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## RESEARCH INTO THE CHEMICAL INDUSTRY AND FERTILIZERS IN WEST AFRICA

THE FORMULATION OF DATA IN REGARD TO PLANNING

ANNEX I

(pages 1 - 176)

THE SITUATION IN THE INDIVIDUAL COUNTRIES

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## CONTENTS

## THE SITUATION IN THE INDIVIDUAL COUNTRIES

A.	NIGERIA	Page
I.	General characteristics	2
II.	Mineral resources	5
III.	Electric energy, fuel and water	10
IV.	Existing industry	13
V.	The present market for chemical products	41
VI.	Planning the chemical industry in Nigeria	60
	References	73
B.	GHANA	
I.	General characteristics	74
II.	Mineral resources	78
III.	Electric energy, fuel and water	84
IV.	Existing industry	87
V.	The present market for chemical products	105
VI.	Planning the chemical industry in Ghana	127
VII.	Other schemes	136
	References	137
C.	THE UPPER VOLTA	
I.	General characteristics	138
II.	Mineral resources	141
III.	Electric energy, fuel and water	142
IV.	Existing industry	143
V.	The present market for chemical products	145
VI.	Planning the chemical industry in the Upper Volta	150
	References	156
D.	MALI	
I.	General characteristics	157
II.	Mineral resources	160
III.	Electric energy, fuel and water	161
IV.	Existing industry	162
V.	The present market for chemical products	165
VI.	Planning the chemical industry in Mali	169
	References	175/176

	<u>Page</u>
E. THE IVORY COAST	
I. General characteristics	177
II. Mineral resources	182
III. Electric energy, fuel and water	184
IV. Existing industry	187
V. Chemical and para-chemical industries	195
VI. The present market for chemical products	201
VII. Planning the chemical industry in the Ivory Coast	208
References	217
F. GUINEA	
I. General characteristics	218
II. Mineral resources	219
III. Electric energy, fuel and water	225
IV. Existing industry	230
V. The present market	237
VI. Planning the chemical industry in Guinea	238
VII. Other schemes	251
References	253
G. SENEGAL	
I. General characteristics	254
II. Mineral resources	258
III. Electric energy, fuel and water	262
IV. Existing industry	265
V. Chemical and para-chemical industries	277
VI. The present market for chemical products	280
VII. Planning the chemical industry in Senegal	285
References	297
H. NIGER	
I. General characteristics	298
II. Mineral resources	300
III. Electric energy, fuel and water	301
IV. Existing industry	302
V. The present market for chemical products	304
VI. Planning the chemical industry in Niger	309
References	315

	<u>Page</u>
I. SIERRA LEONE	
I. General characteristics	316
II. Mineral resources	318
III. Electric energy, fuel and water	319
IV. Existing industry	322
V. The present market for chemical products	326
VI. Planning the chemical industry in Sierra Leone	335
References	341
J. DAHOMEY	
I. General characteristics	342
II. Mineral resources	344
III. Electric energy, fuel and water	345
IV. Existing industry	345
V. The present market for chemical products	346
VI. Planning the chemical industry in Dahomey	351
References	356
K. TOGO	
I. General characteristics	357
II. Mineral resources	360
III. Electric energy, fuel and water	361
IV. Existing industry	363
V. The present market for chemical products	365
VI. Planning the chemical industry in Togo	370
References	376
L. LIBERIA	
I. General characteristics	377
II. Mineral resources	379
III. Electric energy, fuel and water	380
IV. Existing industry	382
V. The present market	393
VI. Planning the chemical industry in Liberia	403
VII. Other schemes	409
References	410



	<u>Page</u>
M. MAURITANIA	
I. General characteristics	411
II. Mineral resources	414
III. Electric energy, fuel and water	416
IV. Existing industry	417
V. The present market for chemical products	418
VI. Planning the chemical industry in Mauritania	421
References	426
N. GAMBIA	
I. General characteristics	427
II. General resources	427
III. Electric energy, fuel and water	428
IV. Existing industry	428
V. The present market for chemical products	428
VI. Planning the chemical industry in Gambia	437
References	441

