), commenced in 1961. The reserves have been estimated in 1965 at 50 million tons proved, and 70 million tons possible. The run of mine ore contains 25 to 40 per cent clay and the recoverable reserves have been estimated as equivalent to about 50 million tons of 81 per cent BPL concentrate. The run of mine ore is transported by a 25-km railway to the beneficiation plant at Kpemé, which is equipped with three parallel production streams. Each production line with a capacity of 100 tons per hour, consists of wet crushing and grinding, clay separation in hydraulic cyclones, centrifugal separators and drying kilns. The dried rock containing 80 to 82 per cent BPL is transported to a covered store with a capacity of 70,000 tons and conveyed to a ship loading facility, capable of handling 35,000 BRT vessels and with a loading capacity of 2,000 tons per hour.

The total rock production (mainly as 80 to 82 per cent concentrate with a very small tonnage of 75 per cent BPL rock) was about 1 million tons in 1967 and the total reduction capacity in 1968 was 1.3 million tons/year of concentrate. The beneficiated rock is exported to Australia, France and the Netherlands with smaller quantities to Belgium, India, Italy and other countries.

Other mineral deposits in Togo, which are not as yet commercially exploited include:

Iron deposits at Bemgeli (400 km from the coast) with estimated reserves of 50 million tons of hematite with 40 to 50 per cent Fe and indications of iron ore at Shniga and Bodgé.

Bauxite deposits in the Agon hills with estimed reserves of 1 million tons.

Chromite deposits in the Ahito and Djeti Hills with estimated reserves of about 1 million tons; dolomite, limestone, rutile and gold are also mined in small quantities.

TOGO

The possibility of producing about 20,000 tons/year of salt by solar evaporation at the Anécho Lagoon has been studied.

The manufacturing industry consists mainly of food processing (e.g. starch) and textiles. There is no basic chemical industry in the country.

Fertilizer industry

There is no production of fertilizers in the country and the market potential is limited at present.

The possibility of using beneficiated phosphate rock for fertilizer production was reviewed by ECA in 1964 at the Bamako conference. By that time it was strongly recommended that granulated superphosphate industry using indigenous rock should be established promptly.

The problem of establishing phosphate fertilizer industry in Togo was studied again in 1967 and an alternative solution was recommended, i.e. to produce triple superphosphate in powder form, instead of granulated single superphosphate, using for the time being imported phosphoric acid and indigenous phosphate rock. The capacity of such a plant, taking into consideration the requirements of Togo and neighbouring countries was to be 36,000 tons/year of P_2O_5 as 80,000 tons of triple superphosphate.

It is now proposed that the original idea of making single superphosphate at Lomé would materialize ultimately on a small-scale size, mostly for local consumption only. It is proposed to import elemental sulphur to produce 6,800 tons sulphuric acid/year. Such a production would enable an annual manufacture of about 13,700 tons of single superphosphate. It is expected that that plant will be put into operation in 1972 at a cost of $1.2 million.

It is assumed that the plant will be operating at 75 per cent of its capacity, i.e. producing 2,100 tons/year of P_2O_5 in 1975.

Present and projected fertilizer consumption

The estimated fertilizer consumption in 1969 is about 500 tons annually, each of nitrogen, P_2O_5 and K_2O, or the equivalent to about 1.7 kg of nutrients per ha of cropped land taken as 870,000 ha.

TOGO

The projected fertilizer demand in the country for 1970 and 1975 as estimated by ECA and recently by a UNIDO consultant is given below in tons of nutrients:

	1970			1975		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	500	500	500	1,500	1,500	1,500
UNIDO consultant	935	885	585	1,580[a/]	1,800[a/]	950[a/]

a/ In 1973.

As it is believed that the projections by the UNIDO consultant, based on a recent study of the agricultural sector in the country should be relatively realistic, these estimates have been adopted for the purpose of this study (rounded up to the nearest 100 tons). In order to obtain projections for the fertilizer demand in 1975, the rate of growth of consumption of 15 per cent/year has been used for all the three nutrients, i.e. in 1975: 2,100 tons nitrogen, 2,100 tons P_2O_5, 1,200 tons K_2O.

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WEST AFRICA

UPPER VOLTA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	negl.	200	500	1,500
	Production	-	-	-	-
	Deficit	negl.	200	500	1,500
	Surplus	-	-	-	-
P_2O_5	Consumption	negl.	100	500	1,500
	Production	-	-	-	-
	Deficit	negl.	100	500	1,500
	Surplus	-	-	-	-
K_2O	Consumption	negl.	000	500	1,500
	Production	-	-	-	-
	Deficit	negl.	000	500	1,500
	Surplus	-	-	-	-

General

The country covers an area of about 274,000 km^2 and has a population of 5.2 million (mid 1968), almost 100 per cent native African. The annual rate of growth is estimated at 2 per cent with an average density of 18/km^2 (very irregularly spaced, e.g. in the plateau Mossi region, density is more than 50/km^2). About 95 per cent of the population is agriculturally employed.

Upper Volta is a landlocked country 800 km from the sea, most of the country is flat savannah or semi-desert land.

The country became independent in 1960, and was admitted to the United Nations.

Animal husbandry is the main economic activity and source of wealth. Livestock is the country's most important export, accounting for almost 60 per cent of total exports. Cotton is the second most valuable export and accounts for 6 per cent, peanuts 9 per cent, 45 per cent of total exports went to Ivory Coast, 21 per cent to Ghana, and 18 per cent to France. The total GDP at current market prices amounted to $240 million in 1966, and GDP is very low with less than $50.

UPPER VOLTA

Agriculture

Eighteen per cent of the country's total area is agricultural land, i.e. about 1 hectare per capita. Agricultural resources are very limited due to primitive farming methods and thin, eroded soil, except along the river. To increase production, as well as the use of fertilizers, a more efficient irrigation system has to be developed.

The principal food crops are cereals, millet and sorghum (about 2.2 million ha). In 1967 the production of sorghum and millet came to 950,000 tons, corn - 150,000 tons, peanuts - 109,000 tons, and paddy rice - 35,000 tons. Yams, cassava and sweet potatoes are also grown.

Cotton has recently become the main cash crop, especially in the central region of the country, and production accounts for about 8,000 to 9,000 tons/year.

Natural resources and industry

There are no known fuel and power reserves in the country. Mineral mining activities were limited to the exploitation of the gold mine at Poura, which has recently been closed down.. Deposits that are believed to have some development potential are those of copper (at Gongondy and Bobo-Dioulasso), manganese (at Tambao with total reserves of about 10 million tons of 40 to 51 per cent mineral), limestone, marble and diamonds. Indications of graphite, dolomite, chrome, nickel, tin and bauxite have been found in a number of locations. In general, however, the industrial and mining activity is restricted by the lack of fuel and energy, large distances and inadequate transport facilities. The existing and planned manufacturing industries are limited to food processing, textiles and building materials.

Fertilizer manufacture

There is no fertilizer production at present in the country and the lack of raw materials and limited potential requirements seem to preclude developments in this field in the foreseeable future.

Present and projected fertilizer consumption

The present consumption of fertilizer nutrients in Upper Volta remains low at about 200 tons of nitrogen, 100 tons P_2O_5 and 600 tons of K_2O. The consumption of nitrogen is insignificant.

UPPER VOLTA

The projected fertilizer consumption in 1970 and 1975 as estimated by ECA is given below in tons of nutrients:

1970			1975		
N	P_2O_5	K_2O	N	P_2O_5	K_2O
500	500	500	1,500	1,500	1,500

Sources

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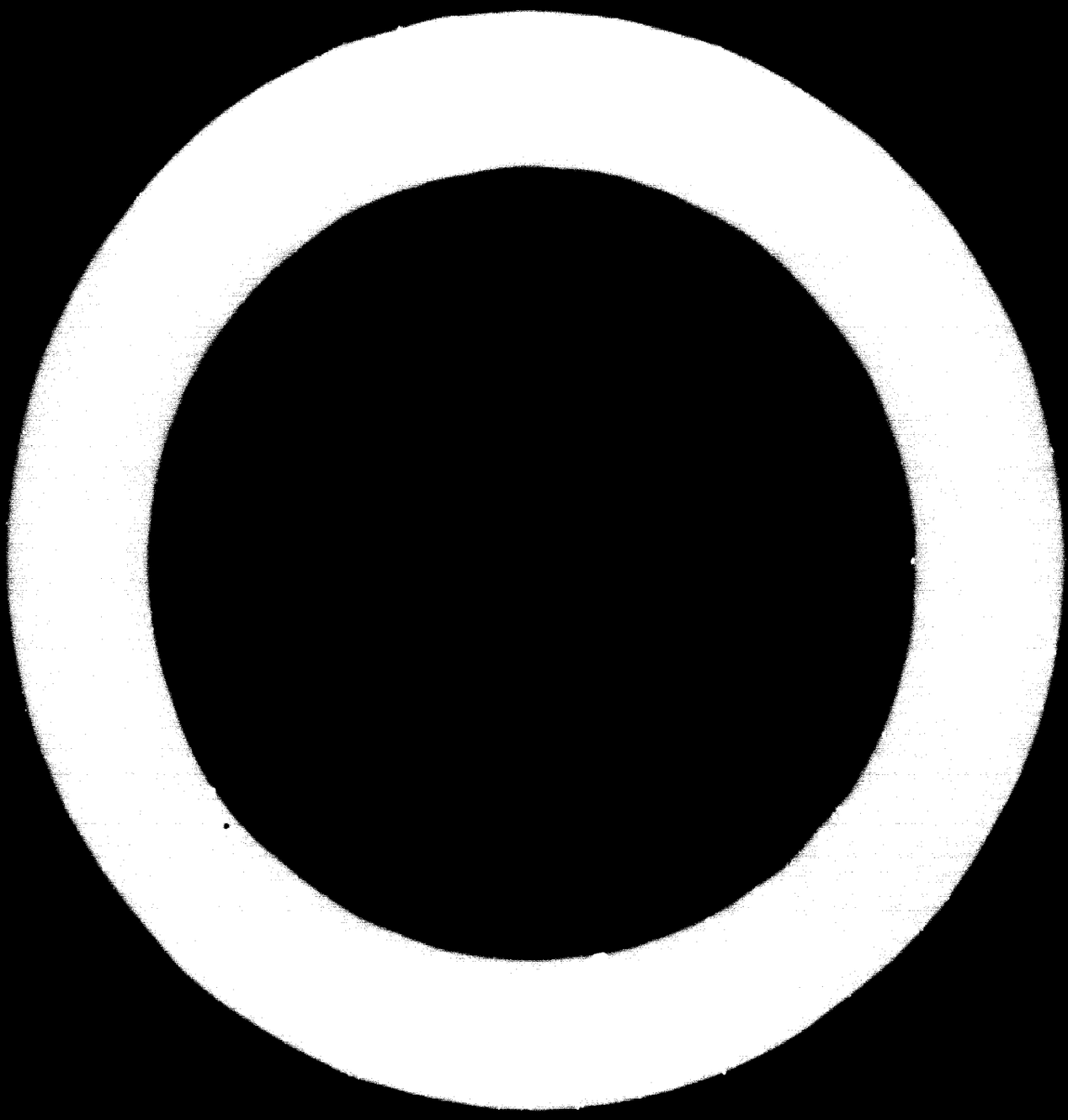

CENTRAL AFRICA

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Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	1,500	3,000	10,000	18,000
	Production	-	-	-	-
	Deficit	1,500	3,000	10,000	18,000
	Surplus	-	-	-	-
P_2O_5	Consumption	240	500	2,500	5,000
	Production	-	-	-	-
	Deficit	240	500	2,500	5,000
	Surplus	-	-	-	-
K_2O	Consumption	1,400	5,000	7,000	11,000
	Production	-	-	-	-
	Deficit	1,400	5,000	7,000	11,000
	Surplus	-	-	-	-

General

Cameroon covers an area of about 475,000 km^2, and has a population of approximately 5 million and an annual rate of growth estimated to be 2 per cent.

The economy of the country is based on agriculture, since neither the mining nor the manufacturing sectors are yet well developed.

The country is pursuing a policy of close economic co-operation with its immediate neighbours, Gabon and the People's Republic of the Congo. The Civil War in Nigeria has created problems for Cameroon, as part of its population in the former British Colony of West Cameroon are Ibos. Considerable financial aid has been received from various sources, including the European Development Fund.

Agriculture

At present 1.9 million ha are cultivated, i.e. about 4 per cent of the total area of the country, and some 95 per cent of the population are agriculturally employed, on a subsistence level. The first five-year plan (1962-1966) gave priority to the development of agriculture and to success in improving the production of crops giving the highest response to farming inputs, e.g. use of fertilizers (mainly for cotton, the

CAMEROON

arabica coffee variety and tobacco). The results obtained with other crops, i.e. rice, cocoa, palm oil and various industrial crops, were less satisfactory. The second five-year plan gives priority to the improvement of the rural economy, mainly in the traditional sector of agriculture, by increasing the cultivated areas and a more extensive use of fertilizer. However, even at present, Cameroon is by far the biggest user of fertilizers and the most important agricultural producing country in the UDEAC region.

The main crops produced in Cameroon are cereals - millet and sorghum - about 500,000 tons/year, and maize - 210,000 tons/year on 230,000 ha, the production of rice being less important. The production of bananas is approximately 110,000 tons/year from some 35,000 ha, cotton - 60,000 tons/year from 90,000 ha, cocoa - 80,000 tons/year, and coffee - 60,000 tons/year from 110,000 ha, and ground-nuts - 165,000 tons/year (undecorticated) from about 150,000 ha.

Natural resources and industry

The industry of the country is not as yet well developed. Cameroon is, however, relatively rich in mineral resources.

To date zinc and titanium ores have been mined, and deposits of tin, molybdenum, tungsten and copper ores as well as rich deposits of iron ores (silicates with 35 to 40 per cent Fe) have been found. The reserves of iron ore at Kribi are said to be extensive (150 million tons) and of high grade and are being developed for commercial exploitation. The bauxite deposits (with reserves exceeding 1 billion tons) are now being worked. Limestone is being worked in very small quantities. Natural gas has recently been discovered with reserves estimated to be 0.4 billion Nm^3. Some crude oil has apparently been recently discovered, but no figures are yet available.

Cameroon has a very modern aluminium electolytic plant, production having exceeded a level of 50,000 tons/year. This plant was built in 1957 and runs on a very cheap supply of electric power from the hydroelectric power plant at Edéa. As no local bauxite was available at the time, the plant was supplied with alumina from France and later from Guinea. Adjoining the plant is a small aluminium rolling mill.

In 1965 the first pesticides factory was opened at Duala by the Société Industrielle Chimique Africaine.

Fertilizer manufacture

Although the consumption of fertilizers in Cameroon is potentially the highest of all the countries of the UDEAC region, the anticipated level in the 1970s would be still insufficient to support a local manufacture unless interregional trade is developed.

CAMEROON

Present and projected fertilizer consumption

The consumption of fertilizers in 1966/1967 in Cameroon was about 6,300 tons of nitrogen, 700 tons of P_2O_5 and 5,000 tons of K_2O; or about 6 kg of nutrients/ha of cultivated land taken as 1.9 million ha.

The projected demand for fertilizers in 1970-1980 in tons of nutrients as estimated by SICAI and obtained recently during a visit to the country is as follows:

	1970			1973/1974			1978/1979		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
SICAI (max.)	-	-	-	12,600	3,500	6,400	23,500	6,500	11,100
SICAI (min.)	-	-	-	18,400	4,400	7,200	25,000	7,400	11,200
UNIDO	9,000	1,500	4,500	-	-	-	-	-	-

The average annual growth rate in fertilizer demand during the period 1973-1979 as estimated by SICAI is about 10 per cent for nitrogen, 12 per cent for P_2O_5 and 10 per cent for K_2O. For the purpose of this study the following approach has been used to determine the probable fertilizer consumption in 1970 and 1975:

1970 - The nitrogen and P_2O_5 consumption has been largely based on UNIDO projections and taken as 10,000 tons/year and 2,500 tons/year respectively. It has also been assumed that the K_2O consumption will grow at a rate of 10 per cent/year between 1966/1967 and 1970 resulting in a demand in 1970 of about 7,000 tons.

1975 - To determine the demand for nitrogen and P_2O_5 the arithmetic mean of the maximum and minimum projections by SICAI for 1973/1974 has been used and assumed to grow at a rate of 10 per cent/year for nitrogen and 12 per cent/year for P_2O_5. This results in a projected demand for 1975 of 18,000 tons/year of nitrogen and 5,000 tons/year of P_2O_5. The K_2O consumption has been determined on the basis of an annual rate of growth of 10 per cent resulting in a projected demand of 11,000 tons/year in 1975.

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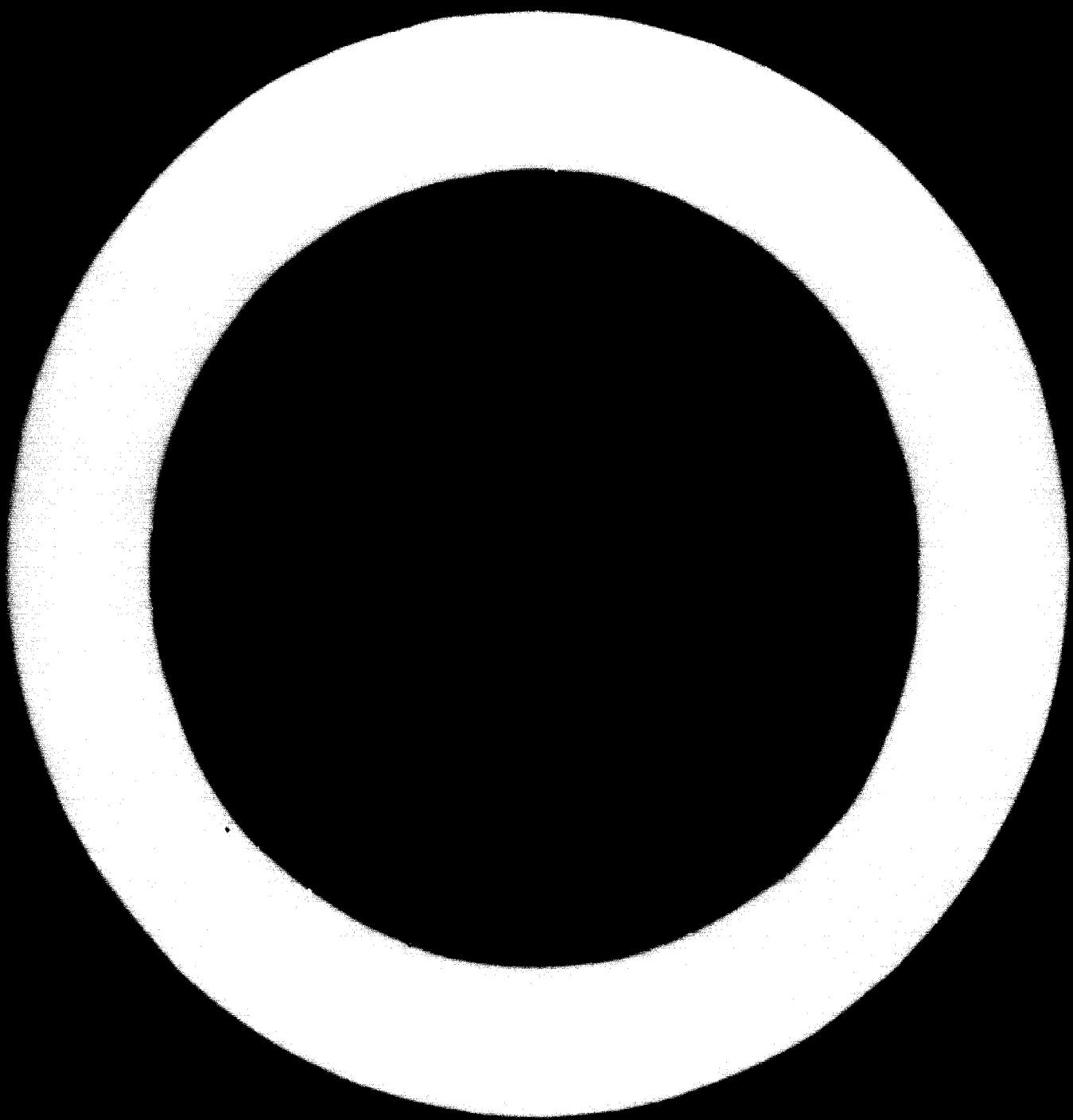

CENTRAL AFRICA

CENTRAL AFRICAN REPUBLIC

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	negl.	600	2,700	5,000
	Production	-	-	-	-
	Deficit	negl.	600	2,700	5,000
	Surplus	-	-	-	-
P_2O_5	Consumption	negl.	100	900	1,600
	Production	-	-	-	-
	Deficit	negl.	100	900	1,600
	Surplus	-	-	-	-
K_2O	Consumption	negl.	100	400	700
	Production	-	-	-	-
	Deficit	negl.	100	400	700
	Surplus	-	-	-	-

General

The Central African Republic covers an area of about 617,000 km^2 and has a population of approximately 1.25 million with a rate of growth of 1.2 per cent/year. About 90 per cent of the total population is supported by the agricultural sector of the economy.

The Central African Republic, formerly a part of French Equatorial Africa, is a landlocked country situated in the tropical zone. It is so far of little economic importance. Per capita income is estimated at about $60, and GDP about $160 million.

Agriculture

Coffee, cotton and rubber were the more important agricultural products exported in 1967, cassava and sorghum are classed as subsistence crops while other crops include maize, potatoes, ground-nuts, sesame and rice. Production of cassava is fairly stable with 250,000 tons/year, millet and sorghum - 50,000 tons/year, maize - 30,000 tons/year, seed cotton - 30,000 tons/year, ground-nuts (uncorticated) - 60,000 tons/year, sesame - 7,500 tons/year, paddy rice - 7,000 tons/year, coffee - 10,000 tons/year,

CENTRAL AFRICAN REPUBLIC

palm kernels - 1,500 tons/year, rubber - 1,000 tons/year. Exports of agricultural products in 1967 were: coffee - 9,136 tons oil seed, oil seeds - 2,277 tons, cotton - 11,998 tons as well as some cocoa, tobacco and rubber.

Natural resources and industry

The country has no reserves of crude oil or natural gas, and the demand for petroleum products is met by imports, which in 1967 amounted to 34,882 tons.

Diamonds are the only important minerals produced. Production increased substantially from 113,295 carats in 1961 to 520,628 carats in 1967. (It is hoped that production will be increased to 640,000 carats by 1970.)

In 1968 an agreement was signed with France for the exploitation of deposits of uranium estimated at 5,000 tons in the Bakouma area.

Geological research and mineral prospecting are carried out by the Commissariat à l'Energie Atomique, the Société Diamantaire and the Direction des Mines et de la Géologie.

Fertilizer manufacture

There is no fertilizer industry in the Central African Republic, and because of the low market potential and lack of known indigenous raw materials, it is unlikely that such industry will be developed in the foreseeable future.

Present and projected fertilizer consumption

The present fertilizer consumption remains very low at about 800 tons of nitrogen and 100 tons of P_2O_5 in 1966/1967. The projected demand in 1973/1974 and 1978/1979 as estimated by SICAI is given below in tons of nutrients:

	1973/1974			1978/1979		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Maximum	4,200	1,500	600	7,000	2,800	1,000
Minimum	3,300	1,200	500	6,300	2,100	1,000

CENTRAL AFRICAN REPUBLIC

Based on the above data the projected fertilizer demand in 1970 and 1975 is estimated as follows:

1970			1975		
N	P_2O_5	K_2O	N	P_2O_5	K_2O
2,700	900	400	5,000	1,600	700

Sources

Studies

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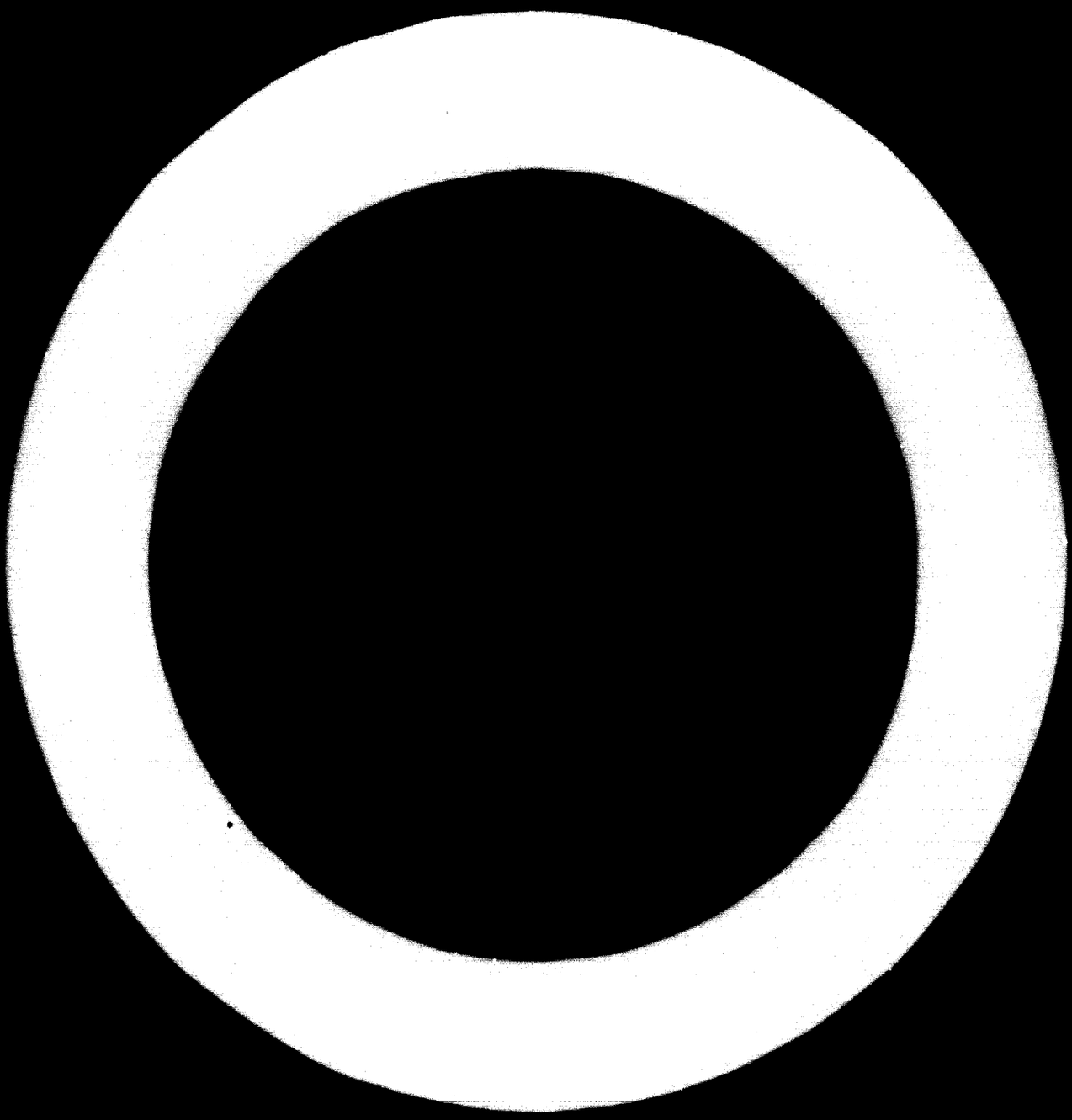

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	negl.	400	1,600	2,500
	Production	-	-	-	-
	Deficit	negl.	400	1,600	2,500
	Surplus	-	-	-	-
P_2O_5	Consumption	negl.	negl.	800	1,200
	Production	-	-	-	-
	Deficit	negl.	negl.	800	1,200
	Surplus	-	-	-	-
K_2O	Consumption	negl.	negl.	400	600
	Production	-	-	-	-
	Deficit	negl.	negl.	400	600
	Surplus	-	-	-	-

General

The Republic of Chad, formerly having been one of the four territories of French Equatorial Africa, and having gained independence in 1960, covers an area of about 1,284,000 km^2. Out of the total estimated population of the country of about 3.3 million, 2.4 million are supported by agriculture, in addition to nomadic population mainly depending on stockraising. Estimated annual rate of growth of the population is between 1.5 and 2.5 per cent. The country's per capita income is very low as compared to some other African countries with $51 to $70, and GDP in 1965 totalled about $240 million. Cotton and animal husbandry are the country's most important industries. In 1966/1967 the cotton crop was 123,000 tons unginned cotton. In 1965 cotton accounted for 91 per cent of exports and provided work for 450,000 farmers. France accounts for 30 per cent of imports and 40 per cent of exports.