LIST OF TABLES  
THE SITUATION IN THE INDIVIDUAL COUNTRIES

	<u>Page</u>
<b>A. NIGERIA</b>	
Table 1. Exports from Nigeria	3
Table 2. Principal indicators relating to industry in Nigeria, 1962	15
Table 3. Chemical and related industries: number of enterprises surveyed and number of persons employed, gross production and value added	21
Table 4. Name, whereabouts, products manufactured and manpower employed by chemical and related undertakings	22
Table 5. Imports: chemical and related products (tonnage)	41
Table 6. Imports: chemical and related products (value)	47
Table 7. Exports: chemical and related products (tonnage)	53
Table 8. Exports: chemical and related products (value)	56
Table 9. Chemicals as a component of Nigeria's foreign trade	59
Table 10. Demand for fertilizers for cocoa plantations	65
Table 11. Demand for fertilizers for natural rubber plantations	66
Table 12. Demand for fertilizers for the palm oil production development programme	66
Table 13. Demand for fertilizers for cotton plantations	67
Table 14. Demand for fertilizers for groundnut plantations	67
Table 15. Over-all demand for fertilizers, period 1963/64-1979/80	68
Table 16. Over-all demand for nitrogenous and phosphatic fertilizers, period 1964-1975	69
<b>B. GHANA</b>	
Table 1. Exports from Ghana	76
Table 2. Akosombo Dam: installed capacity and electric energy production (I. On the assumption that the aluminium plant reaches full capacity by 1972)	85
Table 3. Akosombo Dam: Installed capacity and electric energy production (II. On the assumption that the aluminium plant reaches full capacity by 1969)	86
Table 4. Number of enterprises and persons employed, gross production and value added, by sector of activity	89
Table 5. Growth of industrial production by production sectors, 1962-1964	90
Table 6. Principal industrial products, 1964	91
Table 7. Chemical and related industries: number of enterprises and persons employed, gross production and value added	94

	<u>Page</u>
B. GHANA (cont'd)	
Table 8. Name, number and whereabouts of chemical and related enterprises and undertakings.	98
Table 9. Imports: chemical and related products (tonnage)	105
Table 10. Imports: chemical and related products (value)	113
Table 11. Exports: chemical and related products (tonnage)	120
Table 12. Exports: chemical and related products (value)	122
Table 13. Imports, exports and re-exports of chemical products (value)	124
Table 14. Chemical products as a component of Ghana's external trade	126
C. THE UPPER VOLTA	
Table 1. Exports from the Upper Volta	140
Table 2. Imports: chemical and related products (tonnage)	146
Table 3. Imports: chemical and related products (value)	148
D. MALI	
Table 1. Exports from Mali (1964)	158
Table 2. Production of electric energy	161
Table 3. Imports: chemical products and fertilizers (tonnage)	165
Table 4. Imports: chemical products and fertilizers (value)	167
E. THE IVORY COAST	
Table 1. Exports from the Ivory Coast	179
Table 2. Principal aggregates, 1960-1964	180
Table 3. Development of domestic production by sector of activity, 1960-1964	187
Table 4. Domestic consumption: chemical and related products (tonnage)	202
Table 5. Domestic consumption: chemical and related products (value)	205
F. GUINEA	
Table 1. Imports: chemical and related products (tonnage)	237
Table 2. Imports: chemical and related products (value)	238
Table 3. Imports of chemical products in relation to total imports into Guinea	238
G. SENEGAL	
Table 1. Exports from Senegal	256
Table 2. Origin of gross domestic product at factor cost by branch of activity	257
Table 3. Public distribution of electric energy in Senegal	262
Table 4. Breakdown of industrial establishments by regions	265
Table 5. Employment in industrial undertakings (excluding building and public works)	266