Similarly to the Central African Republic the country suffers from transport difficulties. This may be somewhat alleviated in the future, especially in the southern part of the country, by the projected extension of the Trans Cameroon Railway and proposed improvements to the existing inadequate road network.

CHAD

Agriculture

The greater part of the country's area is arid and in general the lack of water is the main factor limiting agricultural production. The present agricultural practice in the country is primitive and the Government is taking vigorous steps to improve this sector of the economy through a newly established Office Nationale de Développement. It is planned to carry out a resettlement programme for the entire rural population into about 9,000 villages.

The main crops cultivated in the country are: cotton (the total area varying between 230,000 to 340,000 ha with very variable yields, depending on conditions of water supply and incidence of diseases), rice, ground-nuts (about 170,000 ha), sorghum, millet and wheat, sugar-cane and cassava. The present usage of synthetic fertilizers is extremely low; about 55 tons and 490 tons have been used in 1960 and 1965 respectively. There will be no justification for the manufacture of fertilizers to supply the local demand in the foreseeable future.

Natural resources and industry

On account of the long distance to the coast and to poor development of communications, mineral resources in the country have practically not been explored; there is therefore no basis for later development of the country's own fertilizer industry or the production of other chemical products.

In its first five-year plan for the years 1966-1970, Chad has envisaged to drill in the area north of Lake Chad where the existence of natural gas is known. (Oil exploration is also included in the plan; crude imported in 1967 was 41,887 tons.)

The only mineral resources known in the country to date, are tungsten, which is however not yet worked on a commercial scale, and crude sodium carbonate/bicarbonate. The latter is found on the banks of Lake Chad and at the mouth of the Chari river. The potential production has been assessed at 120,000 tons/year and 1966 production was only 7,887 tons. Commercial exploitation of these deposits is being studied. Development of the hydroelectric potential is also being studied (at Ganthior Falls).

Fertilizer manufacture

There is no fertilizer industry in the country and there is no justification for developing local manufacture of fertilizers in the foreseeable future.

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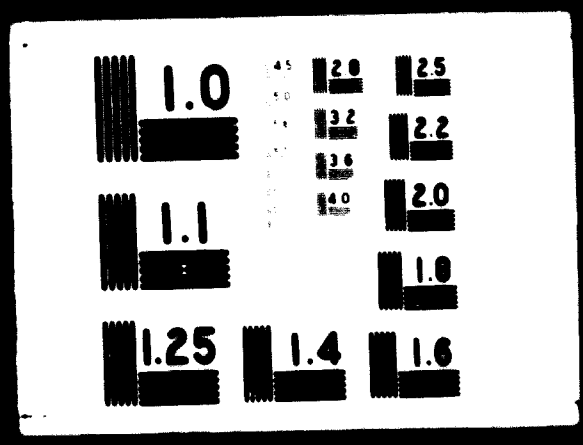

CHAD

Present and projected fertilizer consumption

The consumption of fertilizers in Chad in 1966/1967 was insignificant at about 400 tons of nitrogen and 100 tons of P_2O_5.

The projected fertilizer consumption for 1973/1974 and 1978/1979 has been estimated by SICAI as follows:

	1973/1974			1978/1979		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Maximum	2,300	1,200	600	4,000	2,100	1,000
Minimum	1,700	800	400	2,900	1,200	700
Mean	2,000	1,000	500	3,500	1,700	900

The above figures are based on an average annual rate of growth of 10 per cent for nitrogen, 10 per cent for P_2O_5 and 12 per cent for K_2O.

Based on the above data the projected fertilizer consumption for 1970 and 1975 in tons of nutrients are estimated to be:

1970			1975		
N	P_2O_5	K_2O	N	P_2O_5	K_2O
1,600	800	400	2,500	1,200	600

Sources

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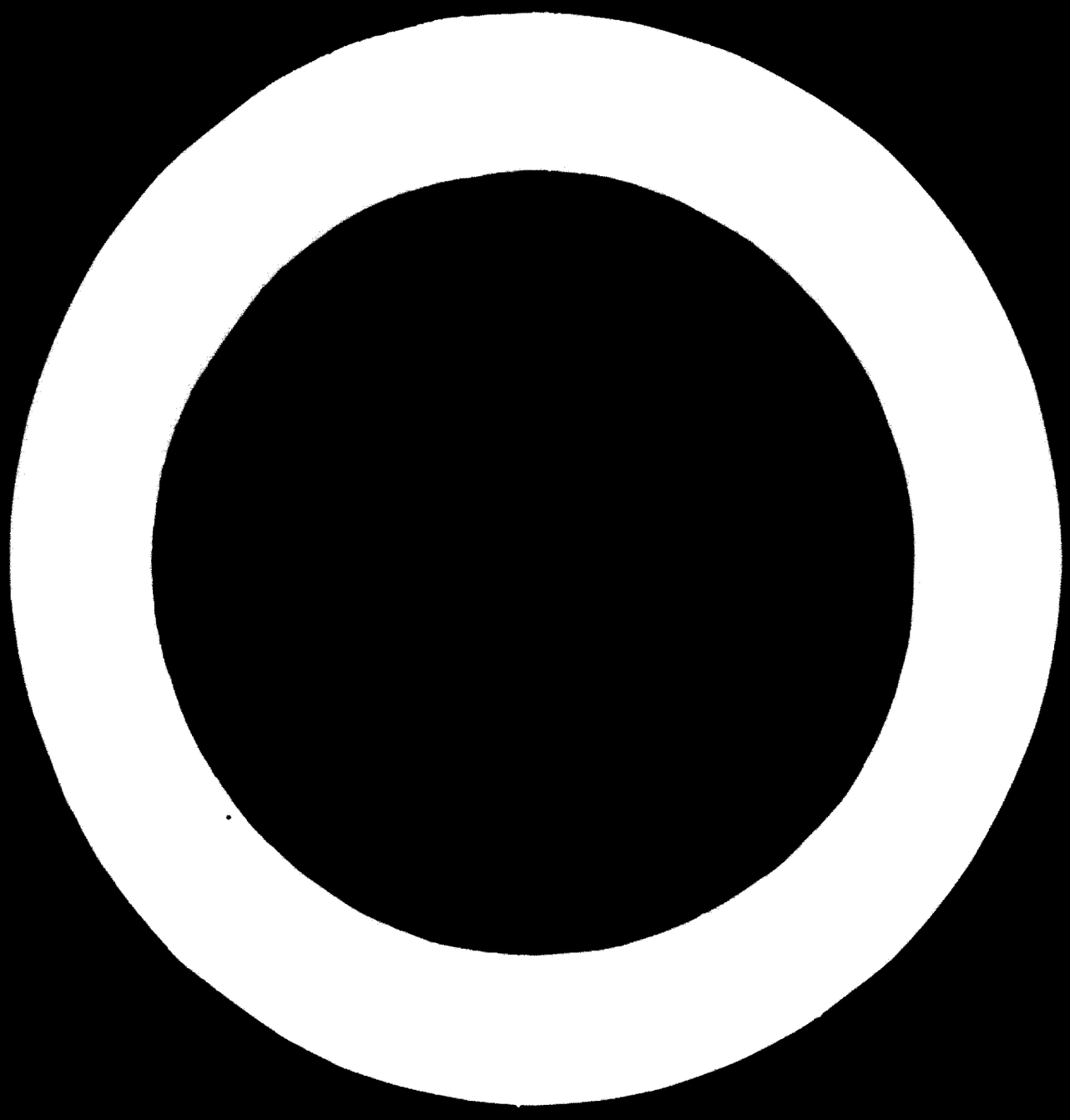

CENTRAL AFRICA

CONGO (DEMOCRATIC REPUBLIC OF)

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	500	700	5,000	19,000
	Production	-	-	-	-
	Deficit	500	700	5,000	19,000
	Surplus	-	-	-	-
P_2O_5	Consumption	200	300	2,000	5,000
	Production	-	-	-	-
	Deficit	200	300	2,000	5,000
	Surplus	-	-	-	-
K_2O	Consumption	200	400	2,000	5,000
	Production	-	-	-	-
	Deficit	200	400	2,000	5,000
	Surplus	-	-	-	-

General

The Democratic Republic of the Congo covers an area of about 2.35 million km^2, and has a population of 16.8 million (1968) with an annual rate of growth estimated at 2.5 per cent. The density of the population is about 7/km^2.

In 1966 the total GDP was estimated to be $1.3 billion and the per capita GDP was $83.6. In the same year, agriculture (providing a livelihood for over two thirds of the population) contributed about 21.5 per cent to the country's GDP, while mining contributed 15.2 per cent and commerce 16.1 per cent.

In spite of the country's great potential - the soil is very rich in minerals, and the mineral wealth of the country itself, has made it one of the leading mining countries in Africa, especially with the extensive copper, cobalt, zinc, lead, cadmium and manganese deposits, and the enormous hydroelectric power resources - the Congo is still a relatively poor country.

The country became independent from Belgium in 1960 under very difficult circumstances. Now it is moving towards greater unity and stability and it is hoped that in the current five-year period 1968-1972 the GDP may well increase at a rate of 4 to 5 per cent.

CONGO (DEMOCRATIC REPUBLIC OF)

Agriculture

Only 1 per cent of the total surface of the Democratic Republic of the Congo is devoted to field and tree crops, and another 1 per cent is permanent pasture. Forty-five per cent of the total area is covered by permanent rainforest (only a small fraction of this is being exploited). The remainder is savannah and mountains. It is believed that much more of this area could be used for agriculture and much of the area that is already being cultivated could be farmed more intensely.

Because of extensive development of mineral resources and the relative importance of secondary manufacturing, agriculture, though supporting about two thirds of the population, only contributes about one fifth of the GDP. The major exports are robusta coffee, rubber and palm products. (In 1966 these alone yielded 76 per cent of the total agricultural export earnings.)

The European sector of the community makes a substantial contribution to agriculture. It accounts for about 50 per cent of the marketed output and in terms of production accounts for almost all the sugar, virtually all of the cocoa and tea, 90 per cent of the arabica and 85 per cent of the robusta coffee, 90 per cent of the rubber, 72 per cent of the table bananas and 87 per cent of the palm oil.

In general the Congolese farmers are primarily producing subsistence crops and food crop surplus to their own requirements such as maize, rice and manioc, have been a source of considerable cash income. The crop most widely grown for cash income is cotton (especially prior to independence) and pyrethrum on a modest scale. The highest cotton output was in 1959, with 179,684 tons of seed cotton.

Due to the political trouble and rebellions, there has been a marked decline in the agricultural sector as a whole and production has only recently started to increase again. It is by now estimated that the years immediately ahead will witness a substantial revival of production, provided the improvement of the internal political situation is maintained. Estimates made available in 1968 indicate that cotton seed production in the whole Congo may exceed 45,000 tons during 1967/1968 and that the country may achieve an export of about 60,000 tons of coffee by this year. Maize and manioc are the staple starchy foods - rice is less common.

Some modest agricultural projects are being launched with the help of outside management. Two are being financed by the EDF of the Common Market; one will focus on the reactivation of two cotton and food producing co-operatives and an associated seed multiplication station in the province of Kasai Orientale, and will be managed by the Compagnie Française des Fibres Textiles; the other is a project in the Katanga province, which concentrates primarily on the production of tobacco. Also a number of smaller organizations with localized programmes are multiplying and distributing seed on a modest scale, and help to increase the production of maize, beans, peanuts and manioc. Among other potentially promising possibilities are

two relatively small livestock development schemes, a project envisaging 15,000 ha of new oil palm plantings, a rice scheme, and a further project for the development of the tea and pyrethrum production (in 1966 about 6,000 tons of fertilizer were imported).

Estimated future production and export of main food and cash crops is as follows:

	1969		1970	
	Production (tons)	Export (tons)	Production (tons)	Export (tons)
Cocoa	4,500	4,400	4,500	4,400
Coffee (robusta)	47,000	42,000	52,000	46,000
(arabica)	8,500	8,500	9,000	9,000
Tea	8,000	7,100	10,000	9,300
Rubber	38,000	34,000	40,000	36,000
Palm oil	200,000	144,000	240,000	0,000
Cotton	15,000	import 1,000	17,000	-
Rice	65,000	import 23,000	67,000	import 25,000
Maize	95,000	import 64,000	110,000	import 57,000

Natural resources and industry

Adjacent to the rich Cabinda finds, oil reserves capable of producing 500,000 tons/year are reported to have been discovered. About 60 per cent or 34 million m^3 expressed in terms of pure methane of the Lake Kivu gas may be considered as belonging to the Democratic Republic of the Congo and the rest, 23 million m^3 to Rwanda. A refinery at Moanda with a capacity of 650,000 tons/year of crude was commissioned in 1968 by the Société Congo Italienne de Raffinage.

The hydroelectric resources in the Congo are very large, estimated at about 100,000 MW, about 80 per cent of which are located in the Cataracts' region between Kinshasa and Matadi. The total installed hydroelectric capacity is estimated at about 650 MW, 80 per cent of which is in the Katanga province.

In Katanga, reserves of coking coal exist in the Luena Basin estimated at about 100 million tons, and in the Lukuga Basin (proved reserves of about 30 million tons and probable reserves estimated at about 750 million tons consisting of coal with high ash and volatiles content). Coal production from the latter deposits amounted to about 400,000 tons in 1957, decreasing to less than 100,000 tons during the 1960s.

There are indications of deposits in the Lower Congo Basin of phosphate rock, potash and pyrites, but no data are as yet available.

CONGO (DEMOCRATIC REPUBLIC OF)

Mining is concentrated on the production of industrial diamonds, the country ranking as the world's biggest producer with a number of metallic ores, the most important being copper. The copper deposits are located in Upper Katanga and consist of sulphate ores near Kipushi, which is upgraded and roasted to a 65 per cent matte in a plant with a capacity of 125,000 tons/year of matte and a mixture of sulphate, hydroxides and carbonates near Kolwesi and Kambove, where ore is upgraded by floatation and roasting. The roasted gases which could be used for production of sulphuric acid (consumed in the refining process, e.g. for the separation of cobalt) are at present wasted.

Output of copper has exceeded 300,000 tons/year in the past, but in the last few years it has slightly decreased. Production of by-products cobalt, silver, cadmium and germanium is also carried out.

Deposits of high grade iron ore (up to 65 per cent Fe) exist near Kibali-Ituri (with reserves estimated at 5 billion tons), at Kasai-Luluaba, and as two smaller deposits, one near Jadotville and the other at Kassumbalessa. Large-scale exploitation is not yet carried out. The country produces also limited quantities of cassiterite, manganese, lead, tungsten and other ores. A number of sodium salts deposits exist in Katanga, but their exploitation is very limited. Production of uranium, which was formerly very important (2,000 tons of U_3O_8 in 1960), has practically ceased because of adverse world market conditions. The country's industry is relatively undeveloped and manufacture of chemicals is directly associated with the mining industry. There are reported facilities for the production of electrolytic caustic soda and chlorine. A sulphuric acid plant exists, operated by SOGECHIM at Jadotville (Katanga) with a capacity of 130,000 tons/year of monohydrate (based on zinc sulphide ores).

Fertilizer manufacture

The Democratic Republic of the Congo does not produce fertilizers and so far the demand for fertilizers has been met by imports.

In 1966 very preliminary steps were taken, first of all to establish the manufacturing plant for the production of 200,000 tons of granulated complex fertilizers. It was assumed that in its initial stages the plant would depend on imported raw materials, i.e. liquid ammonia, phosphoric acid and potassium chloride. It was envisaged that the imported materials would be replaced in the future from local sources, as soon as the intensive prospecting work would prove the availability of potassium salts and phosphates in the Bas Congo region. It was further believed that naphtha would be available for the production of ammonia from the oil refinery constructed in the meantime by ENI. These plans did not develop further mainly because of the absence of a sufficiently developed market for fertilizers in the Democratic Republic of the Congo.

Following another study it was concluded that the production of ammonium calcium nitrate based on fuel oil (using the partial oxidation process), would be best suited. The fuel oil was chosen as raw material since there is not sufficient naphtha available from the Moande oil refinery put on stream in 1968. The production of 90,750 tons/year of ammonium calcium was proposed as technically and economically most viable. It was estimated that the investment costs would amount to about $28.7 million.

It was further believed that ammonium calcium nitrate, if produced in the Democratic Republic of the Congo, will find a market in Cameroon, the Republic of the Congo, Chad, Central African Republic and Gabon. The following nitrogen fertilizer projections were developed:

	Tons of nitrogen	
	Democratic Republic of the Congo	UDEAC countries
1974	17,870	22,500
1975	19,340	24,820
1976	20,920	27,310
1977	22,640	30,060
1978	24,500	33,045
1979	26,500	36,045

From the above-mentioned data it is apparent that if the market were limited to the Democratic Republic of the Congo only, the design capacity of the ammonium calcium nitrate plant could not be achieved before 1979 due to lack of sufficient market.

Up to now, no definite decision has been made on the advisability or otherwise, of setting up of a fertilizer manufacturing industry in the Congo and for the purpose of this study the above plans have been discounted.

Present and projected fertilizer consumption

The present consumption of fertilizers in the country is still extremely low. It has been estimated that the consumption of nitrogen in 1967/1968 was about 2,000 tons, while the corresponding figures for P_2O_5 and K_2O are not available but are believed to be even lower.

CONGO (DEMOCRATIC REPUBLIC OF)

The projected demand for nitrogen as estimated by SICAI for the years 1974 and 1979, is given below in tons of nutrients/year:

1974 - 17,870 tons
1975 - 19,340 tons
1976 - 20,920 tons
1977 - 22,640 tons
1978 - 24,500 tons
1979 - 26,500 tons

This gives an average rate of growth of demand of 8 per cent/year, which seems reasonable. However, as the consumption of nitrogen in 1968/1969 is estimated at 3,000 tons/year, it is not conceivable that the sudden increase in consumption, as assumed by SICAI, will take place within the immediate future. For the purpose of this study, therefore, it is assumed that the nitrogen, P_2O_5 and K_2O consumption in 1970 will be about 5,000 tons/year of nitrogen, 2,000 tons/year of P_2O_5 and 2,000 tons/year of K_2O. It is further assumed that by 1975 the demand for nitrogen will reach the SICAI forecast of 19,000 tons/year. It is further estimated that the corresponding consumption of P_2O_5 and K_2O will be about 5,000 tons/year of each nutrient.

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Annual consumption and production of fertilizers, 1960 to 1975

Nutrient		1960	1965	1970	1975
N	Consumption	400	500	800	1,000
	Production	-	-	-	-
	Deficit	400	500	800	1,000
	Surplus	-	-	-	-
P_2O_5	Consumption	300	500	800	1,200
	Production	-	-	-	-
	Deficit	300	500	800	1,200
	Surplus	-	-	-	-
K_2O	Consumption	400	2,000	3,000	3,500
	Production	-	-	-	
	Deficit	400	2,000	3,000	3,500
	Surplus	-	-	-	-

General

Equatorial Guinea (formerly Spanish Guinea) consists of two overseas provinces of Spain: Rio Muni and the insular provinces of Fernando Po and Annobón, covering a total area of about 28,000 km^2. The population according to a 1960 estimate was about 246,000.

The country has no agriculture or natural resources to speak of, although some wood, cocoa and coffee are grown.

In Rio Muni there are about 30 timber concessions near the Campo, Benito and Muni rivers, which are used for floating and export. Main types of wood are Okume, various mahagonies and African walnut. Central areas south and east of Bata are sometimes replanted with oil palms and sisal. Cocoa and coffee are most remunerative crops and are grown by Africans in the north-east, although there are some European-owned coffee plantations in the coastal hills. The cocoa exports amount to about 3,000 tons/year and coffee to 6,800 tons/year.

Fernando Po is the largest island rising sharply from the sea, the highest point being about 3,000 m. This and other peaks are extinct volcanic cones. There is a mountain range across the narrowest part of the island; this sector is inaccessible and virtually unused, although the hydroelectrical power potential

EQUATORIAL GUINEA

is high. The east, north and west coast lands are narrow and almost completely occupied by European-owned plantations producing cocoa up to 610 m. The African farms raise subsistence crops. Volcanic soils are rich and highly productive. Cocoa exports average about 25,000 tons/year, depending upon availability of labour, and coffee exports are about 1,250 tons/year. (The costs of production are higher than in Ghana.)

Pasture lands have been won by forest clearance - between approximately 1,200 and 1,600 m. A Spanish ranching company keeps Galicia, Swiss and Canary Island cattle around Moka in the south and the island is self-sufficient in dairy-produce, although some meat must be imported.

Plantation labour is mainly provided by immigrants, chiefly Ibos from eastern Nigeria.

Annobón is the smallest of the volcanic isles and farthest to the south-west. Much of the island is rugged and useless. The population of about 1,415 (according to 1960 estimate) are mostly fishermen. The main income is derived from export of palm kernels, copra, cocoa and coffee.

Fertilizer manufacture

There is no fertilizer manufacture in the country and there are no prospects of this situation changing in the foreseeable future.

Projected fertilizer consumption

No reliable estimates of the projected fertilizer demand during the period 1970 and 1980 are available. The consumption is, however, likely to remain insignificant for a number of years. Based on past trends of growth of demand it is estimated that in 1970 the consumption is likely to be about 800 tons of nitrogen and of P_2O_5 with about 3,000 tons of K_2O, mainly used on cash crops, and in 1975 to be about 1,000 tons of nitrogen, 1,200 tons of P_2O_5 and 3,500 tons of K_2O.

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CENTRAL AFRICA

GABON

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	negl.	negl.	150	600
	Production	-	-	-	-
	Deficit	negl.	negl.	150	600
	Surplus	-	-	-	-
P_2O_5	Consumption	negl.	negl.	60	200
	Production	-	-	-	-
	Deficit	negl.	negl.	60	200
	Surplus	-	-	-	-
K_2O	Consumption	negl.	negl.	150	400
	Production	-	-	-	-
	Deficit	negl.	negl.	150	400
	Surplus	-	-	-	-

General

Gabon covers an area of about 267,000 km^2, the total population being less than 500,000 with a very low rate of growth estimated at about 0.6 per cent/year.

The economy of the country is primarily based on the production and export from the mining and extractive sector, the main production being crude oil and manganese ore and timber. As the country is rich in other minerals, which are either being developed or have a big potential, the future of Gabon looks promising. In 1965 per capita income was between $100 and $150. Financial and technical assistance from a number of countries has been received and will continue in the foreseeable future from the United States, the World Bank, the Banque Centrale des Etats de l'Afrique Equatoriale and other sources. The main priorities are expansion of timber industry and of the mining sector and building up of the necessary infrastructure. The transport system in the country is primitive and some expenditure on improvements to the road and railway network is budgeted.

GABON

Agriculture

The agricultural potential of the country is low, and as the economy of the country is primarily concentrated on the mining and extraction sector, the available working population is insufficient to support agricultural production. The cultivation is largely in the traditional sector and the outputs and yields are very low indeed. About 50 per cent of the total area of the country is covered by forests, giving rise to an important timber production destined mainly for export (okoumé wood).

The estimated cultivated area is about 350,000 ha, i.e. approximately 1.3 per cent of the total area of the country.

The main crops are cassava (about 40,000 ha), bananas (25,000 ha), cocoa (22,300 ha), coffee (7,000 ha), palm oil (16,000 ha) and ground-nuts.

The Government in its efforts to modernize the agriculture in the country has budgeted for an increase in production by 1970 (through increased cultivated areas and better farming methods) of 23 per cent as compared with 1963. The present consumption of fertilizers is very low and it is obvious that the country will remain an importer of fertilizers for many years to come.

Natural resources

Gabon is rich in mineral resources.

Among ores uranium is important, and for some time past the country has been exporting uranium in concentrated form to France; in 1964 exports to France amounted to 1,288 tons.

Manganese deposits rank among the most valuable and the country has been exporting high-grade manganese ores since 1962 (from Pointe Noire). Proved reserves are estimated at at least 200 million tons (about 50 per cent manganese content), and production is open cast mining. The mining and transport is in the hands of Cie. Minière de l'Ogooué in which United States companies also have an interest.

Reserves of iron ore near Mékambo (860 million tons of 65 per cent ore) are being commercially developed by the Société des Mines de Fer de Mékambo.

Other potential mineral deposits have been discovered, the most important of these being phosphate rock, but no figures are as yet available. Salt, gold and diamonds have also been found.

Output of oil has steadily increased in Gabon, exceeding the 1 million ton level in 1964. Exploration began more than ten years ago and has extended to increasingly larger areas, stretching across the frontiers of the country into the People's Republic of the Congo. Reserves according to 1967 estimates

GABON

are 150 million tons and production in 1968 amounted to 4 million tons. A refinery has been constructed at Port Gentil by la Société Equatoriale de Raffinage (SER), using local crude and having a capacity of 600,000 tons/year.

Natural gas has been discovered at Gamba, Port Gentil and Anguille with the total of associated and non-associated reserves estimated to be 3 billion Nm^3 and production of associated gas averaging about 11 million Nm^3/year (1967). Part of gas production is used for electricity generation.

Fertilizer manufacture

There appears to be little scope for any appreciable consumption of fertilizers in the country in the near future, and therefore there are no serious prospects for the justification of establishing local production facilities unless regional co-operation is established.

Present and projected fertilizer consumption

The present consumption of fertilizers in Gabon is negligible (amounting to about 50 tons in 1967), and it is expected that the demand will remain very low for a number of years.

The projected demand in 1973/1974 and 1978/1979 as estimated by SICAI is given below in tons of nutrients:

	1973/1974			1978/1979		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Maximum	300	120	270	1,000	370	630
Minimum	50	4	160	250	/ 20	190

The above figures illustrate the extremely low market potential. Based on the above data and on the assumed rate of growth of demand the following projected fertilizer consumption for 1970 and 1975 has been been used for the purpose of this study:

1970			1975		
N	P_2O_5	K_2O	N	P_2O_5	K_2O
150	60	150	600	200	400

GABON

Sources

Studies

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CENTRAL AFRICA

PEOPLE'S REPUBLIC OF THE CONGO

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	...	700	1,000	1,200
	Production	-	-	-	-
	Deficit	...	700	1,000	1,200
	Surplus	...	-	-	-
P_2O_5	Consumption	...	300	400	500
	Production	-	-	-	-
	Deficit	...	300	400	500
	Surplus	-	-	-	-
K_2O	Consumption	...	-	1,000	3,000
	Production	-	-	-	500,000
	Deficit	...	-	1,000	-
	Surplus	-	-	-	497,000

General

The People's Republic of the Congo covers an area of about 343,000 km^2, and has a population of approximately 920,000 (1966), with an annual rate of growth estimated to be 2 per cent. Out of the total population about 60 per cent were agriculturally employed.

The per capita income is between $101 and $150.

Forests have partially been cleared and almost everywhere damaged. Cassava is the main subsistence crop. Two regions in particular, the valley of the Sangha and Niari are suitable for the cultivation of export products, and there are extensive plantations of cassava, peanuts, fibre plants and sugar-cane.

An agricultural post was set up to improve maize and sugar-cane crops, together with research institutes for oil and oleaginous products and for fibre plants.

In Mayombé there are large diamond and gold deposits and at Mfonati, lead ores have been discovered. Processing industries have been developed at Brazzaville and Pointe Noire. In the 1960s, a dam was planned on the Konilon which would provide 7,000 million kWh for industry, including the aluminium industry at Pointe Noire. Export products are principally wood, oils, lead, gold and cocoa. Imports are food products and tools.

PEOPLE'S REPUBLIC OF THE CONGO

Agriculture

Development in this sector of the economy is hampered by widespread individual exploitations, a limited market, and unbalanced state of commerce, financial difficulties and the inflation in prices and salaries.

The soils are poor, limiting the development of agriculture. Only 600,000 ha are arable land. Three quarters of the agricultural production is for home consumption. The main food crops are manioc, corn, sweet potatoes and peanuts. The leading cash crops (grown by moderate European plantations) are peanuts and palm kernels (most of the output is processed into oils). Rice, corn, coffee, cocoa and tobacco are also grown.

Natural resources and industry

Natural gas has been found in the Congo Basin at Pointe Indienne in 1965 with reserves estimated to be 0.4 billion Nm^3.

Hydrocarbon resources are losing their significance in the Congo; output fell from 123,000 tons in 1962 to 62,000 tons in 1966. The reason for this downward trend of production are the limited reserves at Pointe Noire which in 1967 stood at 1 million m^3 crude, according to Industries et Travaux d'Outremer, 1967.

There are also indicated reserves of phosphate rock at Pointe Indienne, estimated at 4 million tons with 52 per cent BPL.

Substantial potash deposits were discovered, extending 100 km in length and 48 km in width along the coastal sedimentary basin of the Congo, with reserves of 30 million tons of 25 per cent K_2O. In order to exploit these deposits, a syndicate was formed by Mines Domaniales de Potasse d'Alsace (MDPA), the world's leading potash producer, SPAFE, and the Bureau des Recherches Géologiques et Miniers (BRGM). Saint-Paul in the Holle region was selected as the most appropriate site, as it not only offered the richest and most easily accessible reserves but was also located in the immediate vicinity of the existing Brazzaville - Pointe Noire railroad. An extraction rate of 45 per cent is considered realistic, and on this basis the total probable ore reserves would assure operation for twenty years. The project entails the opening, equipping and operation of a new underground mine and a refinery with a capacity to produce about 830,000 tons/year of marketable potassium chloride with 60 per cent K_2O, which is equivalent to about 500,000 tons potash. It is believed that the project should be fully operational in the early 1970s.

PEOPLE'S REPUBLIC OF THE CONGO

Fertilizer manufacture

The People's Republic of the Congo produces no fertilizers, and apart from the production of potassium chloride the position is unlikely to change in the near future.

Present and projected fertilizer consumption

The present consumption of fertilizers remains very low. The projected demand as estimated by SICAI for 1973/1974 and 1978/1979 is given below in tons of nutrients:

	1973/1974			1978/1979		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Maximum	1,200	200	3,600	1,500	500	4,000
Minimum	1,000	negl.	3,500	1,100	negl.	3,800

The relatively high consumption of K_2O is due to the requirements in sugar-cane cultivation and to the probable stimulation of the local market by the future indigenous production of potash.

Based on the above data the projected consumption of fertilizers in 1970 and 1975 has been estimated as follows:

1970			1975		
N	P_2O_5	K_2O	N	P_2O_5	K_2O
1,000	400	1,000	1,200	500	3,000

Sources

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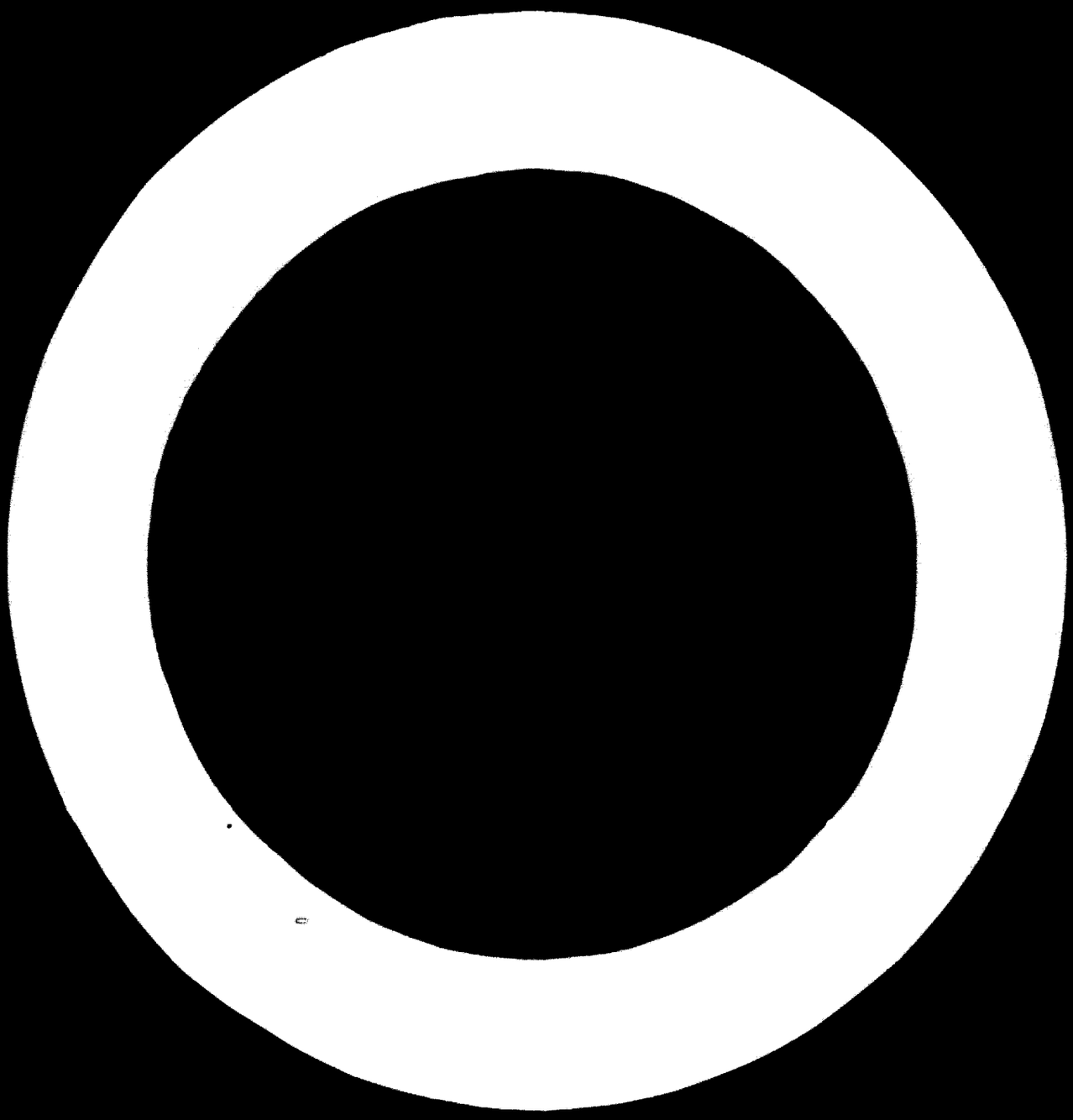

EAST AFRICA

BURUNDI

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	negl.	negl.	2,400	2,800
	Production	-	-	-	-
	Deficit	negl.	negl.	2,400	2,800
	Surplus	-	-	-	-
P_2O_5	Consumption	negl.	negl.	1,100	2,200
	Production	-	-	-	-
	Deficit	negl.	negl.	1,100	2,200
	Surplus	-	-	-	-
K_2O	Consumption	negl.	negl.	1,000	1,500
	Production	-	-	-	-
	Deficit	negl.	negl.	1,000	1,500
	Surplus	-	-	-	-

General

The country covers an area of about 27,800 km^2 and has a population of approximately 3.3 million, with a density of population of as many as 330/km^2 in some agricultural areas.

Burundi originally formed part of the Belgian Trust Territory of Rwanda-Burundi, and became independent in 1962, leaving the economic union with Rwanda and the Democratic Republic of the Congo in 1964. This has put the economy of the country in difficulties slowing down the growth of industry.

The GDP at current market prices in 1965 was about $155 million. The country's economy is based on agriculture, about 80 per cent of the population deriving their livelihood from this sector. About 75 per cent of the agricultural production consists of subsistence crops. Eighty per cent of the country's exports consist of coffee, cotton-seed accounting for another 8 to 10 per cent. The remainder of the exports are mainly cassiterite (tin oxide) and basnaesite and a little gold.

Agriculture

About 600,000 ha are at present cultivated under food crops (principally maize, cassava and pulses), about 100,000 ha are under coffee (mainly arabica). The Government is planning ultimate expansion of the cash crop production, concentrating mainly on the cultivation of coffee.

BURUNDI

Agricultural production in tons in 1967 was as follows:

	Production (tons)	Exports (tons)
Coffee (arabica)	17,899	17,899
(robusta)	938	
Seed cotton	7,945	2,283
Ground-nuts	4,200	
Sorghum	127,400	
Maize	109,700	
Wheat	8,200	
Rice	2,000	
Manioc	849,000	
Bananas	1,278,600	

Natural resources and industry

The main products of the extractive industry in Burundi are tin oxide ore, bastnaesite and some alluvial gold (some geological exploration is currently being carried out). In 1966 the production of cassiterite was 50 tons, of tastnaesite 200 tons and of gold 35 kg.

Fertilizer manufacture

At present there is no manufacture of fertilizers in Burundi and there appears to be very little scope for this activity in the foreseeable future.

Present and projected fertilizer consumption

The present consumption of fertilizers in Burundi remains negligible. Estimates of the projected fertilizer consumption for the period up to 1980 have been carried out in the past by a number of sources including ECA and recently UNIDO based on a fertilizer market study of the East African Region. These estimates are shown below in tons of nutrients:

	1970			1975		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	2,400	1,100	...	2,800	2,200	...
UNIDO	2,400	1,100	...	2,800	1,500	...

BURUNDI

For the purpose of this study the projected consumption of K_2O has been taken as 1,000 tons/year in 1970 and 1,500 tons/year in 1975. This is broadly in agreement with agronomic recommendations for the main crops grown in Burundi.

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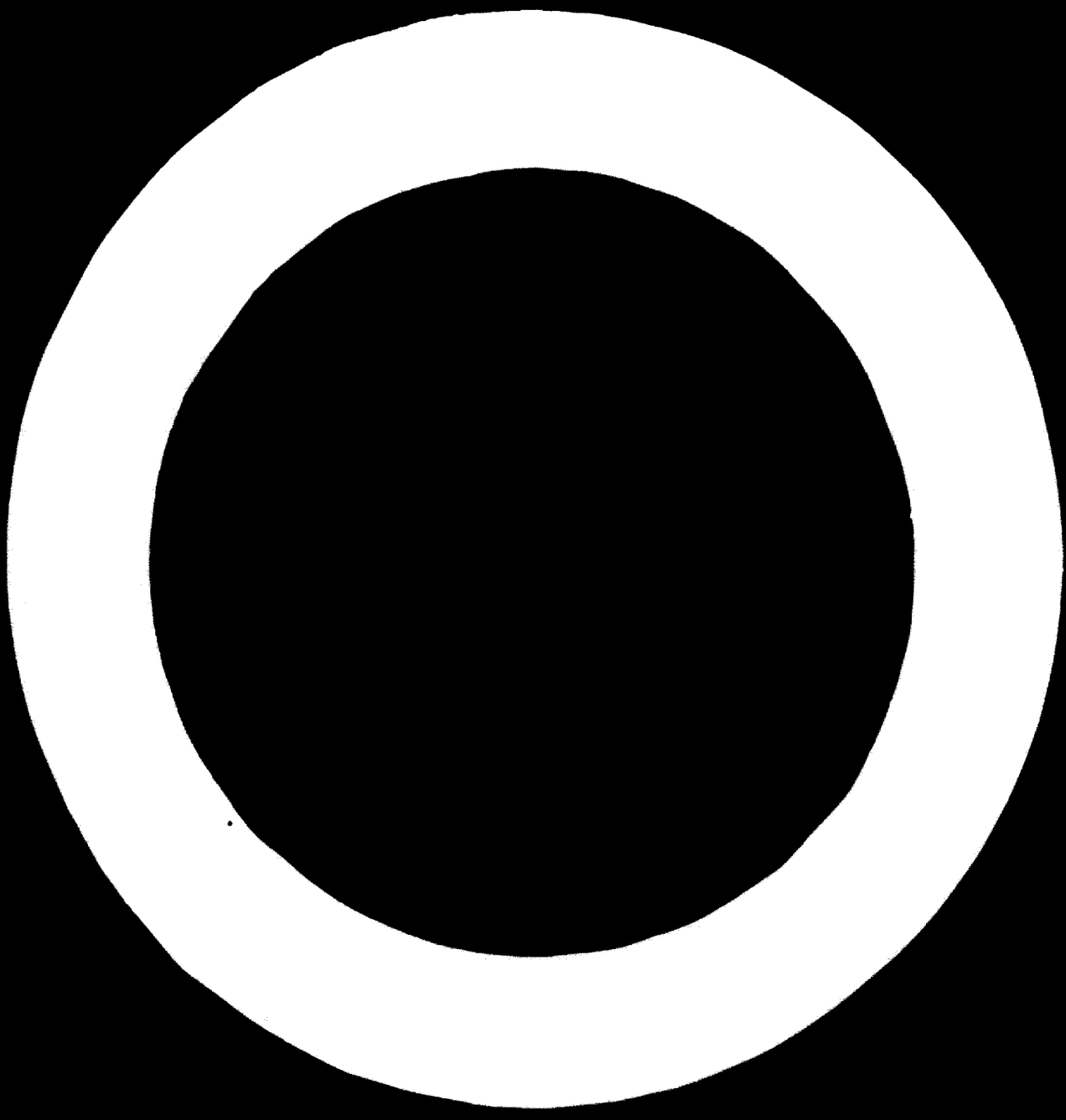

EAST AFRICA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	negl.	600	1,400	4,100
	Production	-	-	-	-
	Deficit	negl.	600	1,400	4,100
	Surplus	-	-	-	-
P_2O_5	Consumption	negl.	negl.	800	1,500
	Production	-	-	-	-
	Deficit	negl.	negl.	800	1,500
	Surplus	-	-	-	-
K_2O	Consumption	negl.	negl.	500	2,000
	Production	-	-	-	380,000
	Deficit	negl.	negl.	500	-
	Surplus	-	-	-	378,000

General

Ethiopia covers an area of about 1.16 million km^2, and has a population of about 22 million, out of which about 6 per cent are urban dwellers; the annual rate of growth is estimated to be 1.6 per cent.

The country can be divided into four distinct regions with different climates, vegetation and modes of living. At the highest altitudes stock raising is the major activity, while cultivation of cereals and sugar-cane is also possible. In the eastern part of the region cotton, and in certain areas coffee, is produced, and in the southern parts of the country with their tropical climate grains, pulses, fruits and vegetables are grown.

The economy is basically agricultural, about 90 per cent of the population being supported by this sector. Agriculture contributes about 60 per cent of the GDP as compared with about 3 per cent for the manufacturing industry. Animal husbandry is an important part of the agricultural sector, contributing 20 to 25 per cent of the total income derived from this sector. The GDP of current factor cost in 1966 was estimated at about $1,400 million (a 24 per cent increase since 1962).

The development of agriculture was given priority during the first and second five-year plans. The third five-year plan was expected to come into operation in 1969, providing for increased expenditure on

ETHIOPIA

development. One of the main difficulties, counting the expansion of the economy of the country and especially agricultural production, is the lack of adequate transport facilities. For example, it is estimated that about 80 per cent of the villages representing a proportionate share of the population have no road access to the outside world. The World Bank, the International Development Association and Sweden have recently agreed to lend Ethiopia about $27 million for the development of highways. In addition to development finance from the World Bank, the country has received financial assistance from the Federal Republic of Germany, the United States, the USSR, Yugoslavia and other countries.

Agriculture

Approximately 60 per cent of the total area of the country is classified as agricultural land: less than 22 per cent, however (of which about 14 million ha) is cultivated, the remainder (51 million ha) being pastures and natural meadows. It is estimated that about 30 per cent of the pasture land could be cropped. Only an estimated 15 per cent of all the agricultural produce is marketed, since the agriculture very largely consists of subsistence farming.

About 75 per cent of the cultivated arable land in the country is used for the production of cereal grains, grown mainly for human consumption. The total grain production in 1966 amounted to about 5 million tons, of which the principal cereals accounted for: teff (the principal bread crop) 2 million tons, sorghum 1.2 million tons, barley 0.8 million tons, maize 0.8 million tons, and wheat 0.2 million tons. (Harvests show, however, great fluctuations from year to year due to the effect of droughts and plant disease, and because of this Ethiopia is at present a net importer of wheat.) Pulses represent another important food crop, accounting for about 760,000 ha, and producing approximately 550,000 tons of produce. (Part of this is exported, about 50,000 to 60,000 tons/year.)

Coffee is the most important export crop, its production, as a normally peasant crop, with a low yield per ha believed to be of the order of 400,000 tons/year. Exports of coffee were varying between 60,000 and 75,000 tons/year during the last few years, accounting for about 60 per cent of total value of exports. In terms of value, oil seeds ran second among the country's exports, earning about 10 to 13 per cent of the total value of exports. The principal oil seeds grown in Ethiopia are noug, linseed, sunflower and cottonseed. The total production of oilseeds in 1964 was about 370,000 tons, exports in 1964-1966 being of the order of 60,000 to 70,000 tons/year. Other crops grown in Ethiopia are cotton, sugar-cane, tobacco, vegetables and fruits. The value of the country's forest resources has been recognized only recently.

ETHIOPIA

Natural resources and industry

Until recently the exploration of the mineral resources has been very limited. The country has a considerable potential, and several ore deposits have already been discovered and are either being exploited or developed.

The most important finds were reserves of potash (as sylvanite, near Dallel), and other saline deposits in the Danakil Depression. The reserves are believed to exceed 60 million tons of 25 per cent K_2O ore and commercial development by the Ralph M. Parsons Co., United States, including the construction of port facilities on the Red Sea ore, is planned. The present status of the project is uncertain, but full-scale production at a rate of up to 900,000 tons of potassium chloride/year was planned to start during the next few years and be expanded later. Other deposits of potash and sulphur have been found in the Awash Basin. Gold is being produced from Adola and Adolso River deposits, the total production being about 650 kg in 1965.

Salt is being produced at Eritrea, both from natural deposits and evaporation of sea-water at Massawa and Kassab, and a total output of 250,000 tons/year is hoped to be reached shortly. Substantial deposits of iron ore and copper and smaller deposits of lignite, lead, platinum, chromium, cobalt, manganese, graphite and asbestos have been found, but are as yet undeveloped. An extensive exploitation work for crude oil produced some finds but as yet not in commercial quantities. A petroleum refinery with an annual capacity of 500,000 tons/year of crude, far in excess of the country's present market, has been built in 1967 with the assistance from the USSR at Kassab on the Red Sea.

The industrial sector is still in its infancy and is dominated by the food and beverage industry. One hundred thousand tons/year of limestone are being mined.

Fertilizer manufacture

There is no fertilizer manufacturing industry in Ethiopia at present and as far as can be judged from the projected demand for fertilizers, there will be no case for the setting up of such an industry for a number of years to come. Ethiopia should shortly become an important producer of potash for export and this may to a limited extent stimulate the local market.

It has been assumed for the purpose of this study that by 1975 the present problems relating to the establishing of a potash mining and beneficiation industry in Ethiopia will be solved and that the plant will be operating at 70 per cent of its rated capacity of 900,000 tons/year of potassium chloride, i.e. producing the equivalent of about 380,000 tons/year of K_2O.

ETHIOPIA

Present and projected fertilizer consumption

The present consumption of fertilizers in Ethiopia is still extremely low at an average of less than 1 kg of nutrients/ha of cropped land.

A number of estimates of projected fertilizer consumption during the period up to 1980 have been carried out in the past. The projections prepared by ECA and as the result of a recent UNIDO mission to Ethiopia are shown below in tons of nutrients:

	1970			1975			1980		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	2,100	600	...	-	-	-	15,000	4,500	...
UNIDO	1,400	800	...	4,100	1,500	...	-	-	-
Adopted projections	1,400	800	500	4,100	1,500	2,000	-	-	-

For the purpose of this study the UNIDO projections, based on a recent study of the conditions in Ethiopia, have been adopted. The K_2O consumption has been estimated based on agronomic recommendations available and on the assumption that the local production of potash will begin to stimulate the local market.

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EAST AFRICA

FRENCH TERRITORY OF AFARS AND ISSAS

General

The French Territory of Afars and Issas is situated on the East African coast, covering an area of about 23,000 km^2. The population was estimated at 108,000 (1966), including about 55,000 Somalis and some 7,000 Europeans. The annual rate of growth of the population is estimated to be 2.5 per cent.

The Afar and the Somali, the country's two major groups are essentially a pastoral and nomadic people. The territory's main economic asset is the free port of Djibouti. In the mid 1960s this port was entered by more than 2,000 vessels annually. This port serves the Ethiopian hinterland to which it is connected by rail.

The chief imports are cotton goods, sugar, cement, flour and benzene; the chief exports being hides, cattle and coffee.

Agriculture

This sector of the economy is of minor importance, and is restricted to subsistence agriculture, but the output is not sufficient to meet the country's requirements. Livestock is fairly important, the estimated figures being: 25,000 camels, 700,000 sheep and goats and some 78,000 cattle.

Natural resources and industry

The only mineral exploited so far, and of commercial value is marine salt, of which some 6,500 tons are exported annually. Gypsum, mica, amethyst and sulphur are supposed to exist, but so far research has not been fruitful.

Fertilizer manufacture

There is no fertilizer industry in the country and data on consumption of fertilizers are not available.

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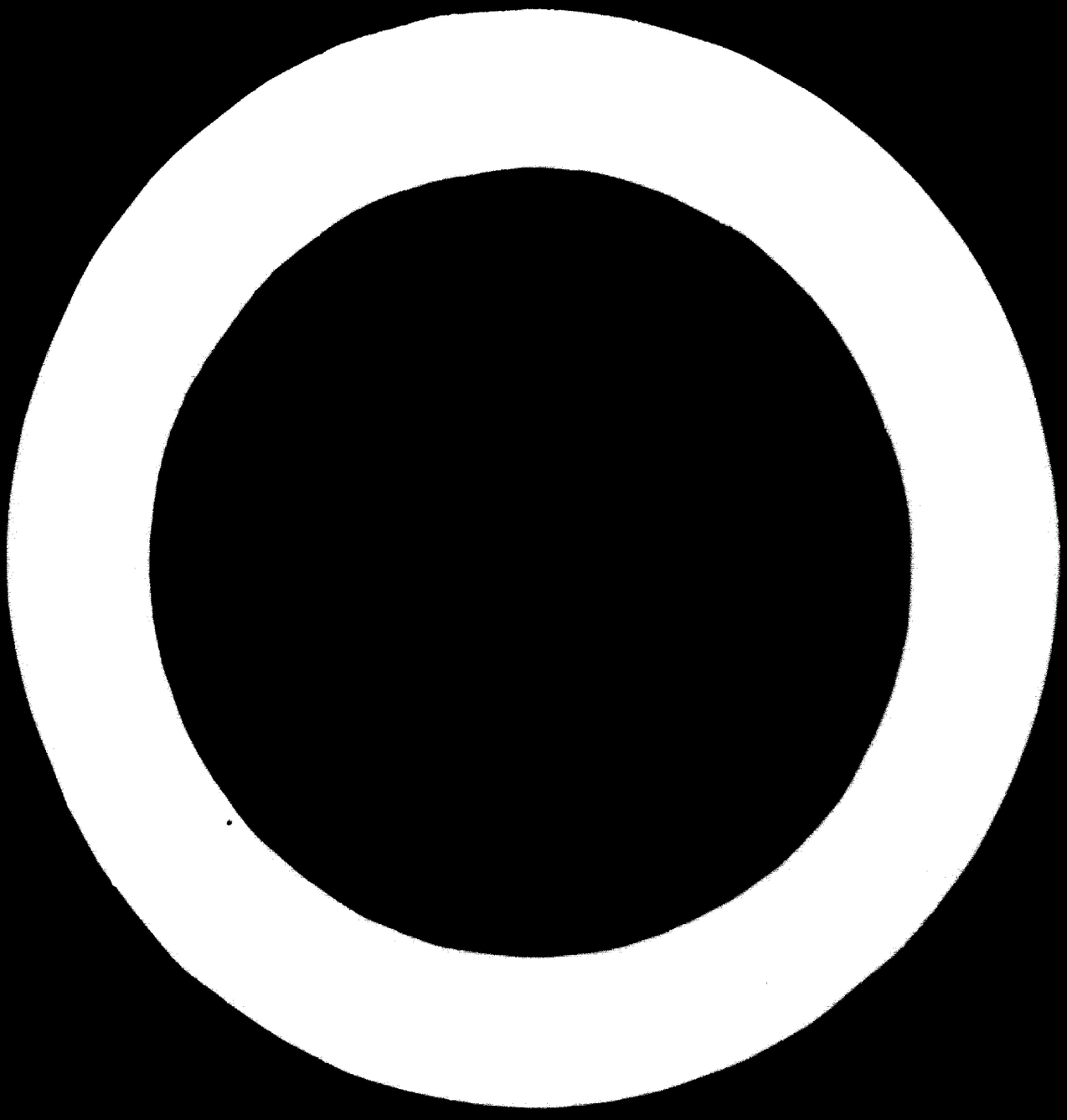

EAST AFRICA

KENYA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	2,628	13,000	18,000	23,000
	Production	-	-	-	-
	Deficit	2,628	13,000	18,000	23,000
	Surplus	-	-	-	-
P_2O_5	Consumption	6,087	10,200	18,500	25,000
	Production	-	-	1,000	1,000
	Deficit	6,087	10,200	17,500	24,000
	Surplus	-	-	-	-
K_2O	Consumption	1,131	800	9,000	12,000
	Production	-	-	-	-
	Deficit	1,131	800	9,000	12,000
	Surplus	-	-	-	-

General

Kenya covers an area of about 579,000 km^2 of which nearly 566,000 km^2 is land and little over 12,000 km^2 is water. The population of the country is estimated at 9.8 million with a rate of growth of about 3 per cent/year.

Prosperity of East African countries is primarily dependent on exports to industrial consuming countries in Europe and the United States, of such crops as coffee, cotton, tea, pyrethrum etc. The total GDP in 1967 at current factor cost amounted to about $1,100 million, and per capita income was about $100. In recent years agriculture accounted for 40 per cent of GDP and manufacturing for 9.4 per cent.

Rapid expansion in some sectors, particularly manufacture and tourism, makes Kenya less dependent upon agriculture than are her common market partners, and her agriculture is also more diversified. The latter fact is due principally to the favourable climatic and soil conditions, which enable a wide variety of tropical, semi-tropical and temperate crops to be produced.

KENYA

Agriculture

Of the total land area only 6.7 million ha, i.e. 11.9 per cent is considered to have high potential for agriculture. About 75 per cent of the area is mostly arid desert, the contribution of which to the economy is very limited. Some areas suffer from considerable overcrowding and are also desperately short of arable land and yet there is a substantial amount of high potential land, which is unutilized in other parts of the country.

The high potential farm lands with adequate rainfall and good soils are situated principally in the highlands and in a narrow belt near the coast. Here maize, pineapples, arabica, pyrethrum, wheat and tea are grown. At lower levels sugar, cotton, maize and other food crops are grown; the conditions along the coast are suitable for coconuts, sugar, cashew, cotton, mangoes, cassava and yams.