G.	SENEGAL (cont'd)	<u>Page</u>
Table 6.	Index of industrial output (1959 = 100)	268
Table 7.	Main industrial products	269
Table 8.	Imports: chemical products and fertilizers (tonnage)	281
Table 9.	Imports: chemical products and fertilizers (value)	283
Table 10.	Fertilizer consumption	293
Table 11.	Consumption of fertilizers. Plan forecasts	294
H.	NIGER	
Table 1.	Exports from Niger	299
Table 2.	Electric power production	302
Table 3.	Imports: chemical products and fertilizers (tonnage)	304
Table 4.	Imports: chemical products and fertilizers (value)	307
I.	SIERRA LEONE	
Table 1.	Exports from Sierra Leone	317
Table 2.	Electric power production	319
Table 3.	Number of persons employed in the industrial sector	322
Table 4.	Number of persons employed in manufacturing industry	323
Table 5.	Existing establishments built in the period 1961-1965	324
Table 6.	Imports: chemical and related products (tonnage)	327
Table 7.	Imports: chemical and related products (value)	331
Table 8.	Chemical products as a component of the foreign trade of Sierra Leone	335
J.	DAHOMEY	
Table 1.	Exports from Dahomey, 1964	343
Table 2.	Imports: chemical and related products (tonnage)	347
Table 3.	Imports: chemical and related products (value)	349
K.	TOGO	
Table 1.	Exports from Togo	358
Table 2.	Imports: chemical products and fertilizers (tonnage)	366
Table 3.	Imports: chemical products and fertilizers (value)	368
L.	LIBERIA	
Table 1.	Exports from Liberia	378
Table 2.	Structure and main indicators of the industrial sector	383
Table 3.	Imports: chemical and related products (tonnage)	393

	<u>Page</u>
L. LIBERIA (cont'd)	
Table 4. Imports: chemical and related products (value)	397
Table 5. Imports, exports and re-exports of chemical products (value)	401
Table 6. Chemical products as a component of Liberia's foreign trade	402
Table 7. Cost of pharmaceutical products used in hospitals	404
M. MAURITANIA	
Table 1. Imports into Mauritania: chemical products and fertilizers (tonnage)	418
Table 2. Imports: chemical products and fertilizers (value)	420
N. GAMBIA	
Table 1. Imports into Gambia: chemical and related products (tonnage)	429
Table 2. Imports: chemical and related products (value)	432
Table 3. Chemicals as a component of Gambia's foreign trade	436

RESEARCH INTO THE CHEMICAL INDUSTRY AND FERTILIZERS  
IN WEST AFRICA

THE FORMULATION OF DATA IN REGARD TO PLANNING

THE SITUATION IN THE INDIVIDUAL COUNTRIES

The purpose of this report is to throw light on the economic development of the various countries in the sub-region by examining the following points:

1. General characteristics of the industrial situation as it is today.
2. Mineral resources which can be used for the chemical industry (phosphates, natural gas, sodium chloride, etc.) with due regard to known or inferred reserves, possibility of exploitation and transport. Estimated selling prices are compared with c.i.f. import prices.
3. Auxiliary agents and motors: quantities available, prices and quality of electric energy, fuel and water.
4. Existing industry (chemical and para-chemical): production capacity, present production, running costs and manpower.
5. Market estimates, 1960-1964. Statistics of imports and exports combined with local production make it possible to estimate consumption by groups of products.
6. Plan projections for the years 1965, 1970, 1975, 1980. The main projects undertaken by the countries concerned are reviewed together with their characteristics: investments, production capacity, techniques used, location, operating costs, etc.

Consumption is calculated on the basis of the period 1960-1964, with due regard to population growth, increase in individual income and projects under way. From this are deduced the needs to be met in 1965-1975 and in 1980.

## A. NIGERIA

### I. GENERAL CHARACTERISTICS

#### I.1. Population

55,620,000 inhabitants (1963)

Annual growth rate, 1958-1963: 3 per cent

Population projection (thousands of inhabitants)

1965 ..... 58,000

1970 ..... 67,500

1975 ..... 78,500

1980 ..... 91,000

#### I.2. Area

923,800 km<sup>2</sup>

#### I.3. Population density

60 inhabitants per km<sup>2</sup> (1963)

I.4. The industrial development of Nigeria actually began at the time when independence was achieved; but although the country is developing rapidly and a large-scale planning programme is under way, it would be true to say that up to the present, Nigeria is still a rural economy exporting raw products and importing most of the manufactured goods it needs.

Agriculture today accounts for over 60 per cent of the country's gross domestic product; the main sources of foreign currency earnings are agricultural products: groundnuts, cocoa, palm kernels, rubber, cotton, etc.

The main groundnut-producing region is Northern Nigeria. Western Nigeria is the cocoa region. Palm kernels and rubber are produced in Western and Eastern Nigeria. Cotton plantations are to be found in Northern and Western Nigeria.

The following table illustrates the importance of agricultural products in Nigeria's economy.