The production of main cash crops in 1967 and the estimated figures for 1970, as included in the current 1966-1970 Development Plan are shown below:

	1967 (tons)	1970 (tons)
Coffee	47,000	70,000
Pineapples	20,000	42,000
Cashew	14,000	11,900
Pyrethrum	14,000	12,500
Sisal	51,000	65,000
Sugar cane	000,000	1,500,000
Cotton	22,000 bales	95,000 bales

Natural resources and industry

Mining has so far been of minor importance. Copper ore deposits were found, but they are mined only on a negligible scale. Gypsum is being mined in the north, production being about 20,000 tons/year (used in a local cement factory). Small deposits of asbestos and graphite also occur. There have been indications of sulphur deposits, but investigations have so far not resulted in significant discoveries. The production of gold has dropped from an annual average of about 12,000 oz. during the period 1964 to 1966, to somewhat less. Silver has dropped from 47,700 oz. in 1964 to 19,000 oz. in 1966, and no more recent figures are available. Diatomite is of importance, and a South African mining company is working on the exploitation of extensive pyrochlore deposits estimated at 30 million tons of thorium-containing monazite sands. Natural soda ash is mined at the Magadi soda lake (mine in operation since 1924), annual exports

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ranging from 100,000 to 150,000 tons/year. Other raw materials of possible importance to a future chemical industry of the country is salt, also present in Magadi lake - present production being about 70,000 tons/year.

The first petroleum refinery, situated in the port area of Mombasa, started operation in 1964 and has a capacity of 1.5 million tons/year using crude supplied from the Persian Gulf. Oil explorations carried out in the country have so far shown no positive results.

Fertilizer manufacture

There are two fertilizer plants in Kenya; one is a bulk blending plant at Nukuru operated by Windmill Fertilizers with unspecified capacity. The other is a sodium phosphate plant at Turbo operated by the East African Fertilizer Co. Ltd. The capacity of the plant is about 4,000 tons/year of phosphate (24 per cent P_2O_5) using Sukulu phosphate rock and alkali salts from the Magadi Lake. The product is used mainly for the cultivation of cereals (wheat and maize).

Plans for a fertilizer plant at Mombasa, to be operated by Triangle Fertilizer Co., are now in abeyance. The plant was to produce 27 per cent N calcium ammonium nitrate with a rated capacity of 110,000 tons/year.

Kenya is the world's largest producer of the natural insecticide pyrethrum (annual production of dried pyrethrum flowers is about 10,000 tons).

Present and projected fertilizer consumption

The consumption of fertilizers in Kenya in 1966/1967 was about 13,000 tons of nitrogen, 13,000 tons of P_2O_5 and 1,000 tons of K_2O, corresponding to an average of about 9 kg of nutrients/ha of cropped land taken as about 3 million ha.

Several estimates of the projected fertilizer consumption for the period up to 1980 have been carried out in the past. The projections prepared by ECA, UNIDO (as the result of a recent mission to East Africa), by FAO and by ICI are given below in tons of nutrients:

	1970			1975			1980		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	13,600	8,000	...	-	-	-	26,800	19,000	...
FAO	-	-	-	14,300	11,200	6,300	-	-	-
ICI	-	18,500	-	-	25,000	-	-	-	-
UNIDO	18,000	10,000	...	23,000	15,000	...	-	-	-

KENYA

For the purpose of this study the following projected fertilizer consumptions were used:

(a) Nitrogen demand in 1970 and 1975 as projected recently by UNIDO;

(b) P_2O_5 demand as projected by ICI since the other projections appear to be far too pessimistic. (The 1970 projected demand was exceeded in 1966/1967;

(c) The K_2O demand based on the P:K ratio of about 0.5 estimated by FAO for 1975, i.e. equal to about 9,000 tons/year by 1970 and 12,000 tons by 1975.

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EAST AFRICA

MADAGASCAR

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	800	2,300	6,600	11,600
	Production	-	150	150	42,000
	Deficit	800	2,150	6,450	-
	Surplus	-	-	-	30,400
P_2O_5	Consumption	300	1,500	7,200	12,100
	Production	-	900	900	900
	Deficit	300	600	6,300	11,200
	Surplus	-	-	-	-
K_2O	Consumption	700	1,200	3,200	5,800
	Production	-	-	-	-
	Deficit	700	1,200	3,200	5,800
	Surplus	-	-	-	-

General

Madagascar covers an area of about 590,000 km^2, and has a population of 6.5 million, out of which about 90 per cent are active in agriculture. The annual rate of growth is estimated at 2.6 per cent. The country's GDP at market prices in 1966 came to $700 million, to which agriculture contributed 35 per cent, mining and manufacture 10 per cent, and services 55 per cent. In the same year the rate of growth of GDP was 5 per cent and the per capita income was $112.5/year.

Since Independence in 1958, Madagascar has continued to maintain close ties with France, which imports over 50 per cent of the Malagasy exports. It is also an associated member of the EEC and OCAM and receives substantial amounts of financial assistance from the European Development Fund.

Agriculture

The Government is taking serious measures to achieve 3 per cent annual increase of the value added to GDP by the agricultural sector in the five years from 1966-1971, since output has been very low in the past few years due to poor weather in the 1960s and a very severe cyclone in 1965. The principal target is to step up paddy production by 400,000 tons at the 1971/1972 harvest, i.e. an increase of about

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30 per cent over average production in recent years. It is expected that such a programme will cost almost $42 million and is being financed with the help of French and EEC aid. The output should be raised by bringing new land under cultivation and by an improvement in productivity in existing cultivated areas mainly by promotion of fertilizer use. If the paddy production target is met by 1971/1972, there will be enough paddy to meet the population growth, and about 20,000 to 25,000 tons of high-grade rice varieties for export. Similar efforts are devoted to the output increase of other subsistence crops (mainly cassava, corn and sweet potatoes), which has to follow the population rate of growth.

The main cash crops are sugar-cane and ground-nuts, which are cultivated for both domestic and export markets. The cultivation of sugar-cane in the future will be almost confined to the supply of local demand. Production of ground-nuts is expected to grow for export and to be converted into edible oil for local consumption. The main cash crops grown primarily for export are coffee, vanilla, cloves, pepper, sisal, tobacco, bananas and cocoa.

Coffee exports account for 30 per cent of all merchandise exports, and if not for substantial decrease of world prices, they would be expected to reach 51,000 tons/year in 1971 totalling nearly $32 million, within the frame of Madagascar's long-term quota under the International Coffee Agreement.

Madagascar, as the world's largest supplier of vanilla, succeeded in entering into agreements with the principal importers from the United States, which stabilized the fluctuating prices in the past. If these arrangements continue, about $8.4 million/year could be earned in the near future.

Growing of bananas, which developed recently has risen rapidly and is expected to maintain its present high level. Growing of cocoa has good prospects due to the excellent quality of this crop and its export is limited by the production potential only.

Future difficulties to keep earnings from sugar exports are due to market problems and not to production possibilities. The first blow came when in 1965 France took half of the sugar quantities purchased in earlier years. Excessive piled stocks had to be marketed below the cost of production. Whatever is the result of obtaining sugar export quota with EEC, it cannot be assumed that more than 35,000 tons could be exported in 1971.

As further foreign exchange earners tobacco, cloves, oil of cloves, pepper, cassava and tapioca, raffia and beans can be mentioned.

Cotton is gaining importance, which, after supplying the local textile industry, may be available for export.

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The Government is further striving for increased output of livestock products, which accounts for about 20 per cent of value added by the agricultural sector to the GDP and is considered as a potential foreign exchange earner. Planned targets in this sector are aimed at improvements of pasturage, cattle breeding and construction of government owned slaughter-houses.

In 1967/1968 production of main crops was as follows:

	Tons
Rice	1,560,000
Coffee	55,500
Ground-nuts	30,000
Seed cotton	13,000
Sisal	20,000
Sugar-cane	1,000,000
Cloves	10,000

Total grain production in 1965 was estimated at about 1,369,000 tons.

In 1967 the production of cash crops mainly grown for export was:

	Tons
Coffee	49,900
Sugar	76,700
Vanilla	670
Raffia	7,230
Cloves	5,260
Pepper	1,450
Sisal fibre	20,200
Tobacco	2,190

Natural resources and industry

Madagascar is rich in minerals. In 1967, 16,500 tons of graphite and 738 tons of mica were produced. Chrome ore deposits are thought to be very considerable, although reliable information is still not available (mining of 100,000 tons/year of ore is projected). Important deposits of ilmenite have been found, and an annual production of 1,200 tons of monazite, 1,500 tons of zirconium and 20,000 tons of ilmenite are provisionally planned.

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In 1968 prospecting rights of oil were granted to an international company and a prospecting agreement for bauxite was signed with another company. The petroleum refinery at Tamatave came on stream in 1966, using imported crude and having an estimated capacity of 500,000 tons/year.

Deposits of coal and lignite are indicated at Sakoa and Sambania. The reserves of coal are 60 million tons with a production of 2,000 tons/year (1966/1967), reserves of lignite being 18 million tons.

Fertilizer manufacture

Madagascar has only one relatively small fertilizer plant owned by Sté. Rochimax and manufacturing bone phosphate. The volume of the manufacture is limited by the supply of bones which may increase as soon as recently planned slaughter-houses are constructed. At present 6,000 tons/year of bones are treated, yielding about 3,600 tons/year of finely ground, bagged bone-meal containing 25 to 28 per cent P_2O_5 and 4.5 per cent N. Due to relatively high price of bones, the price of bone-meal loco factory at Tannarive exceeds the c.i.f. price of imported phosphatic fertilizers with similar or better P_2O_5 content.

Manufacture of bone-meal will soon be complemented by the production of mixed fertilizers. A separate company was instituted, called 'Madagascar Engrais' with a capital of FMG5 million, located at Svanicrona near Tannarive. Principal shareholders of this company are the following:

SEPCM (Société d'Engrais et de Produits Chimiques de Madagascar);

PROCHIMAD (Produits Chimiques de Madagascar);

COMOI (Comptoir de Commercialisation et de Représentation de l'Océan Indien);

SNI (Société Nationale d'Investissement).

The initial envisaged manufacturing capacity is about 3,000 tons/year of blended NPK fertilizers. In addition there are plans in the country to produce urea to be used mainly for rice cultivation. This includes construction of a 225 tons/day based on imported hydrocarbon feedstocks for ammonia and a 240 tons/day urea plant. The total capacity of such a complex would be equivalent to about 46,000 tons/year of nitrogen as urea and 14,000 tons/year of nitrogen as excess ammonia. Because of the limited domestic market potential a high proportion of the output will have to be exported.

There is also another project to build a fertilizer plant, with production based on sulphur-containing coal deposits.

For the purpose of this study it has been assumed that in 1970 the bone-meal plant will be operating at the present rate of about 3,600 tons of product, equivalent to 900 tons/year of P_2O_5 and 150 tons/year of nitrogen.

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By 1975 it is assumed in addition that the ammonia and urea plants are in operation at 70 per cent of their rated capacity. The output of the Madagascar Engrais blending plant has been neglected since it will be based on purchase of intermediate products.

Present and projected fertilizer consumption

The consumption of fertilizers in 1966/1967 was about 2,500 tons of nitrogen, 2,000 tons of P_2O_5 and 1,800 tons of K_2O.

The projected fertilizer consumption in tons of nutrients, based on the findings of a recent mission to Madagascar, which have been adopted for the purpose of this study, is as follows:

1970			1975		
N	P_2O_5	K_2O	N	P_2O_5	K_2O
6,000	7,200	3,200	11,000	12,100	5,800

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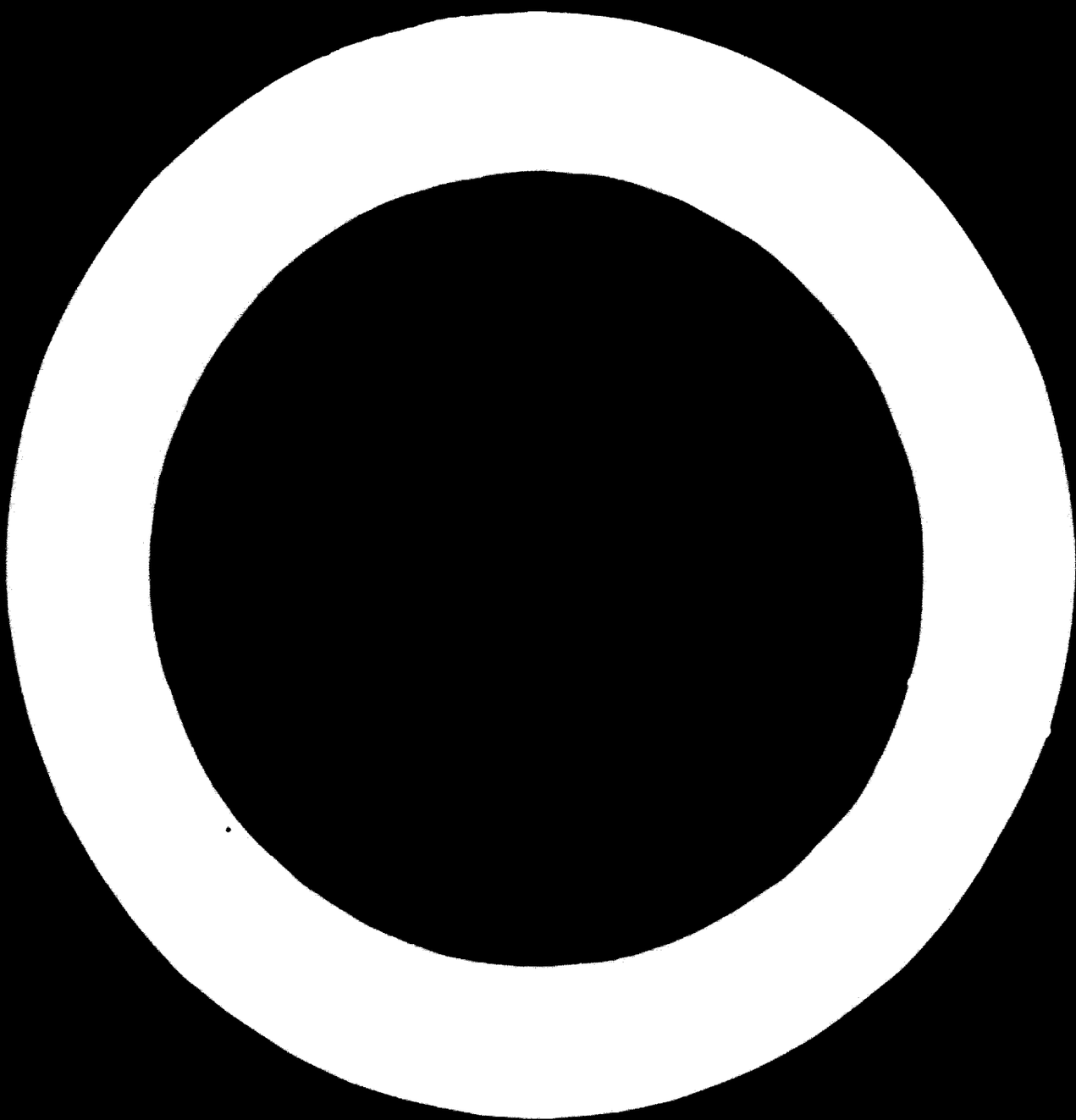

EAST AFRICA

MALAWI

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	...	3,600	5,700	9,000
	Production	...	-	-	-
	Deficit	...	3,600	5,700	9,000
	Surplus	...	-	-	-
P_2O_5	Consumption	...	600	2,500	4,000
	Production	...	-	-	-
	Deficit	...	600	2,500	4,000
	Surplus	...	-	-	-
K_2O	Consumption	...	-	1,000	2,500
	Production	...	-	-	-
	Deficit	...	-	1,000	-
	Surplus	...	-	-	-

General

Malawi, which was known as Nyasaland before gaining independence in 1964, covers an area of 120,000 km^2 including the area covered by lake Malawi, or about 53,000 km^2 of land area. The population of the country is just over 4 million, some areas having a population density of about 310/km^2. The estimated annual rate of growth of the population is about 3 per cent.

The country has practically no developed mineral resources or industry and its economy is primarily based on agriculture. The GDP is low at about $200 million (at current factor cost), with the per capita income being estimated at about $50, one of the lowest in Africa. Most of the population is supported directly or indirectly by agriculture, mainly in the subsistence sector. The country is receiving regular budget assistance from the United Kingdom. The country's economy is now undergoing reorientation. The future prosperity of Malawi is largely dependent upon the performance of the agricultural sector, which is being diversified.

MALAWI

Agriculture

At present the area cleared for cultivation is about 2 million ha, of which about 30 per cent lies fallow. Potentially another one million ha of arable land could be developed.

The main crops grown in the country are maize (present production being around 100,000 tons), ground-nuts (50,000 tons), tobacco (15,000 tons), cotton (1,500 tons of seed), and tea (15,000 tons).

The major export crops are tobacco, tea, ground-nuts and cotton, contributing together about 65 to 80 per cent of the total exports of Malawi ($50 million in 1966).

Various agricultural development projects are being undertaken, including new cotton plantation and afforestation schemes.

Natural resources and industry

There is little mineral production although deposits of several minerals exist. There is a large deposit of coal, reserves being estimated at 160 million tons with a high content of ash. There are also considerable deposits of limestone at several places, which would be worth while mining for later building up of an additional chemical industry. Phosphate deposits with reserves estimated at 800,000 tons of apatite with more than 20 per cent P_2O_5, one million tons with more than 10 per cent P_2O_5 and 500,000 tons with about 5 per cent P_2O_5, have been found but are not yet developed. The same applies to four deposits of iron pyrites with an average sulphur content thought to be 10 per cent. Deposits of bauxite, titanium and niobium also exist.

The possibility of cheap power from the Cabora Bassa Scheme in Mozambique might speed up development of the bauxite deposits at Nyanje.

Fertilizer manufacture

At present there is no fertilizer industry in Malawi, but in 1967 an economic appraisal of a fertilizer plant based on pyrites and phosphate was conducted. No outcome of this study is yet known.

Projected fertilizer consumption

The projected fertilizer consumption for the period 1970-1980 as estimated by FAO, ECA and UNIDO is given below in tons of nutrients:

	1970			1975			1980		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
ECA	3,800	2,500	...	...	...	...	9,800	6,500	...
FAO	...	...	...	3,800	3,800	900	...	...	...
UNIDO	3,200	1,000	...	4,700	2,500	...	...	...	...

The projected demand for nitrogen in 1970 shown above has already been approached or exceeded in 1965. It is assumed therefore that an annual rate of growth of demand for nitrogen of 10 per cent/year (ECA) will apply during the period 1965-1975. This would give a consumption of nitrogen projected for 1970 and 1975 of 5,700 tons/year and 9,000 tons/year respectively, using the data for 1965 as a basis. The projected demand for P_2O_5 has been taken as 2,500 tons/year in 1970 (ECA) and 4,000 tons/year in 1975 (calculated on the basis of a rate of growth of 10 per cent/year). The consumption of K_2O has been projected at 1,000 tons/year in 1970 and 2,500 tons/year in 1975.

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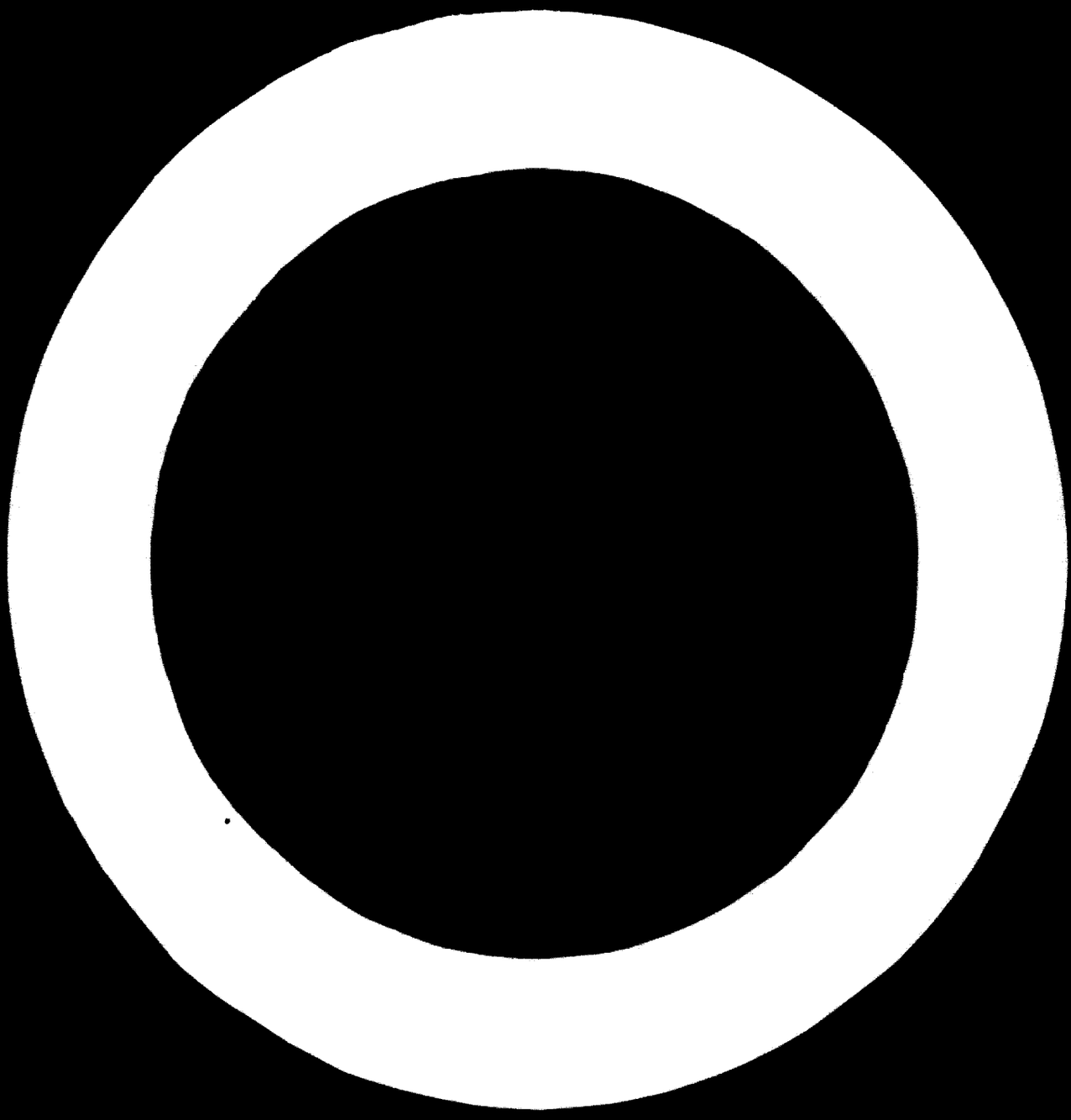

EAST AFRICA

MAURITIUS

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	8,300	9,000	12,000	12,500
	Production	-	-	-	-
	Deficit	8,300	9,000	12,000	12,500
	Surplus	-	-	-	-
P_2O_5	Consumption	4,200	7,000	10,000	12,000
	Production	-	-	-	-
	Deficit	4,200	7,000	10,000	12,000
	Surplus	-	-	-	-
K_2O	Consumption	5,600	6,700	10,000	10,500
	Production	-	-	-	-
	Deficit	5,600	6,700	10,000	10,500
	Surplus	-	-	-	-

General

Mauritius is an island in the Indian Ocean, lying about 2,240 km east of the African mainland and 800 km east of Madagascar. Its area is about 1,843 km^2, out of which a fair part is mountainous. The island's population is about 770,000 (December 1966) and growing rapidly at an annual rate of 2.7 per cent. The population density is 420/km^2.

GDP for 1959/1965 was $170 million, at current factor cost, i.e. about $220 per capita. National income depends largely on sugar exports, which fluctuate under the influence of cyclones, and droughts of a limited free world market, although a large part can be sold on preferential markets, mainly in the United Kingdom.

Agriculture

A distinct feature of Mauritius' agriculture is sugar-cane cultivation. About 18 per cent of the fields are covered with sugar-cane, while the area devoted exclusively to food crops is less than 1 per cent. Limited possibilities for expanding agricultural activities exist in the plateau where some tea is grown at present. The total sugar production averaged 614,000 tons in the last five years. Tea is

MALAWI

the only secondary crop, which accounted for 2,200 tons in 1967. Limited land available for agriculture requires substantial use of fertilizers to get the adequate crops. This is the main reason for Mauritius' high fertilizers consumption compared to the rest of the subregion. The pattern of consumption indicates the growing popularity of NPK fertilizers. Practically all fertilizers imported were used on sugar. Until now, optimum fertilization was made on large plantations whereas small cultivations have often used fertilizers in negligible quantities. Ammonium sulphate was the main fertilizer used in the past.

Natural resources and industry

Local corals supply high grade lime for use in the sugar industry and output is about 6,000 tons/year.

Phosphate deposits exist in the islands between Mauritius and the Seychelles but would need export markets as well as the local market to justify exploitation.

Fertilizer manufacture

At present there are no fertilizer manufacturing facilities in Mauritius. Several plans have been made in the past to establish fertilizer production and a number of alternative projects have been considered including blending and granulating plants.

The most recent plans, which have a chance of materializing, are to build a 100,000 tons/year fertilizer plant capable of producing various NPK formulations as well as about 10,000 tons/year of calcium ammonium nitrate (26 per cent N). The Mauritius Chemical and Fertilizer Industry Ltd. was formed to operate the plant. The plant is to be based on imported anhydrous ammonia, phosphoric acid and potash. A large proportion of the output, however, estimated at 40,000 to 50,000 tons would have to be exported in the near future. Unless regional co-operation in fertilizer marketing is established this may present difficulties. We understand also that the supply of investment capital for the project is encountering difficulties. Because of the above problems and the uncertainty of the real status of the project, it has not been considered for the purpose of this study.

Present and projected fertilizer consumption

The consumption of fertilizers in Mauritius is relatively high. In 1966/1967 about 8,700 tons of nitrogen (compared with 9,000 to 11,000 tons/year during the period 1961-1966), 4,300 tons of P_2O_5 (compared with 5,000 to 7,000 tons/year during the period 1961-1966) and 7,000 tons of K_2O (compared with

8,500 tons in 1963/1964 and 10,800 tons in 1964/1965). The consumption of fertilizers during the last few years was static; it was equivalent to about 200 to 250 kg of nutrients/ha of cultivated land taken as 93,000 ha.

The projected fertilizer consumption, based on recent market study by UNIDO and by ECA is given below in tons of nutrients:

	1970			1975		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
UNIDO	9,500	4,300	...	11,000	5,000	10,500
ECA	12,000	10,000	...	12,450	12,000	...

The consumption projected by ECA of K_2O has been taken as 10,000 tons/year in 1970 and 10,500 in 1975.

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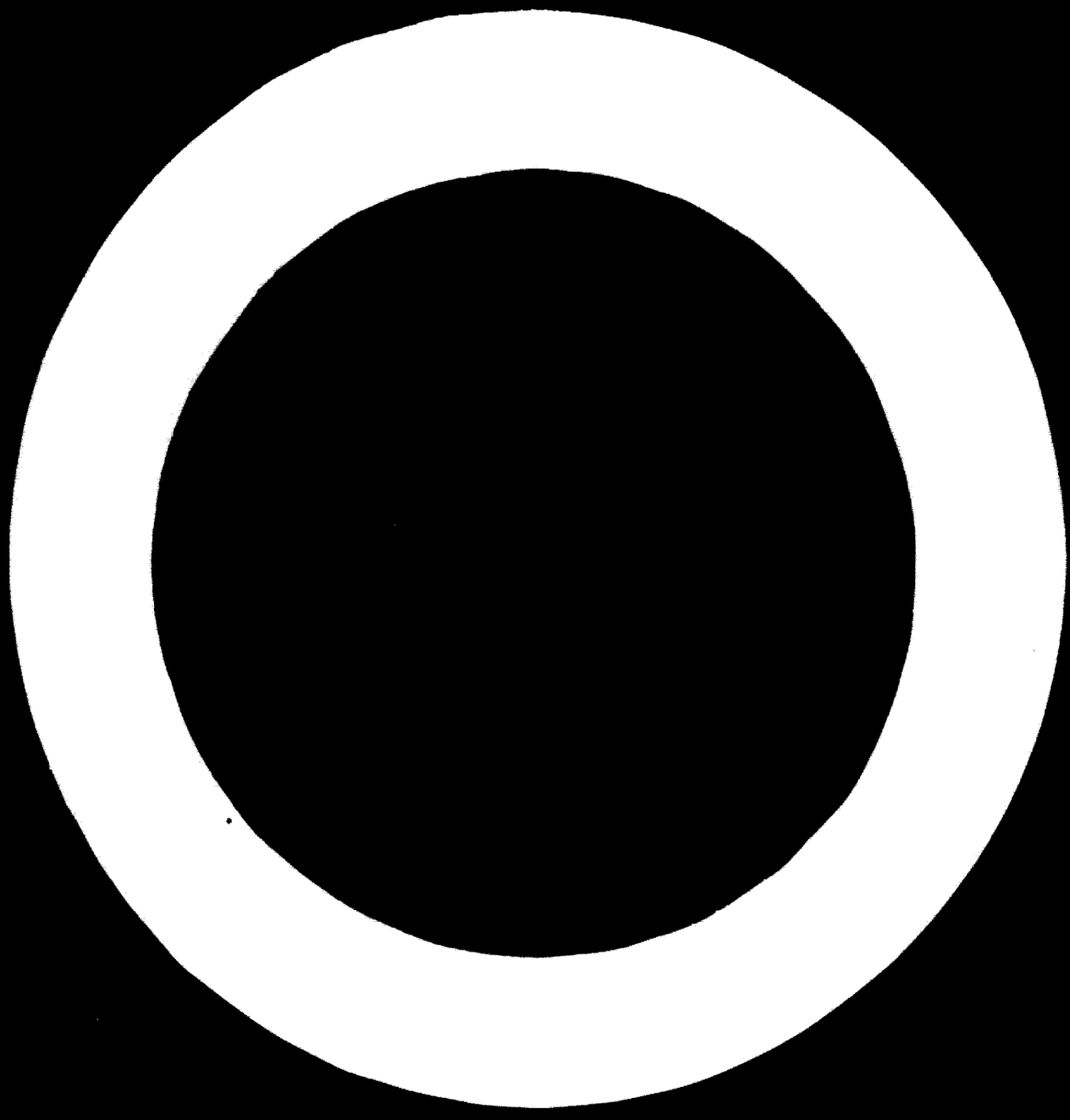

EAST AFRICA

MOZAMBIQUE

Annual consumption and production of fertilizers, 1960 to 1980
(tons)

Nutrient		1960	1965	1970	1975	1980
N	Consumption	3,000	5,000	11,000	-	19,000
	Production	-	-	11,000	-	190,000
	Deficit	3,000	5,000	-	-	-
	Surplus	-	-	-	-	171,000
P_2O_5	Consumption	500	1,000	2,600	-	4,300
	Production	-	-	1,800	-	1,800
	Deficit	500	1,000	800	-	2,500
	Surplus	-	-	-	-	-
K_2O	Consumption	300	2,000	4,200	-	6,000
	Production	-	-	-	-	-
	Deficit	300	2,000	4,200	-	6,000
	Surplus	-	-	-	-	-

General

The country covers an area of about 783,030 km^2. At the 1960 census the population was about 6,578,604. The country is very densely populated, and the average annual rate of growth is about 2 per cent.

Mozambique is an overseas province of Portugal situated on the seacoast of Africa between Tanzania and South Africa.

Mozambique is one of the least developed parts in Africa. The country can be divided into three economic zones: the northern part, which is served by the port of Nacala and a developing railway to Lake Nyasa, and dominated by agriculture; the central zone with several railways leading from the hinterland to Beira the capital; and the southern region depending on transit trade and on the migration of 150,000 Africans to the Rand mines every year.

Agricultural production has steadily increased and Portuguese industrialists have introduced a number of manufacturing projects. British and South African interests are represented in transport services, distribution and agriculture, and capital of the United States, France, Belgium and Federal Republic of Germany has also been invested in the territory.

MOZAMBIQUE

The country exports a fair amount of agricultural products, and there are a number of mineral resources still not fully exploited.

Agriculture

About one third of the country is suitable for agriculture, but only about 2 million ha of this are actually cultivated.

African agriculture consists mainly of subsistence farming, the main crops being maize, peas, peanuts, manioc and sesame. Among the cash crops, African agriculture accounts for almost all the production of cotton, which is the territory's chief export (about 40,000 tons/year), Africans also account for nearly all the rice (30,000 tons husked), which meets local needs and leaves a surplus for export, and cashew-nuts. Both cotton and rice are grown under European supervision, under a concessionary system. Between the 1940s and 1950s productivity per ha of cotton trebled. There are great possibilities for the expansion of rice growing, nearly half of the territory being suitable for it.

A number of important European companies produce sugar (about 200,000 tons in 1960), tea (8,000 tons), sisal (30,000 tons), copra (60,000 tons) and vegetable oils (15,000 tons). All are mostly for export. In 1965 the chief agricultural products for export were: sugar (147,069 tons), cotton (28,164 tons), copra (33,919 tons), sisal (26,694 tons) and cashew nuts (77,235 tons).

On a Chimoio plateau cotton, citrus fruits, wheat and a little cotton are cultivated by white farmers. In the early 1960s after irrigation was introduced in the Limpopo valley, a settlement for Portuguese farmers was started and production of long staple cotton and wheat became very successful.

Natural resources and industry

Mineral resources are as yet little developed, although the Mines Department has started a full survey in the mid 1950s.

A little gold is mined near Vila de Manica and at Tete, and there are alluvial deposits near Vila de Manica and at Alto Ligonha.

More than 250,000 tons of coal are extracted annually from the Moatize field. Reserves are estimated at 700 million tons and recently more reserves have been discovered in the Limpopo valley and in the Nyasa Basin.

Iron ore is found at Moatize, and beryl and mica, columbite and bismuth at the Alto Ligonha mines. Considerable quantities of graphite exist near Nacola. Radioactive minerals are found in Tete and

MOZAMBIQUE

Mozambique districts. Prospecting for petroleum has yielded no positive results by the late 1960s, except at Pande. Reserves of natural gas have been discovered near Moambo. No information is however available regarding the extent of the deposits. At least one well was completed by 1966 with a flow rate of about 10 million standard ft^3/day. Construction of a 350-km gas pipeline from Moambo to the Republic of South Africa is planned.

Some bauxite has also been discovered.

Diamonds were found for the first time in 1966 near the Rhodesian border.

There is a petroleum refinery at Matola with crude capacity of 700,000 tons/year.

Fertilizer manufacture

Quimica Goral SARL brought its fertilizer plant at Natola fully on stream in January 1968. Facilities have been erected for the production of 50,000 tons/year of sulphuric acid, 60,000 tons/year of ammonium sulphate and about 10,000 tons/year of single superphosphate. This is equivalent to about 12,000 tons/year of nitrogen and 2,000 tons/year of P_2O_5, presumably intended for the domestic market.

Construction of a 1,000 tons/day ammonia plant based on natural gas is planned at Panda, about 800 km north of Lourenco Marques. The output of this plant must be intended to supply export markets. The present status of the project is uncertain.

For the purpose of this study it is assumed that the Matola plant will be working at 90 per cent capacity in 1970 and in 1975.

It is also assumed that by 1975 the 1,000 tons/day ammonia plant will be operational at 70 per cent of its capacity.

The only figure available for the import of N fertilizer is for 1961/1962, which amounted to 2,585 tons. N consumption has increased steadily since 1956/1957 from 1,200 tons to 5,000 tons in 1956/1957 to 1,300 tons in 1966/1967. Consumption of P_2O_5 has also increased from 250 tons in 1956/1957 to 1,500 tons in 1966/1967. Consumption of K_2O has increased from 140 tons in 1956/1957 to 2,500 tons in 1966/1967.

Present and projected fertilizer consumption

The consumption of fertilizers in Mozambique was showing a steady growth during the last few years. The consumption of nitrogen increased from 1,200 tons/year in 1956/1957 to 5,000 tons/year in 1966/1967. The corresponding data for P_2O_5 are 250 tons/year in 1956/1957 and 1,500 tons in 1966/1967 and for K_2O,

MOZAMBIQUE

140 tons in 1956/1957 and 2,500 tons in 1966/1967. This is equivalent to an average consumption of 4.5 kg of nutrients/ha of cultivated land taken as 2 million ha.

No projections for the fertilizer demand in 1970 and 1975 are available. The following estimations of the potential fertilizer demand in 1970 and 1975 take into account the present existence of a small local fertilizer industry and the relatively low fertilizer consumption at present. The average annual rates of growth of fertilizer demand during 1963-1965 were 18 per cent for K_2O, 20 per cent for P_2O_5, and 12 per cent for nitrogen. If it is assumed that these growth rates would continue at the same level for the period 1966-1970, the demand for 1970 would be 4,200 tons/year of K_2O, 2,600 tons/year of P_2O_5, and 7,000 tons/year of nitrogen. Because of the existence of a nitrogen production plant, however, it is likely that the nitrogen fertilizer demand will be particularly stimulated and that the rate of growth of nitrogen consumption will increase to 25 per cent annually, which would result in a projected demand for 1970 of 11,000 tons/year of nitrogen fertilizers.

It has been further assumed that during the subsequent period of 1971-1975 the consumption of fertilizers will increase by an average of 8 per cent annually for K_2O and by an average of 12 per cent annually for P_2O_5 and nitrogen. This would yield a projected demand for 1975 of 6,000 tons/year of K_2O, 4,500 tons/year of P_2O_5, and 19,000 tons/year of nitrogen (under the assumption that the 1970 demand for nitrogen will be 11,000 tons/year).

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EAST AFRICA

RÉUNION

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	2,500	5,000	5,700	6,500
	Production	-	-	-	-
	Deficit	2,500	5,000	5,700	6,500
	Surplus	-	-	-	-
P_2O_5	Consumption	800	2,000	3,100	3,300
	Production	-	-	-	-
	Deficit	800	2,000	3,100	3,300
	Surplus	-	-	-	-
K_2O	Consumption	2,000	5,000	8,000	9,000
	Production	-	-	-	-
	Deficit	2,000	5,000	8,000	9,000
	Surplus	-	-	-	-

General

A French overseas department in the Western Indian Ocean, 680 km east of Madagascar and 145 km west-south-west of Mauritius, Réunion covers an area of about 2,510 km^2. The country has no indigenous population and there is serious overcrowding. Half of the population is under 20. In 1961 the census was about 349.3 having doubled in less than a century, and with the elimination of malaria in the 1950s the rate of increase has steepened.

The country is almost entirely volcanic and there are appreciable climatic differences, according to altitudes, and parts of the island are liable to destructive tropical cyclones.

Agriculture

The population of the country is very poor and the white highlanders in particular are wholly dependent on subsistence cultivation.

The coastal peasantry lives almost entirely on rice, the inland peasantry on maize. Commerce is largely controlled by a small number of sugar companies.

RÉUNION

The sugar industry dominates Réunion's economy, production being concentrated on the coastal lowlands. In the 1960s about a dozen big estates were producing the bulk of the crop. The approximately 20,000 small sugar growers are completely dependent on the estates, and yields are very poor. Most of the sugar production, expansion from 70,000 tons in 1934 to 248,000 tons in 1966, was achieved on these estates.

Besides sugar, representing about 85 per cent of Réunion's exports, the only other important export crops are geranium, vetiver and vanilla. More than 90 per cent of the country's exports (mainly sugar and rum) go to France.

The imports are mainly manufactured goods from France, and foodstuffs (rice) principally from Madagascar.

Communications are good on the coast and lateral roads give access to the interior. An artificial harbour at Pointe des Galets is in operation since 1886.

Natural resources and industry

There are no mineral resources of commercial value in Réunion.

Fertilizer manufacture

Réunion has no production of fertilizers, and so far the demand has been met by imports. As in Mauritius and other East African countries, ammonium sulphate has until 1960 been the prime source of nitrogen fertilizers, constituting some 60 per cent of the total nitrogen requirement. Since that time the situation changed considerably, and in 1966 out of 4,400 tons nitrogen applied to the soil, 3,180 tons came in the form of NPK and 1,120 tons as ammonium sulphate. It may be assumed that this trend will continue in the future.

Some ideas were expressed in Réunion whether at least finishing steps in fertilizer production could be made in Réunion. In connexion with the setting up of NPK manufacturing plant in Mauritius, it was considered to supply stock solutions of selected materials from there and to make the granulation and bagging in Réunion. If such plans materialize in the future this will not in itself create fertilizer manufacturing facilities on the island and therefore they have been disregarded for the purpose of this study.

Present and projected fertilizer consumption

The consumption of fertilizers in 1966/1967 was about 5,000 tons of nitrogen, 2,000 tons of P_2O_5 and 7,500 tons of K_2O. The consumption of fertilizers has remained static over the last few years, equivalent to an average of about 230 kg of nutrients/ha of cultivated area taken as 62,000 ha.

The projected fertilizer consumption for 1970 and 1975, based on a recent UNIDO market study of East Africa is given below in tons of nutrients:

1970			1975		
N	P_2O_5	K_2O	N	P_2O_5	K_2O
5,700	3,100	3,600	6,500	3,300	4,200

Because of the apparent saturation of the market for fertilizers on the island the above projections, although appearing very conservative, have been adopted for the purpose of this study with the exception of K_2O, which has been taken as 8,000 tons/year in 1970 and 9,000 tons/year in 1975.

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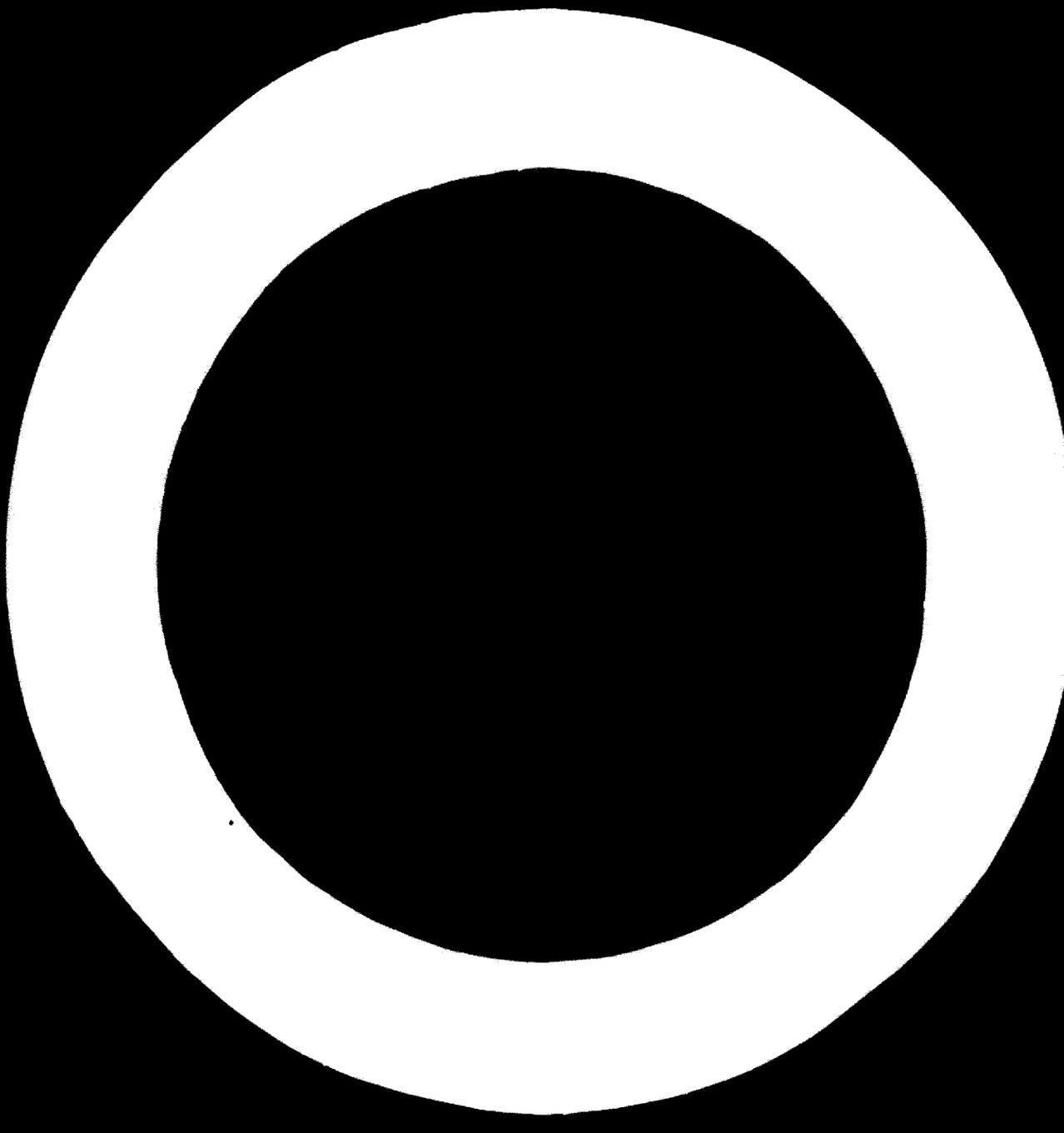

EAST AFRICA

RHODESIA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	...	31,000	53,000	64,000
	Production	...	-	-	62,000
	Deficit	...	31,000	53,000	2,000
	Surplus	...	-	-	-
P_2O_5	Consumption	...	30,000	50,000	61,000
	Production	...	35,000	42,000	42,000
	Deficit	...	-	8,000	19,000
	Surplus	...	5,000	-	-
K_2O	Consumption	...	19,000	29,000	46,000
	Production	...	-	-	-
	Deficit	...	19,000	29,000	46,000
	Surplus	...	-	-	-

General

Internally a self-governing British colony in southern Africa, which in November 1965 made a declaration of independence. The country covers an area of about 389,400 km^2, of which Salisbury is the capital. In 1962 the total population was 3,857,500, including about 3,618,000 Africans. (The 1962 census was the first complete census ever taken of Africans in Rhodesia.) Between 1946 and 1956 the European population had more than doubled. (Immigrants were the main factor in this increase.) The population's increase is now estimated to be about 2.5 per cent/year.

Sanctions imposed against Rhodesia after the unilateral declaration of independence had a severe effect upon the economy of the country, and prohibition by many countries of the import of tobacco was particularly damaging. At the moment it is difficult to make accurate assessments, but prior to 1965 the country's economy was primarily based on agriculture, with tobacco being the main export product. Mining and a number of secondary industries are assuming major importance. These are backed by subsistence agriculture practiced by the great majority of the African population. (In agriculture, mining and industry Africans are generally employed as unskilled or semi-skilled labour.)

The per capita income is estimated at about $150. The GDP at current factor cost was in 1967 about $1,000 million.

RHODESIA

Rhodesia is receiving financial aid from a number of international organizations, such as IBRD, UNDP and other United Nations sources.

Agriculture

Because of the importance of agriculture every effort is being made to improve farming methods. Rhodesia's sandy soil has proved particularly suitable for the production of Virginia flue-cured tobacco, output of which was about 136,500 tons/year in the mid 1960s. This represented an increase in production and value of more than 100 per cent compared with the 1950s.

Corn is the most important grain and in many parts of the country it is the staple of subsistence agriculture also used in livestock feed, and has lately become increasingly important as an export crop. Wheat, grown under irrigation is the most important winter crop, and attempts are being made to evolve better strains. Other winter crops include barley, oats, peas and rye. (Sugar production was mounting rapidly in the 1960s.)

Under the stimulus of a co-operative programme, African farmers are engaged in the production of the country's chief crops. In the 1960s Africans harvested annually about 300,000 tons/year of corn, (i.e. about one third of the total production), while the production of wheat, about 1,365 tons/year was much higher than the European output. Other crops grown by Africans include Turkish tobacco (requiring little capital investment, but giving high yield), tea, sugar, coffee arabica, vegetables and fruit.

In the mid 1960s the cattle population amounted to about 3.5 million, of which more than 50 per cent were owned by Africans. Value of output of livestock indicated was second only to tobacco.

Utilized forests, covering an area of about 800,000 ha yield mainly Rhodesian teak.

Natural resources and industry

The mining industry in Rhodesia has gradually expanded and it now forms an important sector in the country's economy. More than 30 minerals are produced, the total annual output being valued at about $78.5 million in the mid 1960s. The most important are asbestos and gold, followed by chrome, copper and coal. The value of production of these minerals (except gold) almost doubled between the 1950s and 1960s. Chrome of all grades is found in Rhodesia, which is the world's second largest producer. Resources of asbestos are limited and substantial capital investment has been made in efforts to obtain access to additional Rhodesian reserves of asbestos ore.

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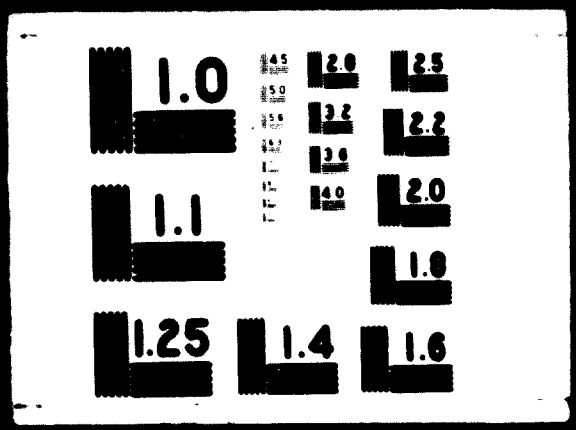

RHODESIA

Of Africa's known coal reserves of over 77,000 million tons, Rhodesia has 8.5 per cent (hard coal) 6,613 million tons at Wankie, with an average production of 3 to 3.5 million tons/year.

There are also pyrites and phosphate reserves, the latter at Dorowa, about 200 km from Salisbury are estimated at 16 million tons (14 per cent BPL). The quality of African rock phosphate varies considerably, ranging from 74 per cent BPL in Morocco to less than 20 per cent BPL in Malawi, Rhodesia and Zambia. Early in 1967 the working and upgrading of the phosphate rock to about 76 per cent BPL was in full production at a rate of about 100,000 tons/year. It is hoped to raise production to about 50,000 tons/year of P_2O_5 during the next few years.

There are reserves of pyrites 30 km north of Salisbury with 2 million tons with 38 per cent S content and a production capacity equivalent to about 30,000 tons/year of sulphur. Sulphur production (S content in pyrites used) has increased from 5,000 tons in 1948 to 30,000 tons in 1965.

There are also a number of minor and by-products manufactured in the country, which are of considerable importance, i.e. some organic chemicals recovered from coke-ovens. Benzol, toluol, naphtha, naphthalene, tar and pitch are produced.

Sodium silicate, which is used in adhesives, detergents etc. is being manufactured in some countries, i.e. Kenya, Senegal, Rhodesia and Tanzania.

Annual consumption of iron and steel in the East African subregion averaged 440,000 tons, of which Rhodesia accounted for 170,000 tons. Domestic supplies came from integrated works in Rhodesia (about 50,000 tons).

Other steel activities in the subregion include the manufacturing of tubes, drawing of wires and galvanizing of sheets. The current output of seamless tubes is about 9,000 tons/year.

Southern Rhodesia also has a very high potential for hydroelectric power. The plant at Kariba (joint project of Zambia and Rhodesia) has recently been put into operation with a capacity of 700 MW.

An oil-refinery came on stream at Umtali in 1965, designed to supply both Rhodesia and Zambia, with a capacity of 1 million tons/year using crude from Beira (Mozambique).

Fertilizer manufacture

At present the production of fertilizers in Rhodesia is as follows:

(a) African Explosives and Chemical Industries Ltd. at Salisbury operate the following plants:

(i) Two sulphur acid plants based on local pyrites and imported sulphur with total capacity believed to be about 120,000 tons/year;

RHODESIA

(ii) A phosphoric acid plant with a capacity of about 20,000 tons/year of P_2O_5;

(iii) Single superphosphate (19 per cent P_2O_5) with a capacity of about 55,000 tons/year to be extended shortly by 15,000 tons/year;

(iv) Triple superphosphate (44 per cent P_2O_5) with a capacity of 55,000 tons/year to be extended shortly by 15,000 tons/year;

(v) A bulk blending plant;

(b) Bulk blending plants based on purchased/imported fertilizer intermediates at Salisbury operated by Fisons Fertilizers and Windmill Fertilizers - the total bulk blending capacity in Rhodesia is believed to be about 100,000 tons/year.

Apart from the above mentioned extensions a new project is constructed by Sable Chemical Industries at Que Que with the capacities of 95,000 tons/year of ammonia based on liquid hydrocarbons, and 190,000 tons/year of ammonium nitrate. It is believed that the plant will be in operation by 1971.

It is understood that the production of phosphate fertilizers in 1967 was about 35,000 tons P_2O_5.

For the purpose of this study it is assumed that the production in 1970 will be about 95 per cent of the extended plant capacity and that by 1975 the phosphate plants will operate at 95 per cent of their rated capacity and the new nitrogen plant at 80 per cent of its capacity, i.e. producing 42,000 tons/year of P_2O_5 and 62,000 tons/year nitrogen.

Projected fertilizer consumption

The projected fertilizer consumption in 1970 and 1975 as based on the data collected during the UNIDO market study of East Africa is as given below in tons of nutrient:

1970		1975	
N	P_2O_5	N	P_2O_5
52,000	50,000	64,000	61,000

No corresponding data are available giving the projected K_2O consumption. For the purpose of this study it is assumed that the average rate of growth of K_2O consumption will be 10 per cent/year giving a projected demand for 1970 and 1975 of 29,000 tons/year and 46,000 tons/year respectively.

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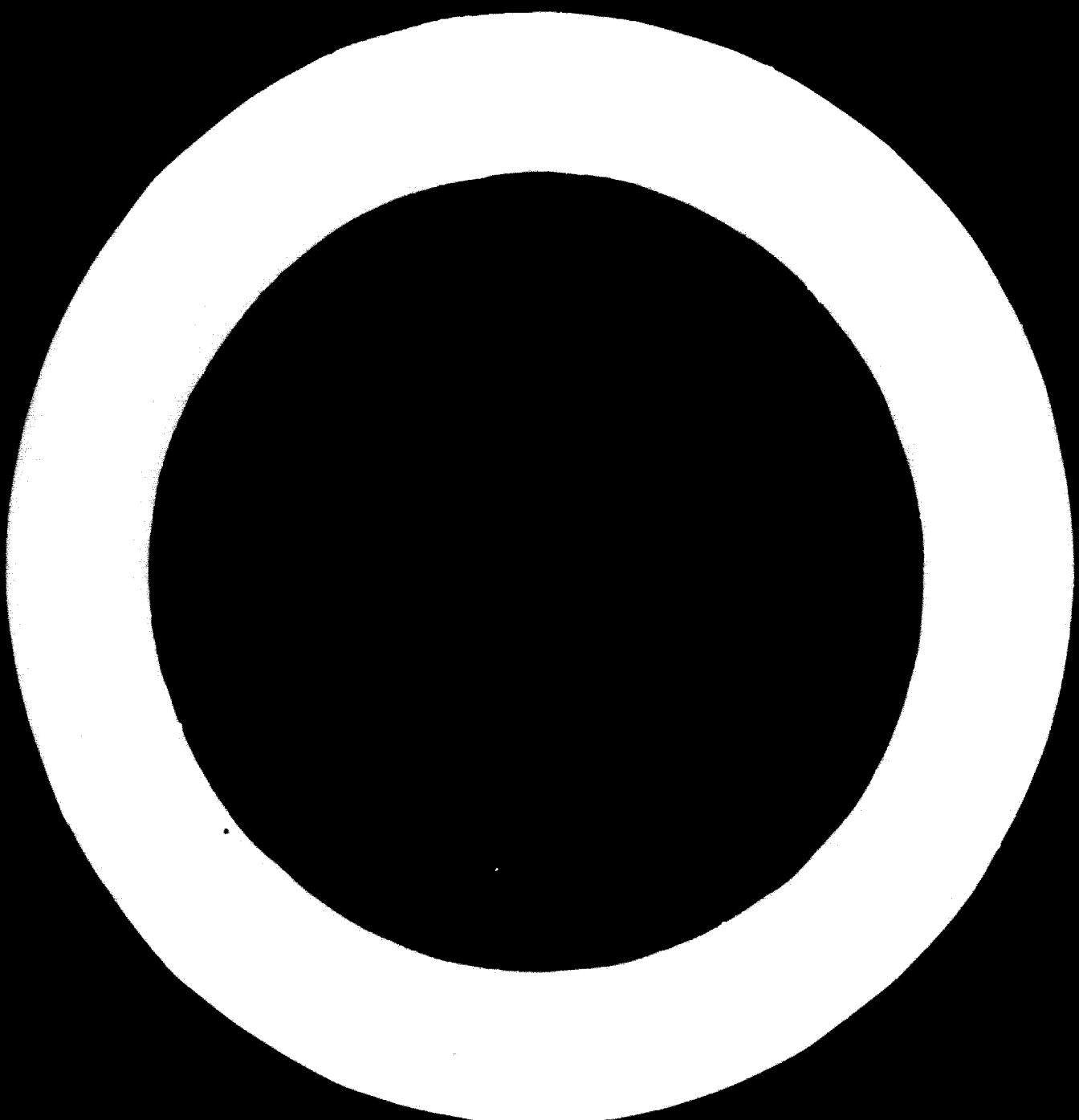

EAST AFRICA

RWANDA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	negl.	negl.	2,100	3,200
	Production	-	-	-	-
	Deficit	negl.	negl.	2,100	3,200
	Surplus	-	-	-	-
P_2O_5	Consumption	negl.	negl.	900	1,700
	Production	-	-	-	-
	Deficit	negl.	negl.	900	1,700
	Surplus	-	-	-	-
K_2O	Consumption	negl.	negl.	600	1,000
	Production	-	-	-	-
	Deficit	negl.	negl.	600	1,000
	Surplus	-	-	-	-

General

Rwanda is a small country covering an area of about 23,600 km^2. Most of the 3.3 million inhabitants live in the lower lying agricultural areas, where the density of the population approaches 200/km^2. The rate of growth of the population is about 3 per cent/year.