Table 1

Exports from Nigeria (value in millions of dollars, quantity in thousands of tons)

Product	1960		1961		1962		1963	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Groundnuts	337	64.1	502	90.3	539	90.8	624	102.5
Cocoa	157	103.0	187	94.5	198	93.4	178	90.6
Palm kernels	425	73.0	418	55.7	373	47.3	404	58.3
Crude petroleum	860	12.3	2255	32.3	3355	42.2	3755	56.5
Natural rubber	58	39.9	56	30.9	61	31.8	64	33.0
Raw cotton	27	17.4	47	31.1	23	16.4	41	26.7
Palm oil	186	39.2	168	37.1	120	25.0	128	26.2
Groundnut oil	48	14.9	46	14.0	64	17.3	70	18.3
Hides and skins	9	12.7	9	11.6	8	10.7	7	8.5
Sesame seeds	27	5.2	21	4.1	24	5.2	15	3.4
Timber (sawn)	2132	3.1	2236	3.5	2375	3.6	2734	3.8
Timber (logs) (in thousands of m <sup>3</sup> )	629	16.6	576	15.3	459	12.2	557	15.3
Other commodities	-	62.5	-	56.0	-	63.5	-	74.7
Total		463.9		476.4		459.4		517.8

Source: Annual Abstract of Statistics Nigeria 1964, Federal Office of Statistics, Lagos 1965.

Another vital source of Nigeria's wealth is its forests: they earn foreign currency and are the backbone of the timber industry. The best quality timber comes from Western Nigeria. Smaller quantities for export come from the Eastern and Northern Regions.

Nigeria possesses a variety of mineral resources, which have been known and exploited for a long time. Large-scale exports of petroleum are an important factor in the national wealth of the country; natural gas has new



and highly promising prospects to offer; Nigeria is the only coal-producing country in West Africa and a major producer of tin, columbite and limestone; gold and silver, zircon, tantalite and monazite are mined; and prospecting operations have located large quantities of iron ore, which is regarded as second in importance among the factors making for the industrial development of the country - fuel being the first.

Industry as such plays only a small part in Nigeria's economics. Manufacturing industry accounts for 3 per cent of the gross domestic product of the country, and exports of industrial products represented 1 per cent of total exports in 1963. Industrial concerns are mostly small or medium-sized. Undertakings employing 2,000 persons, some slightly over, are only a handful. Most of them are private and foreign-owned. Nigeria has more foreign capital than any other country on the West Coast of Africa.

Between 1945 and 1962, four economic and social development plans have been drawn up, at the request of the British Colonial or Commonwealth Relations Office or with the help of the International Bank. The more important are the 1946 ten-year plan and the revised five-year plan 1951-1956, involving a series of projects which had not been fully co-ordinated or embodied in an over-all economic policy or target. Several of these projects merely involved expanding the normal activities of the various services.

The 1962-1968 plan may be regarded as the first National Plan. Implicit in it is the firm determination to avoid the mistakes made in the earlier plans. Its aim is as far as possible to integrate all the programmes drawn up by the regional governments of the Federation with a view to reaching the national targets set. Over the period covered by the Plan, the various sectors of the economy are scheduled to grow at the following annual rates:

Population .....	2.5 per cent
Gross domestic product .....	4.0 per cent
Consumption .....	4.4 per cent
Capital formation .....	5.6 per cent
Exports .....	5.5 per cent
Imports .....	4.0 per cent

Priority is given under the Plan to agriculture, industry, and the training of administrative personnel at the higher and intermediate levels.

Nigeria's economy is of the mixed type, and the intention of the authorities is to continue to participate actively in providing not only social

services but also basic economic services such as electric energy and port facilities, and various industrial activities, e.g. the construction of a steelworks and an oil refinery. At the same time, they would like to make it possible for Nigerian capitalists to control an increasing share of the economy by speeding up training for business administration, organizing advisory services and other training facilities, encouraging private investment, and furnishing technical and commercial information.

## II. MINERAL RESOURCES

### II.1. Iron

It is estimated that Nigeria has deposits of nearly 206 million tons of iron ore, in the area south of Lokaja and west of the Niger in the Agbaja Plateau area. There is also an iron ore deposit in the coalfield region, at Udi Hill in the neighbourhood of Enugu, the capital of the Eastern Region. Reserves here are estimated at 60 million tons.