The country was part of the Belgian Trust Territory of Ruanda-Urundi. It became independent in 1962 and abandoned the economic and monetary union with Urundi in 1964. Rwanda is a very poor agricultural country with an economy largely dependent on subsistence. It is basically a two-commodity export country, where coffee and cassiterite (tin ore) together account for about 7 per cent of the GDP and 90 per cent of total exports (which range from $11 million to $14 million/year). In the past Rwanda's balance of payments showed a deficit, which was financed mainly from Belgium and the European Development Fund. The GDP in 1966 was about $62 million, of which about 70 per cent was contributed by agriculture including stock raising, and only 2 per cent by the mining activities.

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Agriculture

About 90 per cent of the population is supported by agriculture and it has been estimated that 75 per cent of the production is in the subsistence sector. The farming methods are primitive and little use is made of fertilizers and other farming inputs. It is estimated that about 800,000 ha are under cultivation.

The main food crops are bananas (1.5 million tons in 1967), sweet potatoes (380,000 tons), cassava (230,000 tons), sorghum (130,000 tons), potatoes (100,000 tons) and maize (50,000 tons).

The main cash crops are coffee (in 1967 production was about 11,000 tons from about 20,000 ha), pyrethrum (700 tons of dry flowers), tea (500 tons of dry leaves) and cotton.

Natural resources and industry

Cassiterite (tin oxide) is the main mineral product in Rwanda, the production being at present about 1.9 million tons/year, but because of poor reserves and weakening prices this level may subsequently drop.

The country also produces about 400,000 to 500,000 tons/year of wolframite and smaller amounts of tantalite and beryl (110 tons in 1967). Some further mineral exploration was carried out, some of it financed by the Federal Republic of Germany. UNDP and EDF are currently considering financing further work. The manufacturing industry in the country is insufficient with small prospects of growth due to the extremely limited home market.

Plans for the installation of a UNDP demonstration plant to process 3,000 tons/year of dry pyrethrum flowers are well advanced and the unit should be in production in 1970, mainly supplying export markets.

Fertilizer manufacture

There is no fertilizer manufacture in the country at present. The water of Lake Kivu has a significant gas content, analysing after release about 24 per cent V/V methane. The current methane reserves are estimated at about 50 billion Nm^3 and a pilot plant is being operated for the purification of this gas. These reserves represent the only known source of hydrocarbons in this region. The possibility of its exploitation for the possible manufacture of nitrogenous fertilizers to supply the markets in Rwanda, Burundi and adjoining countries is being investigated.

For the purpose of this study it is assumed that such plans will not materialize by 1975.

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Present and projected fertilizer consumption

At present the consumption of fertilizers in the country is extremely low, believed to be of the order of 100 to 200 tons/year of compound fertilizers. The projected demand for 1970 and 1975 as estimated by ECA and recently as a result of a UNIDO mission to East Africa is given below in tons of nutrients:

	1970		1975		1980	
	N	P_2O_5	N	P_2O_5	N	P_2O_5
ECA	2,100	900	...	...	5,600	2,500
UNIDO	2,100	900	3,200	1,700	...	...

The corresponding projected demand for K_2O is not available. For the purpose of this study the projections estimated by UNIDO and based on a recent study of the conditions in the country have been adopted. The main crops receiving fertilizer application are coffee and maybe tea. The demand for K_2O (mainly for coffee plantations) has been taken as 600 tons/year in 1970 and 1,000 tons/year in 1975.

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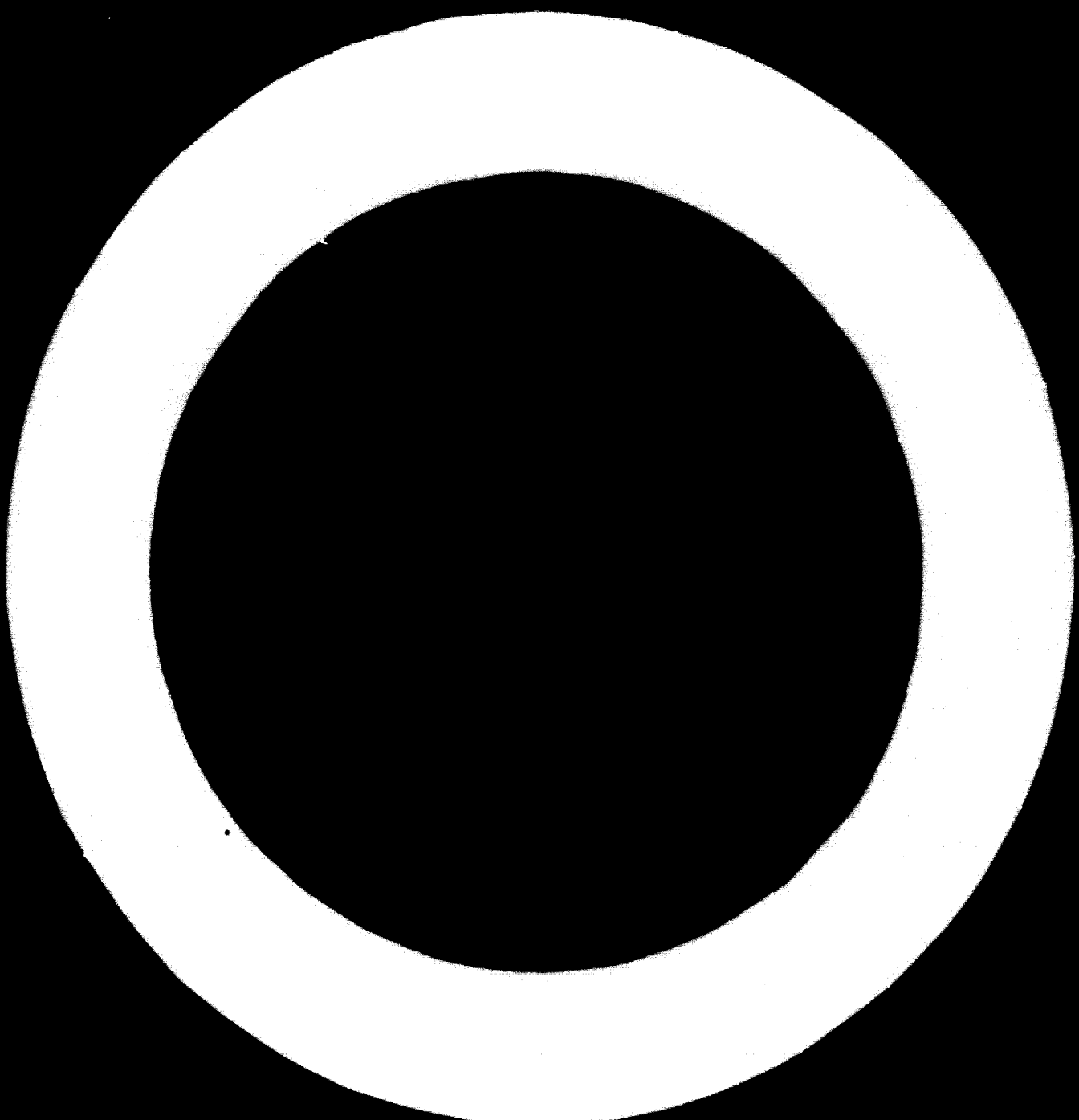

EAST AFRICA

SOMALIA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	800	3,300	4,800	8,400
	Production	-	-	-	-
	Deficit	800	3,300	4,800	8,400
	Surplus	-	-	-	-
P_2O_5	Consumption	*)	*)	350	550
	Production	-	-	-	-
	Deficit	-	-	350	550
	Surplus	-	-	-	-
K_2O	Consumption	*)	*)	300	500
	Production	-	-	-	-
	Deficit	-	-	300	500
	Surplus	-	-	-	-

*) Data are not available, but consumption is believed to be negligible

General

Somalia covers an area of 638,000 km^2, with a total population of 2.5 million, of which about two thirds are nomads. The annual rate of growth of the population is estimated at 1.5 per cent.

Somalia, which comprises former British and Italian Somalilands, and became independent in 1960, is still at an early stage of economic development. No national accounting data exist, but experts estimate Somalia's per capita income at about $50. Total GDP is about $125 million.

Livestock and agriculture are Somalia's principal resources. Apart from providing subsistence to two thirds of the population, livestock represents about 45 per cent of export earnings. In agriculture, bananas have long been the leading export product with about 45 per cent of export earnings.

The general economic performance of Somalia in the last few years has been quite satisfactory (increase in the export of livestock since 1960 to 1965 being spectacular, growing in value 170 per cent). Further development programmes have been set up mainly in animal health and marketing and also a number of industrial projects have been completed; but most of these would not be economical unless problems relating to management and working capital could be solved. The country is receiving substantial financial aid from

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a number of countries, among them the Federal Republic of Germany, Italy, the United States, the USSR, EEC and the United Nations. (It is estimated that since independence until 1966, the total external aid received was some $320 million).

Agriculture

Of the land, 8 million ha are arable and 350,400 ha are under cultivation (about 90 per cent of the population are wholly dependent on livestock raising and farming).

Traditional agriculture is devoted mainly to the production of sorghum, maize, sesame and cotton. The average food grain production is about 150,000 tons, which has to be supplemented by the import of about 30,000 tons to meet the country's minimum food requirements. Studies conducted by FAO and UNDP suggest that available land and water resources would permit an increase of food grain production to 400,000 tons. Very often it is the availability of water rather than suitable land which limits cultivation. The two rivers, Giuba and Scebelli are used for irrigation, but no more than 30,000 ha are at present under controlled irrigation, the rest being left under dry farming.

The yield of sugar-cane and banana, the two main agricultural products, has already been greatly increased as a result of better cultivation, drainage and use of fertilizer. To be able to compete in the Italian market with bananas from the associated members of the European Common Market, such as Ivory Coast, certain concerns have already taken steps to reduce cost of production. An Italian sugar mill, which has 24,000 ha, has one third under irrigation. Due to more land available for cultivation and the expansion of the capacity of the sugar mill, there already is an increase from 12,000 tons to 40,000 tons/year. Between 1960 and 1965 banana production increased by about two thirds, from 91,000 to 157,000 tons, achieved almost entirely through higher yields per ha (as total area under banana cultivation remained nearly unchanged, i.e. about 11,000 ha. Yield per ha has increased from 9 tons in 1961 to 15 tons in 1965. Likewise exports increased from 77,000 tons in 1961 to 100,000 tons in 1965.

At least two thirds of the population are nomads who raise livestock for a living. Herding covers about 35 million ha, i.e. about 55 per cent of the total area. There has been no census of animals taken in Somalia so far, and estimates are also difficult to make because of the continuous interchange of stock between Somalia and surrounding countries. However, it is thought that more than two thirds of Somalia's cattle is in the southern region. Camels are equally distributed between north and south, and the north has 80 per cent of the country's sheep and 30 per cent of its goats. According to estimates made by the government veterinary services in 1964, the total animal population was 10.6 million, out of which 2.8 million were cattle, 2.5 million camels, 2.1 million sheep and 3.2 million goats.

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Natural resources and industry

Geological surveys have revealed the existence of some minerals in Somalia. Main deposits are iron ore in the Bur area in Upper Guiba, estimated at 300 million tons (iron content 43 per cent), and gypsum near Berbera, estimated at 30 million tons with a high degree of purity. Minerals such as magnesia, columbite etc. are also reported to exist. In 1968 it was announced that major reserves of uranium and other rare minerals had been discovered in Alio Chellé in the South (some 250,000 tons of uranium have been proved). The production and export of charcoal is of considerable importance, production being about 30,000 to 40,000 tons/year. About 4,000 tons of salt are produced annually, but this is inadequate for industrial purposes.

Some oil prospecting is under way, and a small gas producing well was found in Afgoi in 1966. Exploratory rights have been given to two oil companies for approximately 140,000 km^2, with a planned investment for a seven-year period of $6.2 million.

Fertilizer manufacture

No fertilizers are produced in Somalia. The fertilizer requirements, mainly in urea were met by imports.

Present and projected fertilizer consumption

The present consumption of fertilizers (mainly of nitrogen) is still low and is used solely on the sugar-cane and banana plantations. Estimated fertilizer consumption as projected by ECA and as the result of a recent UNIDO mission to East Africa is given below in tons of nutrients:

	1970		1975		1980	
	N	P_2O_5	N	P_2O_5	N	P_2O_5
ECA	5,600	400	...	...	1,600	1,100
UNIDO	4,800	350	8,400	550	...	...

The corresponding projections for K_2O consumption are not available, and for the purposes of this study the more recent estimates by UNIDO have been adopted. The corresponding requirements of K_2O are taken as 300 tons/year and 500 tons/year in 1970 and 1975 respectively.

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UGANDA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	1,200	2,000	7,500	15,000
	Production	-	-	-	-
	Deficit	1,200	2,000	7,500	15,000
	Surplus	-	-	-	-
P_2O_5	Consumption	1,100	1,500	5,000	8,000
	Production	-	5,000	5,000	30,000
	Deficit	1,100	-	-	-
	Surplus	-	3,500	-	22,000
K_2O	Consumption	300	1,000	1,500	3,000
	Production	-	-	-	-
	Deficit	300	1,000	1,500	3,000
	Surplus	-	-	-	-

General

Uganda covers an area of 234,500 km^2 (land area 193,000 km^2), with a population of 7.74 million and an annual rate of growth estimated at 2.7 per cent.

Uganda's economy is basically a peasant economy. More than 90 per cent of the people are dependent on land for their livelihood. The average annual per capita income is $113. Agriculture accounts for about 60 per cent of GDP, the remainder being contributed by industry and commerce, i.e. at 11 per cent and 17 per cent respectively.

The country's economy has grown fairly rapidly in recent years, chiefly as a result of a strong export boom. In mid 1966 the Government inaugurated the second five-year plan covering the years 1966-1971, constituting the first phase of a fifteen-year planning period to modernize the structure of the economy and double the present per capita GDP.

Agriculture

It has been estimated that there are approximately 14 million ha available for crop production. The 1963 census indicated that the total area of holdings was 4.6 million ha, but that much agricultural land

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is left fallow. The percentage of land used for agricultural purposes varies from more than 55 per cent in the heavily farmed areas to little more than 9 per cent in others. It is further estimated that more than half of the cultivated land is devoted entirely to subsistence production and only one quarter reserved exclusively for cash crops. Coffee is the most important cash crop in Uganda (almost all is for export), accounting for 25 to 35 per cent of output of the monetized part of the agricultural sector. The recent production increase is the result of major expansion in acreage when the area planted rose by nearly 14 per cent/year.

Cotton is second to coffee in value of output, yet this crop is produced on 60 per cent of all holdings, making this the most widely grown commercial crop in the country.

Parts of Uganda have a climate suitable for growing sugar-cane. Yields of 161 to 173 tons cane/ha can be obtained from plant crops and the annual average output on plantations is about 99 tons/ha.

It was recognized in the 1966-1971 plan that increased and diversified agricultural production seems to be the only possible basis of economic growth. It is expected that in the agricultural sector tea, sugar and tobacco output increased by 5 per cent in 1966/1967, and it is hoped that the two main crops, coffee and cotton will follow the same pattern. Research results on ground-nuts alone indicate a potential for at least a 25 per cent increase and this could be doubled by the use of fertilizer, new varieties and insecticides. Thus it is expected that the production will increase to 224,000 tons by 1971, as compared with 115,000 tons in 1966.

There are also plans to promote those cash crops that at present contribute little or nothing to agricultural output, i.e. hard and soft fibres, citrus fruit, cocoa and rubber.

Natural resources and industry

The only mineral exported in any quantity is copper, reserves of which are not expected to last another ten years at the current rate of extraction. The copper mine at Kilembe is the most important part of the mining sector (copper content of the run of mine ore is 1.9 to 2 per cent), and sales amount to about 18,000 tons/year.

Phosphate rock deposits exist at Bakusa and at Sukulu, both near Tororo. The reserves at Bukusa, estimated at about 50 million tons, have been exploited until 1962 and the rock was exported to Kenya. Subsequently it was displaced by mining from the Sukulu deposit with reserves estimated at 200 million tons of 12 to 15 per cent P_2O_5 ore together with magnetite and pyrochlore. At present opencast mining and beneficiation yield about 16,000 tons/year of concentrate containing approximately 40 per cent P_2O_5.

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This is subsequently used for the production of single superphosphate. It is planned to increase the output of the mine by improving mining methods. No firm decision has yet been taken.

Pyrites are said to exist at Kilombe, but no further details are known.

A few metals are exported on a small scale. In 1967 these were: beryl - 310 long tons, cassiterite - 143 long tons, and wolfram - 84 long tons.

There are considerable deposits of mineral salts in Lake Katwe, about 10,000 tons are recovered annually (i.e. sodium chloride, sodium carbonate and potassium chloride).

Among other minerals produced are tin, gold, bismuth, tungsten, limestone, tantalite and lithium. These are mined in small quantities by individual miners.

Fertilizer manufacture

There is a phosphate fertilizer plant in Uganda. Messrs. Tororo Industrial Chemical and Fertilizer Co., owned by Uganda Development Corporation, Falconbridge Nickel Mines, International Ore and Fertilizers Corporation and ICI, and operated by ICI to produce single superphosphate (21 per cent P_2O_5). Phosphate rock is supplied from the Sukulu mines and sulphur needed for the manufacture of sulphuric acid is imported (in a plant operating at its full design capacity of 14,000 tons of sulphuric acid annually). The plant has a rated capacity of 25,000 tons/year of single superphosphate and is operating at nearly its full capacity.

The Tororo plant has in recent years supplied the fertilizer blending plant in Nukuru, Kenya, with phosphate fertilizer and may enter into collaboration with 'Triangle Fertilizers' for manufacture of liquid mixed fertilizers in the future.

It is planned to expand production of phosphate fertilizers at the plant. Various possibilities have been considered. These include replacement of the existing sulphuric acid plant by a 60,000 tons/year plant based on pyrites from the Kilombe deposits (situated about 600 km by rail from Tororo) and production of a corresponding tonnage of triple superphosphate. Alternatively, after a recent study of the East African market, Imperial Chemical Industries advocates the production of NP fertilizers probably as ammonium phosphate. The outcome of these considerations is not yet known. For the purpose of this study it has been assumed that by 1975 the plant will be producing a total of 30,000 tons/year of P_2O_5 in some form. Any production of nitrogen fertilizers has been discounted for the purpose of this study.

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Present and projected fertilizer consumption

The consumption of fertilizers in Uganda in 1966/1967 was about 4,000 tons of nitrogen, 2,700 tons of P_2O_5 and 1,000 tons K_2O. A number of projections for the fertilizer demand in the period of 1970-1980 have been carried out, some of them recently. The projections of ECA (1965), UNIDO (1968), ICI (1968) and Klockner-Humboldt-Deutz (1966) are shown below in tons of nutrients:

1970		1975		1980	
N	P_2O_5	N	P_2O_5	N	P_2O_5
6,500	10,000	17,000	13,400	27,000	16,400
...	2,000	...	6,000	...	...
3,100	5,200	7,000	8,000	...	...
12,000 (1972)	-	19,000	...	...	...

The corresponding projections for K_2O are not available.

For the purpose of this study the projected demand for P_2O_5 as estimated by UNIDO has been adopted as it appears realistic at this stage. The rate of growth of nitrogen consumption has been taken as 20 per cent/year up to 1970 resulting in a projected consumption of 7,500 tons/year and 15 per cent/year between 1970 and 1975, resulting in a projected demand of 15,000 tons/year by 1975.

It is further assumed that the K_2O consumption will grow at a rate of 15 per cent/year throughout the period resulting in a demand of 1,500 tons in 1970 and 3,000 tons/year by 1975. This is in broad agreement with FAO, who estimates the N:P:K ratio in 1975 to be about 1:0.5:0.3.

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UNITED REPUBLIC OF TANZANIA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	1,300	4,000	8,000	15,000
	Production	-	-	-	8,500
	Deficit	1,300	4,000	8,000	6,500
	Surplus	-	-	-	-
P_2O_5	Consumption	800	1,000	3,000	7,000
	Production	-	-	-	30,000
	Deficit	800	1,000	3,000	-
	Surplus	-	-	-	23,000
K_2O	Consumption	500	2,000	3,500	5,500
	Production	-	-	-	-
	Deficit	500	2,000	3,500	5,500
	Surplus	-	-	-	-

General

The United Republic of Tanzania covers an area of about 939,767 km^2 and has a population of approximately 10.5 million. The annual rate of growth is estimated to be 2.2 per cent, the density of the population being about 11/km^2.

By an act of union signed by their respective presidents, the Republics of Tanganyika and Zanzibar united on 27 April 1964, forming the United Republic of Tanzania. In May of that year a five-year economic and social development plan was initiated. In the economic field the aim was to make Tanzania less dependent upon foreign imports, and to do this, numerous processing industries were developed including seven textile mills, an oil refinery and four factories for processing sisal. To help in these plans, loans were accepted from several countries, among them the Federal Republic of Germany, the German Democratic Republic, the United Kingdom and the USSR. Substantial financial aid also comes from AID, IBRD and IDA.

Agriculture dominates the economy, accounting for about 55 per cent of the country's GDP and about 80 per cent of the total value of exports. There is also an important livestock industry and mining production is well developed.

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The per capita income for the country as a whole is estimated to be about $78. Of the GDP at current factor cost ($770 million) agriculture accounted for about 53 per cent in 1966, manufacturing 5 per cent and mining 2.6 per cent. In the past five years the economy's growth has fluctuated on an average between 5 and 6.5 per cent/year (development was first slowed down by a bad crop in 1961, and then again following a drought in 1965, when the harvest in general and export prices for sisal fell drastically).

Agriculture

On the mainland about 47 million ha, i.e. about 50 per cent of the total area, is used for agriculture. However, almost two thirds of the country is not really suitable for agriculture because of poor soil, inadequate and unreliable rainfall or infestation with tsetse fly, and only 10 per cent of the country is well irrigated. On the whole the soils are poor, deficient in plant nutrients and affected by accelerated soil erosion.

The principal cash crops on the mainland are: sisal (Tanzania is the world's largest producer of sisal with 221,500 tons in 1966), cotton (77,600 tons), sugar (69,900 tons), coffee (48,600 tons), peanuts (81,700 tons), oilseeds (58,000 tons), tea (6,700 tons), pyrethrum (4,400 tons), wheat (32,800 tons), paddy (37,700 tons) and tobacco (5,200 tons). The projected production rates of the above crops in 1970 are: sisal (270,000 tons), cotton (81,000 tons), sugar (105,000 tons), coffee (49,000 tons), peanuts (85,000 tons), tea (10,500 tons), pyrethrum (5,500 tons), oilseeds (70,000 tons), wheat (30,000 tons), paddy (75,000 tons) and tobacco (5,600 tons).

Most of the cash crops are grown by non-Africans (Zanzibar and Pemba are the world's leading clove producers). Cloves are produced on an area of about 30,000 ha, the annual production averaging about 11,000 tons, of which more than 75 per cent originate from Pemba. Coconuts occupy about 65,000 ha, mostly on the island of Zanzibar, and rice is the main cereal grain.

Irrigation projects have been developed in the central part of the country Tanzania, and sugar production in Moshi and Kilombero Valley is expanding, reaching about 50,000 tons.

The co-operative movement is widespread, and value of produce thus handled is about 25 per cent of total value of exports.

Natural resources and industry

Diamonds account for about 65 per cent of value of the country's mineral output. Diamond deposits were discovered around Shinyanga, south of Lake Victoria in 1940 and by mid 1960s the mine at Mwadui was

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producing more than 800,000 carats annually. Exports rose from 515,000 carats in 1958 to 986,000 carats in 1967. A considerable amount of gold (exports amounting to 68,000 troy ounces in 1958 and 21,000 troy ounces in 1967), salt, mica, silver and tin concentrates (487 long tons) are also produced. Large deposits of iron ore and coal exist in the south-west near Lake Nyasa, but are difficult of access (at least 190 million tons of coal are considered recoverable). Production in the mid 1960s reached about 3,000 tons.

Deposits of pyrites with 30 per cent sulphur content have been found at Geita, but so far this has not been exploited.

There are modest quantities of lead concentrates, magnesite and tungsten mined. Deposits of beryl and titanic iron ores are also known to exist.

It is estimated that the country has about 10 million tons of phosphate reserves at Jingu Hills with about 20 per cent P_2O_5 content. These deposits are being investigated.

Production of salt rose from 11,600 tons in 1948 to 33,900 tons in 1963, exports rising from 9,000 tons in 1958 to 11,000 tons in 1967.

Relatively large deposits of gypsum are also exploited. Sodium silicate and sodium sulphate are also produced.

Exploration work is being carried out to prove the presence of oil in commercial quantities on Mafia Island. A petroleum refinery has been in operation since 1967 in Dar-es-Salaam owned by Tanganyikan Italian Petroleum Co. (TIPER), refining imported crude with a capacity of 600,000 tons/year. (A pipeline to take the product from the refinery to Zambia was finished late last year.)

The estimated exploitable potential of hydroelectric power is 75 million kWh/year according to ECA. The major hydroelectric installations include one at Pangani Falls (17.5 MW), and Hale Station on Pangani River (21.5 MW). The latter, completed in 1964, has a transmission line to provide Dar-es-Salaam with virtually all its needs, and 33 kW lines run east from Hale to Tanga and other coastal lines.

Fertilizer manufacture

At present there is no production of fertilizers in the country. A decision has recently been taken to construct a fertilizer plant, probably at Tanga. The plant will be based initially on imported ammonia from the Gulf area, sulphur and potassium chloride, and imported phosphate rock, which could subsequently be supplied from the deposits at Jingu Hills. The rated capacity is believed to be as follows: (a) 20,000 tons/year ammonium sulphate; (b) 15,000 tons/year diammonium phosphate; (c) 25,000 tons/year triple superphosphate; (d) 45,000 tons/year of NPK compound fertilizers; and the corresponding production facilities for sulphuric and phosphoric acids.

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It is understood that when in full production the plant will require the following quantities of imported feedstocks: 100,000 tons/year of phosphate rock, 14,000 tons/year of calcium chloride, 30,000 tons/year of sulphur and 11,500 tons/year of ammonia. This is equivalent to a production of approximately 33,000 tons/year of P_2O_5 and 9,500 tons/year of nitrogen. It is believed that the plant will be in operation by 1971.

For the purpose of this study it is assumed that the plant will be operating at 90 per cent of its rated capacity in 1975.

Present and projected fertilizer consumption

The consumption of fertilizers in Tanzania in 1966/1967 was about 5,000 tons of nitrogen, 1,300 tons of P_2O_5 and 12,500 tons K_2O. Several projections have been carried out in the past giving the estimated consumption of fertilizers in 1970-1980. The estimates by ECA, UNIDO, ICI and Klockner-Humboldt-Deutz, are given below in tons of nutrients:

	1970		1975		1980	
	N	P_2O_5	N	P_2O_5	N	P_2O_5
ECA	8,100	10,600	14,600	18,500	21,000	25,000
UNIDO	5,500	2,500	9,500	8,000	...	...
ICI	...	2,900	...	7,200	...	...
KHD	13,000 (1972)	...	15,000	...	...	...

The corresponding data for K_2O are not available. For the purpose of this study the following projections have been adopted: nitrogen as estimated by ECA, i.e. 8,000 tons in 1970 and 15,000 tons in 1975; P_2O_5 as estimated by ICI, i.e. 3,000 tons in 1970 and 7,000 tons in 1975; K_2O assuming an annual growth rate of 10 per cent/year, i.e. 3,500 tons in 1970 and 5,500 tons in 1975.

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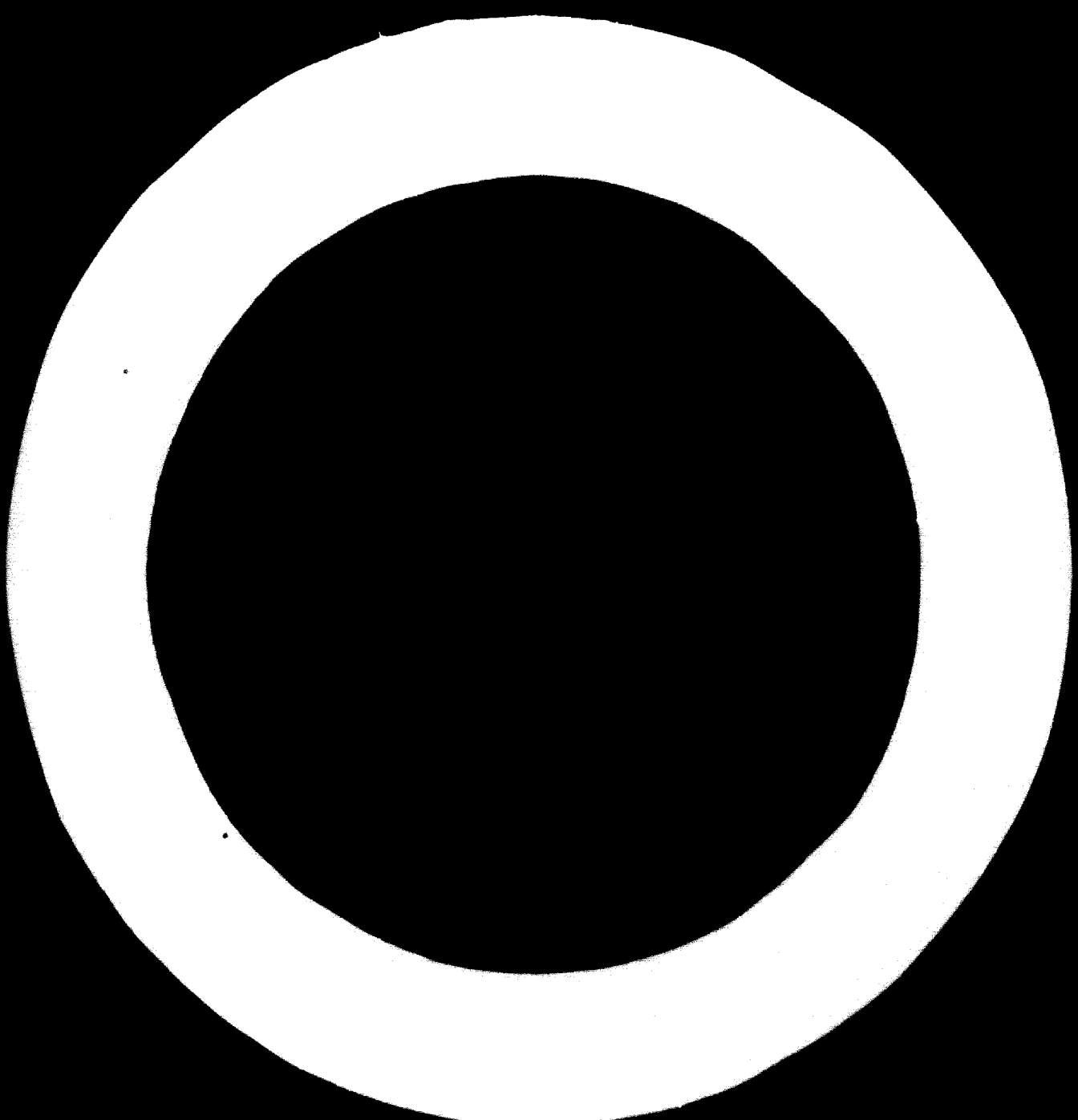

EAST AFRICA

ZAMBIA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	...	11,200	15,000	21,700
	Production	...	-	8,000	16,000
	Deficit	...	11,200	7,000	5,700
	Surplus	...	-	-	-
P_2O_5	Consumption	...	5,300	6,700	9,500
	Production	...	-	-	-
	Deficit	...	5,300	6,700	9,500
	Surplus	...	-	-	-
K_2O	Consumption	...	2,400	2,900	4,100
	Production	...	-	-	-
	Deficit	...	2,400	2,900	4,100
	Surplus	...	-	-	-

General

Zambia covers an area of 752,600 km^2 and has a population of about 3.8 million (mid June 1966), out of which 98 per cent are Africans. The annual rate of growth is estimated to be 2.8 per cent, and the density of the population 50/km^2.

Although agricultural production contributes less than 10 per cent of total GDP at factor cost, over 80 per cent of the population derive their livelihood from the land. Copper dominates Zambian economy, producing nearly half the GDP and two thirds of government revenues and comprising over 90 per cent of exports. The total GDP in 1966 at factor cost was $900 million, and *per capita* GDP $240.

Apart from copper and a few less important minerals, Zambia is an agricultural country. Many of the northern provinces have poor soil fertility, sparse population and therefore very low production. Zambia is still handicapped by shortage of education, trained and experienced personnel and all sectors of the economy are therefore still heavily dependent on expatriate skills.

Development of alternative transport routes to reduce Zambia's dependence on route via Rhodesia to Beira has had top government priority since UDI. The North Road to the Tanzanian port of Dar-es-Salaam has been the main alternative route chosen and is being reconstructed and resurfaced along its entire

ZAMBIA

length. An agreement has also been reached to construct a railway linking the existing line to the Copperbelt, to Dar-es-Salaam. (The road link, which carries more than 30,000 tons of Zambia's annual petrol imports, is occasionally flooded by heavy rains.)

Agriculture

The country has vast potential for the development of agriculture, on which the majority of the population still depends for subsistence. So far, agriculture concentrates on the production of foodstuffs, principally maize for local consumption, and cash crops like tobacco, cotton and ground-nuts for export. Cultivation of sugar-cane has been introduced to make the country self-sufficient in sugar in the next few years. In the Copperbelt area eucalyptus and pine have been planted to provide timber for use in the mines and in the construction industry.

Tobacco is the major agricultural export crop, accounting for more than 60 per cent of the foreign exchange earnings by the agricultural sector. Zambia's tobacco is of good quality, but output has been declining since independence. The production in 1967/1968 is estimated at 6,800 tons.

Until last crop season, the maize production at about 400,000 tons was not always sufficient to cover home consumption and some maize had to be imported.

Ground-nuts are grown in most areas of Zambia, but the bulk of the export crop is grown in the Eastern province. Production fell by about 8,200 tons in 1967, but there has been a recovery to about 18,200 tons by 1968. There is also a growing domestic demand by the edible oil industry, but the type of nuts currently being grown do not have a high oil content, and consequently prices have been low. (There are plans for obtaining and planting varieties with higher oil content.)

Cotton is concentrated mainly in the southern and central provinces; it has increased at a very rapid rate, from 21 tons in 1961 to over 2,700 tons in 1966. (This increase has come entirely from African farmers, since European farmers had virtually ceased to grow this crop.)

Natural resources and industry

Zambia is the world's third largest producer of copper. Output of this metal in 1968 was 645,000 short tons, mainly electrolytic. Other minerals include zinc - 41,000 tons, lead - 18,500 tons, manganese - 26,300 tons and cobalt - 1,600 tons.

ZAMBIA

Coal production was started in 1966 and 440,000 tons were produced in 1967; total reserves are estimated at 17 million tons.

Systematic prospecting continues in the Copperbelt area, to the north-west and south-west of the Copperbelt and Luapula River. All but about 5 per cent of the territory is held by companies under exclusive prospecting rights. Total value of all minerals produced in the late 1960s was over $509,600,000 annually. The Copperbelt is the second largest source of copper in the world after the United States.

Transporting finished copper out of Zambia presents difficulties and various emergency routes have to be used. Exports through the Congo have now reached a level of 14,000 short tons per month. About 20,000 tons go out of the country in empty petrol tankers, which bring fuel by road to Zambia from Dar-es-Salaam.

Fertilizer manufacture

At present there is no manufacture of fertilizers in Zambia. Plans for the construction of a nitrogen fertilizer plant based either on the supply of cheap electric power from the Victoria Falls or from Kariba Dam or using coal, were considered jointly with Japanese Kobe Steel. This has now been resolved and a plant is in construction at Kafue for the production of about 26,000 tons of nitrogen as ammonium nitrate, including plants for the production of ammonia from local coal and of nitric acid. The plant is owned and operated by Nitrogen Chemicals of Zambia Ltd. (eighty per cent owned by the Industrial Development Corporation of Zambia and 20 per cent by Kobe Steel) and it is understood that it is to be completed in 1970. About 70 per cent of the output will be used for fertilizer purposes, and the balance as explosives. For the purpose of this study it has been assumed that the plant will be operated at 90 per cent of its rated capacity in 1975 to supply the domestic market as it is unlikely that the production can compete on the world markets or even in the neighbouring countries.

Projected fertilizer consumption

A number of estimates have been made of the projected fertilizer consumption in 1970 and 1975. The projections by ECA, UNIDO and by the Zambian authorities (IDC) are given below in tons of nutrients:

	1970		1975		1980	
	N	P_2O_5	N	P_2O_5	N	P_2O_5
ECA	17,700	8,100	...	...	46,000	21,000
UNIDO	15,200	7,100	22,700	10,600	...	...
IDC	15,100	6,700	2,900	21,700	9,500	4,100

ZAMBIA

For the purpose of this study estimates by the Industrial Development Corporation of Zambia Ltd. which are based on a more recent study of the market have been adopted.

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SOUTHERN REGION

ANGOLA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	500	2,800	8,000	16,000
	Production	-	-	-	-
	Deficit	500	2,800	8,000	16,000
	Surplus	-	-	-	-
P_2O_5	Consumption	100	700	1,500	4,000
	Production	-	-	-	-
	Deficit	100	700	1,500	4,000
	Surplus	-	-	-	-
K_2O	Consumption	negl.	negl.	500	1,500
	Production	-	-	-	-
	Deficit	negl.	negl.	500	1,500
	Surplus	-	-	-	-

General

Angola is Portugal's largest overseas province, covering an area of about 1,246,700 km^2. The population is approximately 5 million with an annual rate of growth estimated to be 2 per cent, and a density of population of about 4/km^2 (varying from only 1/km^2 in some areas, to 18/km^2 in others).

The majority of the population are agriculturally employed on a subsistence level. Mining also employs many, though the province has to rely on immigrants to complement its deficiency in labour.

The economy of the country is based on agriculture, mainly on the primary activities, accounting for about 60 per cent of total exports. Angola is the foremost producer and exporter of coffee in Africa (36 per cent of total exports) with 156,412 tons in 1966. Other principal export products are sisal accounting for 8 per cent, maize 6 per cent, diamonds 17 per cent, iron ore 4 per cent and crude oil.

Great emphasis has recently been put on the production of the extractive industries. Crude oil has been discovered in deposits that guarantee economic rates of production, and considerable reserves of manganese, limestone, phosphates, salt and mica have also been found.

Recently efforts have been made to extend and improve agricultural land, mainly by irrigation benefiting the production of cereals, cotton, tobacco and sisal.

ANGOLA

According to the register of Direçao dos Serviços de Economia, there were a total of more than 3,000 industrial establishments in 1961, employing about 62,000 people on a permanent basis.

About one third of the total trade is with Portugal, which provides about 50 per cent of the imports, and purchases 20 per cent of the exports. Annual value of total exports by 1960 totalled over $112 million.

Agriculture

The coast is rich in oil palms and mangroves. The northern region is covered with dense forests, some of which contain valuable timber. Rubber trees are abundant, but the yield of rubber has been reduced by ruthless tapping.

Angola is among the principal coffee producing countries in Africa, and has doubled production in the last decade to about 120,000 tons/year. Among the other agricultural products of importance are, cotton-seed with about 15,000 tons/year, palm kernels - 15,000 tons/year, palm oil - 10,000 tons/year, sugar - 75,000 tons/year and sisal - 50,000 tons/year. Wheat, some tobacco and cocoa are also produced.

There is excellent grazing land in many parts of Angola but the tsetse fly is prevalent in many districts.

Natural resources and industry

There are thick beds of copper (probably outcrops forming part of the deposits in Katanga, the Democratic Republic of the Congo), which are found in the Bembe region in the north and also in other districts.

Iron is mined in many parts of the country, principally at Oeiras in the south. It is believed that about 8 million tons of ore are available, and production is expanding. Salt is worked in several places along the coast and production of salt increased from 63,400 in 1948 to 68,600 in 1963. Gold occurs near the source of the Cunene River, and coal reserves are in several places, total reserves estimated at about 8 million tons. Most of the coal produced is exported. There are also some deposits of mica, manganese and other minerals.

Crude oil reserves including those of the recently discovered rich Cabinda deposits are estimated at about 300 million tons (according to the International Financial News Survey, Vol.19, September 1967). The Cabinda crude is of very low sulphur content with average gravity varying between 26^{0} and 36^{0} API. Crude production started in 1956 and expanded rapidly from 67,000 tons in 1960 to over 900,000 tons in

1964, subsequently falling in 1965 to about 640,000 tons/year. The production is refined locally. Production of oil from tar sands has been investigated since 1967 and plans are being made to set up a pilot plant to process up to 100,000 tons/year of tar sands.

A refinery in Mulemba was opened in 1958 with an initial capacity of 100,000 tons/year of crude.

Phosphate rock deposits have been discovered in Cabinda and are being investigated by the Companhia de Fosfatos de Angola in co-operation with Pickands Mather and Co. of Ohio, United States. Preliminary exploration indicates reserves of 40 million tons of rock of up to 24 per cent BPL.

Deposits of sulphur have been discovered in the Benguela Basin in the south-west coast region by Tenneco Angola Inc., a subsidiary of Tenneco Oil Co.

Much effort has been directed to the development of electric power resources. The annual exploitable hydroelectric power potential in Angola has been estimated at 250 billion kWh.

The industrial sector includes production of pulp and paper and cement.

Fertilizer manufacture

At present there is no fertilizer industry in the country. Although the internal market requirements in the near future are likely to remain limited it is possible that, due to the potential availability of the fertilizer raw materials including hydrocarbon feedstocks within the country, at least one of several plans for the establishment of a fertilizer plant may materialize.

Present and projected fertilizer consumption

The present consumption of fertilizers in Angola remains very low. In 1966/1967 the demand in terms of nutrients was about 4,000 tons of nitrogen and 800 tons of P_2O_5. No estimates of the projected demand for 1970 and 1975 are available. For the purpose of this study the following average rates of growth of demand have been adopted:

N - 20 per cent/year during the period to 1970 followed by
15 per cent/year during the period up to 1975

P_2O_5 - 15 per cent/year during the period up to 1975.

ANGOLA

This assumes that the local demand for fertilizers will be stimulated by the development of the fertilizer raw materials production. On the above basis the projected consumption of fertilizer nutrients in tons has been estimated as follows:

	1970	1975
N	8,000	16,000
P_2O_5	1,500	4,000
K_2O	500	1,500

The projected consumption of K_2O is likely to remain relatively low.

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SOUTHERN REGION

BOTSWANA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	1,000	2,000	3,000	5,000
	Production	-	-	-	-
	Deficit	1,000	2,000	3,000	5,000
	Surplus	-	-	-	-
P_2O_5	Consumption	100	100	500	1,500
	Production	-	-	-	-
	Deficit	100	100	500	1,500
	Surplus	-	-	-	-
K_2O	Consumption	negl.	negl.	100	500
	Production	-	-	-	-
	Deficit	negl.	negl.	100	500
	Surplus	-	-	-	-

General

Formerly Bechuanaland, Botswana covers an area of about 570,000 km^2, and has a population of 576,000 (1966), including some 4,000 Europeans (mostly farmers and concentrated in 'blocks' covering about 19,500 km^2). The density of population is about 1/km^2, and the annual rate of growth is estimated to be at least 3 per cent.

The majority of the people are agriculturally employed, living in large central villages. The most fertile area, inhabited by some 80 per cent of the population comprises the central watersheds, and there is just sufficient rainfall for the growing of food crops, and ample grass of good feeding quality. The Kalahari is very sparsely populated with only approximately 6,000 bushmen.

The economy of the country is mainly based on crop and cattle raising with the emphasis on the latter.

Because of lack of industries, migrant workers (nearly 3,000 in 1965) go to South Africa to work in mining and agriculture. Exports go to South Africa, Rhodesia, Zambia and the Democratic Republic of the Congo. The 1963-1968 development plan's main objects were the development of an urban sector at Gaberones equipped with basic services capable of expansion, around which commercial and industrial development

BOTSWANA

could take place. The plan includes measures to develop the economic infrastructure of the country, in particular improvement and expansion of communications and water and power supplies and encouragement of private enterprises (particularly of African yeomen farmers), and schemes to increase the national revenue and thus lay the foundations of economic viability of the country; i.e. modernization and expansion of the agricultural and livestock industries, and of exploitation of mineral resources. Botswana is receiving substantial financial aid from the United Kingdom.

Agriculture

With scanty rainfall and poor methods of cultivation, agriculture among the Africans is limited to subsistence crops, i.e. maize, sorghum, peanuts and tobacco. About 33 per cent of the population is employed in this sector.

At present cereals and sugar have to be imported. There is an agricultural experimental station at Mahalapye and some agricultural extension work is being carried out. There is also an irrigation scheme at Mogobane, and an increasing number of boreholes are being established where supplies of water are adequate.

There are some 1.3 million cattle in the country and the resulting end-products are among the chief export commodities.

Natural resources and industry

There are several mineral resources in the country, among these: export of manganese and asbestos earned Botswana about $364,000 annually in the 1960s. In 1964 production of manganese ore amounted to 23,041 short tons, asbestos to 1,774 short tons. Production of gold and silver in 1964 amounted to 142 oz. No known deposits of indigenous fuel or fertilizer raw materials exist.

Fertilizer manufacture

There is no fertilizer production in Botswana and there is no prospect of this situation changing during the foreseeable future.

BOTSWANA

Present and projected fertilizer consumption

The consumption of fertilizers in Botswana is very low. The consumption of nitrogen increased from about 1 ton in 1956/1957, 1,000 tons in 1961-1967 to 2,000 tons in 1966/1967 (i.e. at an average rate of growth of 15 per cent/year during 1961-1967). The consumption of P_2O_5 remained static at about 100 tons/year during the period 1961-1967.

No estimates of the projected fertilizer demand in 1970 and 1975 are available. For the purpose of this study the following projections in tons of nutrients have been adopted:

	1970	1975
N	3,000	5,000
P_2O_5	500	1,500
K_2O	100	500

Sources

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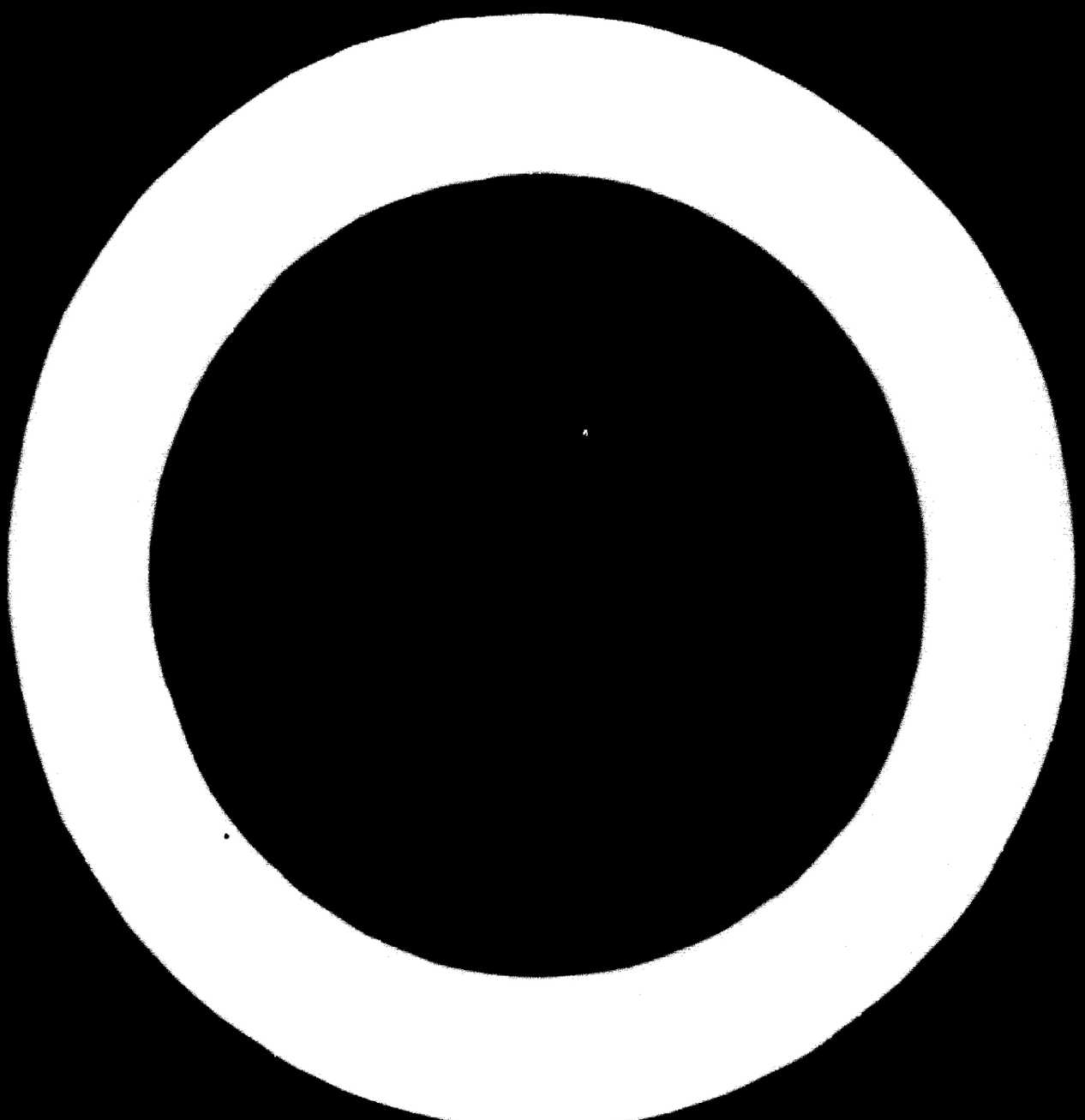

SOUTHERN REGION

LESOTHO

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	negl.	negl.	100	300
	Production	-	-	-	-
	Deficit	negl.	negl.	100	300
	Surplus	-	-	-	-
P_2O_5	Consumption	negl.	500	1,000	2,000
	Production	-	-	-	-
	Deficit	negl.	500	1,000	2,000
	Surplus	-	-	-	-
K_2O	Consumption	negl.	negl.	50	100
	Production	-	-	-	-
	Deficit	negl.	negl.	50	100
	Surplus	-	-	-	-

General

Formerly Basutoland, Lesotho became an independent monarchy within the British Commonwealth of Nations in 1966.

An enclave within South Africa, Lesotho covers an area of about 30,344 km^2. The population is more than 740,000 (1965), out of which about 2,000 are Europeans. The annual rate of growth is estimated to be almost 3 per cent. The average population density is 25/km^2 (77 in some places and exceeding 116 in others). Some 155,000 were absentees in South Africa (1965).

Lesotho's economy is entirely dependent on that of South Africa, and without the remittances of migrant Basuto workers (about 40 per cent of the adult population), employed mainly in mining and agriculture in South Africa, the country's precarious economic position would be even more difficult. Per capita income is estimated to be as low as $60, the GDP being about $50 million.

Lesotho has no industries. Agriculture is the predominant activity of the country, purely on a subsistence level, but it is not sufficient to meet the country's demands as recurring droughts, poor soil, communal tenure and inadequate farming methods have made it necessary to import maize, the staple

LESOTHO

diet of the country. In 1954, 9,000 tons of maize had to be imported, but by 1962 this figure rose to 19,000 tons, and due to devastating droughts in 1964/1965 import figures were even higher.

Principal imports, absorbing 40 per cent of domestic expenditure and 60 per cent of expenditure in the money economy (this large deficit being mainly covered by workers' remittances and United Kingdom aid), are food, drink and tobacco. Principal exports are wool, mohair and diamonds.

Lesotho has good water resources, which could be developed to serve the country's own needs and those of South Africa. At present the economic development should be directed to the expanding and diversifying of agriculture and pastoral production and to a more efficient exploitation of diamonds.

Agriculture

This sector of the economy provides the means of livelihood for about 85 per cent of the population. The arable area available is less than 405,000 ha, i.e. about 14 per cent of the total area of the country. Continuous cropping of the arable land, as well as the population's fast rate of growth, bringing increasing pressure on the country's limited land resources has caused soils to become deficient in organic matter and phosphorus, and consequently crop yields are very low. Only a small proportion of land has so far been protected against soil erosion by means of terracing, and training of banks and grass strips. Efforts are being made to secure the general introduction of rotational grazing in the mountains.

Maize, the country's principal crop, taking up almost two thirds of the arable land, is the most important staple food, supplemented by wheat and sorghum. The average maize yields are about 674 kg/ha; yields of sorghum and wheat are estimated to be about the same.

The villagers are also encouraged to grow vegetables. In 1936 there were 800 vegetable gardens under supervision of field demonstrators, increasing by mid 1960s to about 30,000.

Apart from subsistence agriculture, stock raising is important, almost 70 per cent of the population being owners of livestock. (The 1965 census recorded 346,000 cattle, 1.66 million sheep and 877,000 goats.) In 1963 the imported livestock was valued at $840,000 and the combined wool, hides and livestock exports were $10.26 million.

Agricultural research, absorbing less than 5 per cent of total government expenditure in 1966/1967 is conducted at Maseru Experimental Station. Emphasis has been on variety trials, soil fertility and fertilizer application, rotation problems and irrigation practices. Although useful work has been accomplished, resources allocated to agriculture are far from adequate in relation to need. (Fertilizer

used in 1965 amounted to only 3,000 tons, while improved seed in relation to the total used, was estimated at only 0.5 per cent./

Natural resources and industry

A number of mineral surveys have been made in Lesotho, and the search for diamonds in particular has been comprehensive. Until now, only diamonds have been found in quantities offering a prospect of commercial exploitation.

Fertilizer manufacture

There is no fertilizer industry in Lesotho and due to a very limited market potential and lack of indigenous raw materials the situation is unlikely to change in the foreseeable future.