The components of the ores in question are as follows:

Component	Agbaja ore	Enugu ore
(Dry analysis)		
Fe	47 - 51	33 - 45
Si O <sub>2</sub>	6 - 9	14 - 16
Al <sub>2</sub> O <sub>3</sub>	8 - 10	9 - 10
S	0.1	-
P	0.7 - 1.3	0.6 - 0.8
Ti O <sub>2</sub>	1.5	-

Utilization of Enugu ore presents a number of difficulties: its iron content is low, and the high silica and alumina content would tend to make the slag unduly acid. To avoid this, large quantities of limestone flux would have to be added to the burden, which would impoverish the blast-furnace charge still further. It should also be mentioned that its phosphorous content is fairly high. The deposit is situated close to the railway line Port Harcourt - Enugu - Jos.

The Agbaja deposit is situated close to the Niger. The ore could be taken by water to Port Harcourt about 450 km away. Agbaja ore is richer in iron than that of Enugu. Its silica and alumina content, though lower than that of Enugu

ore, is still high, and would necessitate the liberal use of fluxes (limestone). The sulphur and titanium in the ore could prove an obstacle from the metallurgical point of view. What is more, owing to its high phosphorous content, the pig would be semi-phosphoric. Hence a steelworks of the LDAC or OLP type would be required, and this would increase both the investment costs and the consumption of lime. Iron ore in large quantities is mainly concentrated in these two regions, though it is believed that there is iron to be found in all parts of Nigeria.

Local industry has been supplied with iron ore for centuries, especially in the Bida region in the north and at Awka in the Onitsha province. This ancient industry has almost completely disappeared as a result of competition from cheap imported iron bars and the various steel products. From the viewpoint of the industrial development of the country, iron ore is regarded at present as second in order of importance to fuel. The year 1962 saw the establishment at Emene, near Enugu, of the Nigersteel Company, a joint undertaking by the government of Eastern Nigeria and an Italian commercial firm. The rolling-mill at Emene has a capacity of 12,000 to 15,000 tons a year. In fact, Nigeria does not discount the possibility of becoming a steel producer in the near future with the advent of the steel-making complex to be set up as part of the six-year development Plan. This will be the second largest plant envisaged under the Plan.

## II.2. Tin and columbium

Nigeria is a large tin-producing country. The bulk of production comes from the Plateau province and from Bouchi. The Zaria, Kano and Benue deposits are also worked. The entire ore production is smelted at Jos and shipped abroad in the form of metal. Columbite, which is associated with tin ore, is mined chiefly at Plateau, Benue, Kano, Bauchi and Zaria.

Prior to 1964, total production figures for tin and columbite were as follows:

	1960	1961	1962	1963	1964
<u>Tin</u>					
Cassiterite concentrate	10,540	10,680	11,274	11,977	11,977
Tin content	7,798	7,904	8,342	8,863	8,863
<u>Columbium</u>					
Concentrate	2,081	2,385	2,298	2,044	2,343

### II.3. Lead and zinc

The Abakaliki deposits have been known for a long time, but exploitation would not be an economic proposition. It might be possible, however, as is seriously contemplated, to mine the ore and convert it for local use.

### II.4. Salt

Salt springs are found in the Benue region and in Eastern Nigeria. They are the basis of local salt production, but the salt content is too low to warrant developing salt-mining on any considerable scale.

### II.5. Gold and silver

Gold production in Nigeria is estimated as follows:

1960 ...	...	...	974 ounces
1961 ...	...	...	679 "
1962 ...	...	...	411 "
1963 ...	...	...	315 "
1964 ...	...	...	244 "

The gold contains variable quantities of silver. In 1964, 80 per cent of production came from Imperindo Reef, Ilesha, in the province of Oyo.

### II.6. Zircon

This ore is mined as a secondary product in the tin mines of the Plateau region. Production figures for zircon concentrate are as follows:

1960 ...	...	...	1,785 tons
1961 ...	...	...	755 tons
1962 ...	...	...	494 tons
1963 ...	...	...	804 tons
1964 ...	...	...	180 tons

### II.7. Tantalite

Most of the tantalite produced comes from the provinces of Benue, Niger, Plateau and Zaria. Total production of tantalite concentrate shows the following figures:

1960 ...	...	...	11.2 tons
1961 ...	...	...	11.9 tons
1962 ...	...	...	17.2 tons
1963 ...	...	...	15.2 tons

## II.8. Monazite

Monazite ore is mined as a secondary product in the Plateau mines.