Present and projected fertilizer consumption

The consumption of fertilizers in 1966/1967 was equivalent to about 50 tons of nitrogen, 600 tons of P_2O_5 and 10 tons of K_2O representing about 1.5 kg of nutrients/ha of arable land. No projections for the fertilizer demand in 1970 and 1975 are available, but it can be assumed that it will remain relatively limited. For the purpose of this study the following projections in tons of nutrients have been adopted based on average annual rates of growth of fertilizer demand of 25 per cent for nitrogen and 15 per cent for P_2O_5 and K_2O during the period of up to 1975, resulting in the following figures:

	1970	1975
N	100	300
P_2O_5	1,000	2,000
K_2O	50	100

Sources

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SOUTHERN REGION

General

Namibia covers an area of about 823,000 km^2, and has a population of approximately [illegible], of which some 73,500 are Europeans and 453,000 Africans.

Namibia is the territory of South Africa that came into being as a German protectorate in 1890 and developed under German rule until it was invaded by the forces of the Union of South Africa in 1915.

It is essentially a stock-raising country, scarcity of water and poor rainfall rendering agriculture, except in the northern and north-eastern parts, almost impossible; and even there only vegetative types adapted to extreme droughts will survive. Mining contributes considerably to the economy of the country. Data are not available, since they are incorporated in official statistics of the Republic of South Africa.

Agriculture

There is little crop cultivation except in the northern and north-eastern areas, where the rainfall is just sufficient in most years for the growing of subsistence crops (i.e. maize and sorghum) varying from 1,000 tons to about 2,700 tons/year. Roughly the same amount of wheat is produced under irrigation.

The territory is mainly pastoral with the livestock estimates at about 2.4 million cattle, 3.7 million sheep and some 1.5 million goats. Pelts of newly born Karakul lambs are among the most valuable of the territory's exports, at an average annual value exceeding $36 million.

Natural resources and industry

Diamonds are the most valuable product of this sector. These are found along the coastal strip and off shore between Luederitz and the mouth of the Orange River. The principal fields are now the Oranjemund diggings along the coast for about 100 km north of the Orange River. Annual production amounts to about 1.5 million carats of which about 98 per cent are gem stones and the remaining 2 per cent industrial stones, the annual value being about $84 million.

At the Tsumeb mine various minerals are being exploited, the annual production being: 30,000 tons of blister copper, 45,000 tons of refined lead, 100,000 tons lead, lead-vanadium and lead zinc ores, with 16,000 lbs of germanium dioxide. The total annual production is valued at about $43.4 million.

Tin and tungsten concentrates from the vicinity of the Erongo mountains and the Brandberg vary in quantity from about 450 tons to about 1,500 tons/year.

NAMIBIA

Salt is an important mineral from the coastal pans, production of coarse and refined salt being about 100,000 tons/years. Among other minerals produced are lithium, beryl and sillimanite ores.

Fertilizer manufacture

There is no fertilizer industry in existence in Namibia and the data referring to the consumption of fertilizer and future demand are incorporated in the data on South Africa.

Sources

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SOUTHERN REGION

SOUTH AFRICA

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	45,000	98,500	180,000	300,000
	Production	22,000	75,000	325,000	500,000
	Deficit	23,000	23,500	-	-
	Surplus	-	-	145,000	200,000
P_2O_5	Consumption	144,000	190,000	360,000	500,000
	Production	136,000	184,000	360,000	500,000
	Deficit	8,000	5,500	-	-
	Surplus	-	-	-	-
K_2O	Consumption	33,000	75,600	140,000	200,000
	Production	-	-	-	-
	Deficit	33,000	75,600	140,000	200,000
	Surplus	-	-	-	-

General

The Republic of South Africa covers an area of about 1.2 million km^2, and has a population of approximately 18.5 million with an estimated annual rate of growth of 2.5 per cent. Seventy per cent of the country's population consists of various African tribes (Bantu), and about 20 per cent are Europeans, the rest being a population of Asian and racially mixed origin. The Government practices a policy of apartheid, promoting economic and social separation of racial groups and prohibiting social interracial relations.

The Republic of South Africa was established in 1961, following the withdrawal of the former Union of South Africa from the British Commonwealth. The economy of the country has been expanding rapidly since the Second World War and it has developed to the extent that manufactured goods now contribute a higher value to the GDP than either mining or agriculture. (In 1965 GDP was $9,600 million, of which it has been estimated that manufacturing contributed about 21 per cent, mining and quarrying 13 per cent, and agriculture, forestry and fishing 10 per cent.) South Africa is trying to achieve economic self-sufficiency by 1970, which should be possible due to the country's great potential agricultural and mineral wealth. Most of South Africa's domestic agricultural and mineral requirements with the exception of petroleum, can normally be supplied from within the country.

SOUTH AFRICA

Agriculture

South Africa produces sufficient food-stuffs to meet domestic requirements, with the exception of wheat. Limited rainfall and infertile soil restrict the areas suitable for crop production. The total arable land is about 15 per cent of the whole area. Because of this, South Africa is predominantly a livestock raising country with large individual farming units, and husbandry contributes about 50 per cent of the total annual gross value of agricultural production. It is the world's fourth largest producer of wool (160,000 tons in 1965/1966), and an important supplier of dairy produce. It is the world's third largest producer of maize, with a cultivated area of about 40 per cent of total arable area and a production in 1965/1966 of about 5 million tons. Wheat production in 1965/1966 was about 700,000 tons, but it is still necessary for South Africa to import part of its requirements from Canada and the United States. Other major agricultural products include sugar (900,000 tons in 1965/1966), peanuts and other oil seeds, oats, barley, rye, potatoes, tobacco (20,000 tons), fruits, vegetables and cotton.

South Africa is the largest producer of fish in the southern hemisphere and the largest fish exporter of the world. Forestry products including paper and wood fabrication account for about $90 million of industrial output and are expected to expand in the near future.

Natural resources and industry

South Africa is very rich in mineral resources and ranks among the world's leaders in the production and available reserves of gold, diamonds, platinum, uranium, coal, iron ore, chrome, copper, manganese, asbestos, antimony and corrundum.

South Africa's gold production, about 70 per cent of total world output, was about 30 million fine ounces in 1965. (The industry employed about 400,000 persons in the mines.) At present it is suffering from increasing production costs and the future of the industry is uncertain. However, due to the discovery of uranium and other radioactive materials in the gold-bearing ores, the country emerged in 1952 as a major uranium producer, second in the volume of reserves to Canada. The production during the period 1960-1965 fluctuated between 2,500 and 6,000 tons/year. Although other African countries now lead in output of industrial diamonds, South Africa is still the world's top producer of gem quality stones. The most important deposits are located in Kimberley, Pretoria, Jagersfontein, Koffiefontain and Postmasburg, and more recently off-shore operations have been started off the coast of Cape Province and Namibia. The total annual production is of the order of 5 million metric carats.

Coal reserves in the east and south Transvaal, Natal and the north of the Orange Free State are estimated at about 60,000 million tons and are among the most extensive in the southern hemisphere. The production in 1966 was about 50 million tons, most of which was consumed within the country and the output is expected to increase to 70 million tons/year in the 1970s. As the country has not as yet been successful in discovering significant crude oil or gas reserves, it has to import all its crude oil requirements. For this reason a plant was established in 1955 to produce oil from coal, owned and operated by the South African Oil, Coal and Gas Corporation (SASOL) at Sasolburg. This complex is producing 50 million gallons/year of motor gasoline in addition to other petroleum products (equivalent to about 10 per cent of South Africa's motor spirit requirements) and has captive petrochemical plants at present undergoing expansion.

Considerable efforts have been made to discover indigenous reserves of crude oil and gas. At present Southern Oil Exploration Corporation (SOEKOR) are carrying out exploration of an area of 100,000 km^2 in the northern Karoo Basin between Bloemfontein, Lesotho and Pietermaritzburg (Natal). Exploration is also being carried out by Midlands Oil, west of Mossel Bay (Cape Province) and by Gulf Eastern Oil in northern Zululand. No definite finds have been reported. Shell BP are planning to commence in- and offshore aerial surveys in Namibia.

Natural gas has been discovered 60 km off shore, 250 km west of Port Elisabeth by Superior Oil, operating on behalf of a consortium of Highland Oil, Tenneco, Cities Service and Superior Oil.

Other important mineral deposits are: platinum (at Rustenburg in the Transvaal with a production of about 50 per cent of world's supply), copper (producing about 80,000 tons/year), iron ore (with reserves of high-grade and medium-grade ores also in the Rustenburg area, totalling about 3,000 million tons, and with a production of about 6,000 tons in 1965). Manganese reserves are estimated at 50 million to 100 million tons at Postmasburg and Kingersdorp (Transvaal), with a production of about 1.8 million tons in 1965. Other minerals produced include chrome ore (1 million tons/year), tin (3,000 tons of concentrates/year), asbestos (220,000 tons/year), vanadium (2,500 tons/year), vermicullite (120,000 tons/year), silver (3 million fine ounces in 1965), iron pyrites (450,000 tons/year) and salt.

There are several deposits of pyrites in the country, the production remaining constant at about 190,000 to 210,000 tons/year during 1966/1968. A new pyrites mine is being developed in the northern part of Cape Province by ISCOR with the production capacity of about 60,000 tons/year of ore with 40 per cent sulphur content. Production of sulphur in other forms (as recovered sulphur) was 83,000 tons in 1967 and 35,000 tons in 1968. The balance of the country's sulphur requirements was imported (170,000 tons in 1968, mainly from Canada and France).

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The country is a producer of phosphate rock from deposits mainly at Phalaborwa (Transvaal) and also at Langebaan (Cape Province) with a production reaching 1 million tons of rock in 1966. The operating company is the Phosphate Corporation (FOSKOR).

The natural resources of South Africa form the basis of a widely diversified manufacturing industry, which is expanding fast and includes metallurgy (including iron and steel), oil refining, chemicals, heavy engineering and machinery, textile, pulp and paper, rubber, construction materials, food processing and other sectors.

Fertilizer manufacture

There are several fertilizer manufacturing plants in South Africa in a number of locations.

The world's largest oil from coal production factories operated by the South African Coal, Oil and Gas Corporation (SASOL) at Sasolburg, Orange Free, has already been mentioned. The emphasis is now placed on the production of petrochemical intermediates, rather than motor fuels, including ammonia, ethylene, propylene, butadiene, styrene, phenols, aromatics, alcohols etc. A number of fertilizer manufacturing plants are either directly or indirectly based on this operation. The fertilizer plants operated by SASOL include:

(a) 60,000 tons/year synthetic ammonia plant. (In addition about 30,000 tons/year of by-product ammonia is recovered. It is planned to extend the ammonia production factories by 200,000 tons/year in 1972);

(b) 30,000 tons/year ammonium sulphate plant, which is planned to be expanded to 60,000 tons/year by 1969/1970;

(c) 25,000 tons/year nitric acid plant (1966);

(d) Other plants in operation since 1964 include the production of calcium ammonium nitrate, ammonium nitrate solutions. The output from these plants is supplied to Fisons (Pty) Ltd., Optima Fertilizers (Pty) Ltd., Triomf Fertilizers and Chemical Ind. Ltd., and Omnia Farmers Services (Pty) Ltd., for compounding and distribution.

African Explosives and Chemical Industries Ltd. operate fertilizer production facilities at Modderfontein, Umbogintwini and Somerset West in South Africa and in Rodia (Rhodesia). The company is owned by Imperial Chemical Industries of the United Kingdom (42.5 per cent), De Beers (42.5 per cent) and public shareholders (15 per cent).

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The major plants operated by the company are as follows:

(a) Modderfontein near Johannesburg - This complex, which constitutes the largest explosives plant in the world, includes units for the production of:

(i) About 140,000 tons/year synthetic ammonia;

(ii) 100,000 tons/year of nitric acid (plant completed in 1968) in addition to two smaller units commissioned in 1956 and 1958 respectively;

(iii) 110,000 tons/year of urea (1960);

(iv) 60,000 tons/year P_2O_5 as phosphoric acid;

(v) Plants for the production of ammonium nitrate, sulphuric acid, single superphosphate, ammonium sulphate and NPK fertilizers.

(b) Umbogintwini near Durban - The following plants are in operation:

(i) A plant for the production of 200,000 tons/year of ammonia based on refinery off-gas and naphtha from Mobil and Shell refineries in Durban, completed in 1967;

(ii) A plant for the production of 190,000 tons/year of urea;

(iii) Plants for the production of single superphosphate and NPK fertilizers. Part of the urea output will feed a 40,000 tons/year biuret plant (protein substitute for cattle feed) and attempts are being made to export part of the urea production to the Far East, South America, Canada and Europe. The excess ammonia not captively used will be shipped to the company's plants in Modderfontein, and possibly to the Matola fertilizer plant in Mozambique. A large proportion of the ammonia output by the company is used for the manufacture of ammonium nitrate based explosives.

(c) Somerset West (Cape Province) - This is the second largest explosives factory in South Africa and the plants in operation include sulphuric-acid and nitric-acid (10,000 tons/year) plants. A plant for the production of phosphoric acid (33,000 tons/year of P_2O_5) will be completed by 1970, and the output will be used for the production of single superphosphate and mixed (NPK) fertilizers.

Fisons (Pty) Ltd. operate the following fertilizer plants:

(a) Sasolburg - Plants for the production of sulphuric acid (75,000 tons/year) single and triple superphosphates and mixed (NPK) fertilizers. Raw materials for these plants include phosphoric acid from the Bosveld Kunsmis plant, phosphate rock from the Phalaborwa (FOSKOR) mines and ammonia from the Fisons Milnerston plant.

(b) Milnerston (Cape Town) - Plants for the production of 100,000 tons/year ammonia (completed in 1966), based on refinery off-gases and naphtha from the adjacent Caltex refinery, 100,000 tons/year of nitric acid, ammonium nitrate (26 per cent N), and ammonium nitrate slurry (total capacity about 110,000 tons/year in 1967 to be increased to 200,000 tons/year).

(c) Muils Rivier (Cape Province) - An NPK granulating plant is in operation at this location.

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Triomph Fertilizers and Chemical Industries have recently commissioned a fertilizer complex at Potchefstroom (Transvaal), consisting of plants for the production of sulphuric acid (165,000 tons/year), phosphoric acid, triple and single superphosphate (total capacity estimated at 600,000 tons/year of finished fertilizers).

At present the production of these plants is understood to be restricted due to market difficulties.

Optima Fertilizers (Pty) Ltd. (until recently Windmill Fertilizers S.A. (Pty) Ltd.) operate single superphosphate and NPK blending plants at Sasolburg and an NPK blending plant at Kuils Rivier.

Chemical Industries of South Africa (Bosveld Kunsmis) operate a phosphoric acid plant at Phalaborwa (45,000 tons/year of P_2O_5) and will construct a plant for the production of 450 tons/day of sulphuric acid based on by-product phospho-gypsum.

South African Iron and Steel Corporation (ISCOR) operate a by-product ammonium sulphate plant at Pretoria with a capacity of about 60,000 tons/year.

African Metals Corporation has recently commissioned a phosphorus furnace at Kookfontein; part of the output is converted to phosphoric acid, which is unlikely to be used to any significant extent for the manufacture of fertilizers. The main product from this plant is dicalcium phosphate.

The Phosphate Development Corporation (FOSKOR) is known to have projects in hand for the production of phosphate fertilizers based on the phosphate rock mining operations at Phalaborwa (Transvaal).

Present and projected fertilizer consumption

The consumption of fertilizers in South Africa has shown a steady growth during the last few years. The consumption of fertilizer nutrients in 1968 has been estimated at about 145,000 tons of nitrogen, 330,000 tons of P_2O_5 and 105,000 tons of K_2O.

Official estimates of the demand for fertilizers in 1970 and 1975 are not available. Unofficial estimates based on statistical trends during the last few years indicate a consumption of 180,000 tons/year of nitrogen, 360,000 tons/year of P_2O_5 and 140,000 tons/year of K_2O. For the purpose of this study the following rates of growth of the domestic fertilizer consumption has been taken for the period of 1970-1975: 10 per cent/year for nitrogen, 7.5 per cent for P_2O_5 and K_2O. On this basis the projected demand for fertilizer nutrients in 1975 will be: 300,000 tons/year of nitrogen, 500,000 tons/year of P_2O_5 and 200,000 tons/year of K_2O.

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In order to estimate the projected rates of production in 1970 and 1975 the following assumptions have been made:

(a) SASOL extensions to ammonia production will materialize at Sasolburg in 1972;

(b) The P_2O_5 production facilities based on Phalaborwa rock etc, deposits will increase by 1975 to keep pace with internal demand;

(c) The total nitrogen production includes supplying technical nitrogen (e.g. for explosives manufacture). It is assumed that the over-all rate of production in 1970 and 1975 is 75 per cent and 85 per cent of the total production capacity.

It will be noted that due to the high rate of expansion of the production of synthetic ammonia and nitrogen fertilizers in South Africa a large excess will be available for exports to markets in Africa and the Indian Ocean area as well as satisfying its own requirements for technical nitrogen.

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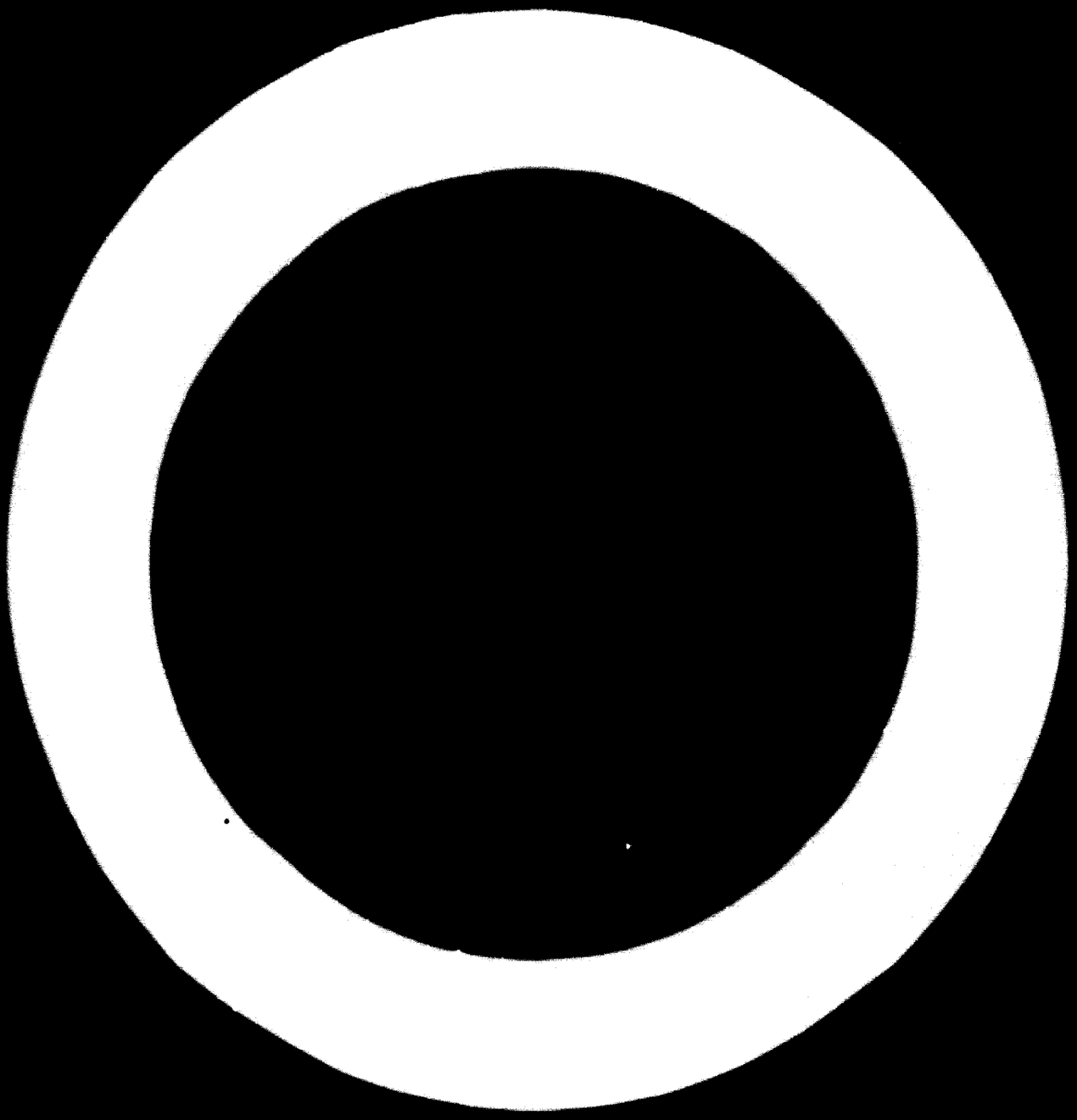

SOUTHERN REGION

SWAZILAND

Annual consumption and production of fertilizers, 1960 to 1975
(tons)

Nutrient		1960	1965	1970	1975
N	Consumption	1,600	3,000	5,000	8,000
	Production	-	-	-	-
	Deficit	1,600	3,000	5,000	8,000
	Surplus	-	-	-	-
P_2O_5	Consumption	1,200	1,500	2,500	4,000
	Production	-	-	-	-
	Deficit	1,200	1,500	2,500	4,000
	Surplus	-	-	-	-
K_2O	Consumption	400	1,000	1,500	2,500
	Production	-	-	-	-
	Deficit	400	1,000	1,500	2,500
	Surplus	-	-	-	-

General

The country covers an area of about 17,400 km^2, and has a population of approximately 390,000 (1966).

Swaziland gained independence in September 1968. The per capita GDP is high compared to some other African countries with $220. The country is also receiving substantial aid from the United Kingdom.

Agriculture

The agriculture of the country is mainly on subsistence level, this sector contributing about 25 per cent to GDP at factor cost, (agricultural production accounts for about 40 per cent of total exports, with forestry alone accounting for 25 per cent).

The main crops are sugar, citrus fruit and rice, all of which are grown under irrigation. Some cotton, maize (the country's staple food), sorghum, tobacco and pineapples are also grown. (So far it has even been necessary to import maize from South Africa to supplement the country's domestic requirements.)

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Since 1962 sugar, first produced in 1958, has become the most valuable single export produce; in 1967, 149,935 short tons were exported.

Livestock is fairly important to the country's economy; it numbered, according to the 1965 census, 510,000 cattle, 218,637 goats and 37,472 sheep.

Natural resources and industry

The country produces large tonnages of asbestos from the Havelock mine (40,883 short tons in 1965) and iron ore from the Ngwenya mine (1,124,310 short tons in 1965).

Reserves of hard coal are estimated at 5,022 million tons. Mines are in the Lowveld; in 1965 the production was 33,032 short tons.

Small quantities of tin, gold and silver are also produced.

A railway has been built from Ngwenya haematite deposits to Goba in Mozambique, chiefly for the transport of iron ore. Swaziland Iron Ore Development Co. has entered into a contract to supply Japanese buyers with 14.5 million tons of ore over a period of ten years. The first shipment began in November 1964. The extensive deposits of low-volatile bituminous coal is being worked to provide coal for the railway, the sugar mills and export.

Fertilizer manufacture

There is no fertilizer industry in Swaziland and due to the limited market potential this situation is unlikely to change in the foreseeable future.

Present and projected fertilizer consumption

The consumption of fertilizers in Swaziland remains low. In 1966/1967 the consumption of fertilizer nutrients was estimated at 3,000 tons of nitrogen (mainly as ammonium sulphate), 1,800 tons of P_2O_5 and 11,000 tons of K_2O. The consumption of P_2O_5 and K_2O remained practically static since 1961/1962, while the nitrogen demand showed an average rate of growth of 12 per cent/year during the period 1961-1967. No estimates of the projected fertilizer consumption in 1970 and 1975 are available. For the purpose of

this study the following average projected rates of growth of demand have been adopted: nitrogen - 15 per cent/year during the period up to 1970, followed by 10 per cent/year during 1970-1975, P_2O_5 and K_2O - 10 per cent/year. This would result in the following projected consumption in tons of nutrients:

	1970	1975
N	5,000	8,000
P_2O_5	2,500	4,000
K_2O	1,500	2,500

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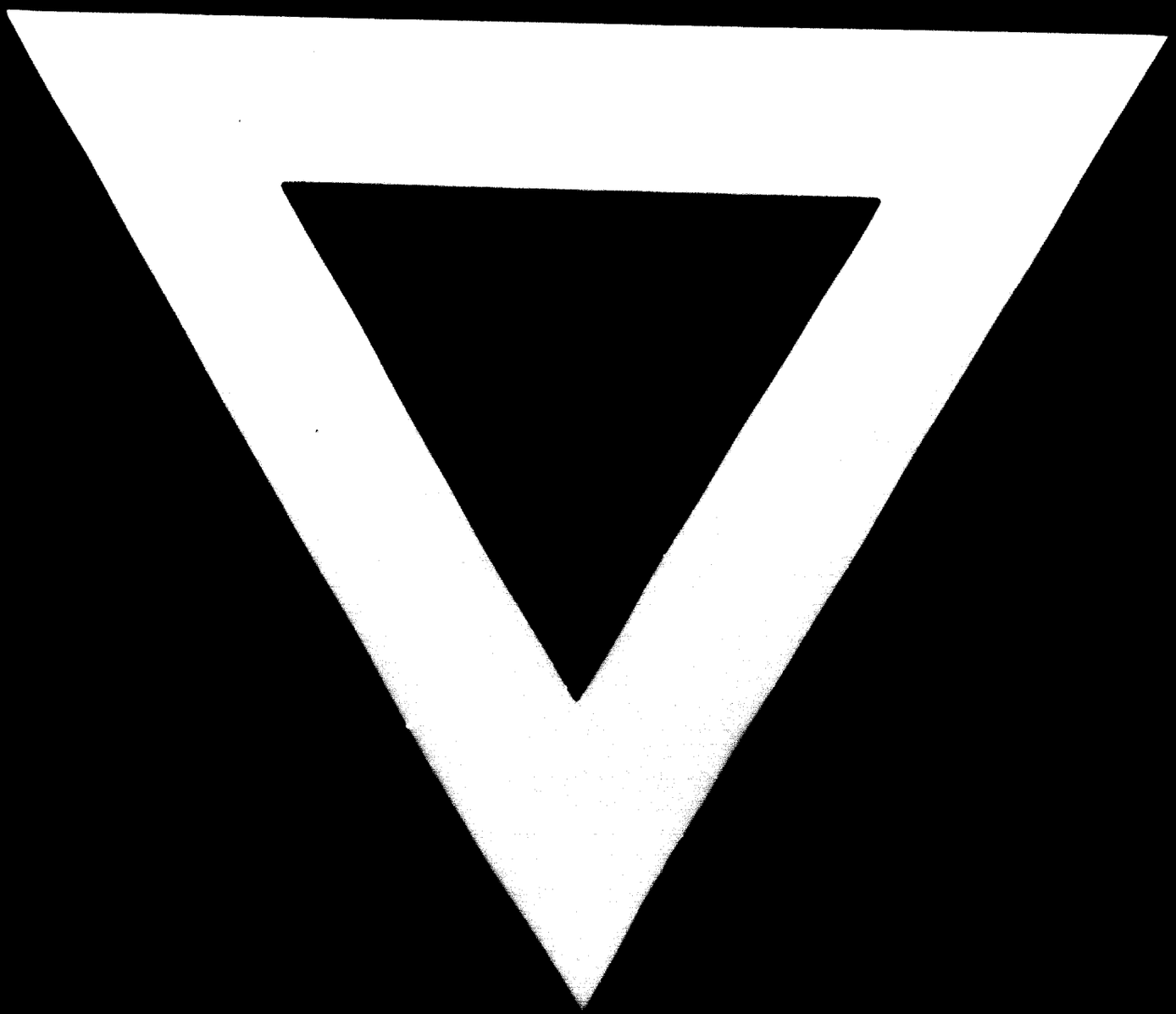
ID/66 Vol. I



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