Monazite concentrate production is estimated as follows:

1960 ...	...	...	12 tons
1961 ...	...	...	7 tons
1962 ...	...	...	9 tons
1963 ...	...	...	11 tons

## II.9. Manganese

There is a manganese deposit in the Cababar province of Nigeria. It is not being worked at present, and the modest tonnage required to work the plant does not justify exploiting the deposit.

## II.10. Limestone

The numerous limestone deposits found in Nigeria have given rise to the cement industry. There are two cement works in operation - at Ewekono and Nkalugu, with an annual capacity of 200,000 and 220,000 tons respectively. Nigeria also has two plants at Port Harcourt and Enugu for grinding clinker, which is imported from Europe. A further cement works, with an annual production capacity of 100,000 tons (which could in due course be stepped up to 200,000 tons) is under construction at Sokoti in Northern Nigeria. Nigeria's limestone reserves are estimated at 109 million tons. At the moment, the deposits being exploited are those of Abeokuta and Ogoja, their annual production figures being as follows:

1960 ...	...	...	244,000 tons
1961 ...	...	...	599,000 "
1962 ...	...	...	725,000 "
1963 ...	...	...	770,000 "
1964 ...	...	...	981,000 "

## II.11. Other mineral occurrences

Prospective operations have located the following:

Asbestos near Shemi, in the province of Katsina;

Barite in the provinces of Adamawa, Benue and Ogoja, the largest deposits being at Keana, in the province of Benue;

Beryl and helvite in the provinces of Plateau, Bauchi, Kano, Kabba and Ibadan;

Bitumen in the provinces of Ondo and Ijebu;

Diatomite at Abakire and Bularoba, Bornu province;

Feldspath near Egba, Kabba province, and at Plateau and Abeokuta;

Fluorine in the Akwana, Abugu and Jos regions;

Siliceous sand in large quantities in the neighbourhood of Enugu, Mokwa and Bida;

Graphite in the provinces of Adamawa and Bauchi, near Ningi and Birnin Gwari;

Lignite at Asaba (estimated reserves: 70 million tons);

Mica in the Kabba area;

Molybdenum in the Kigom Hills region;

Talc in the provinces of Ilorin and Niger;

Wolframite, associated with tin ore, in the Plateau, Bauchi, Kano and Benue regions.

Except for limestone, these minerals are of no direct interest as raw materials for the chemical industry.

### III. ELECTRIC ENERGY, FUEL AND WATER

#### III.1. Electric energy

An organization known as The Electricity Corporation of Nigeria (ECN) is responsible for the production, distribution and sale of electric power in the country. There is also a private company - the Nigerian Electricity Supply Corporation (NESCO) - which produces electric energy for the mining industry in the Jos (Plateau) region, and another private company, The African Timber and Plywood Company Ltd., which produces and uses electricity for its own needs.

Electric energy production in Nigeria is shown in the table below:

(thousands of kWh)

	1958/60	1960/61	1961/62	1962/63	1963/64
Total	423,715	553,641	662,300	785,795	929,059
Electricity Corporation of Nigeria	344,048	440,854	545,266	659,241	793,173
Lagos	152,213	196,080	264,488	346,537	428,104
Western Nigeria	49,086	61,447	56,595	46,018	46,179
Eastern Nigeria	80,404	104,464	127,947	151,093	187,000
Northern Nigeria	62,345	78,863	96,236	115,593	131,890
Nigerian Electricity Supply Corporation	62,471	95,306	100,990	113,038	121,221
African Timber and Plywood Co. Ltd.	17,196	17,481	16,044	13,516	14,665

Source: Annual Abstract of Statistics Nigeria 1964: Federal Office of Statistics, Lagos, 1965.

Installed capacity in March 1964 was 229 MW. The following projects are scheduled to be carried out in 1965 and 1966:

Ijora C .....	2 x 15	MW
Afam .....	2 x 17.5	MW
Sokoto .....	4 x 1.5	MW
Kano .....	2 x 1.5	MW
Kaduna .....	11.4	MW
Kaduna C .....	2 x 10	MW

The vital factor for the future of electric energy in Nigeria is the Kainji dam. This project forms part of the six-year plan, and once it is carried out it will be possible to cope with the general expansion of demand. Provision is made for the installation of four 80 MW units and two other units of similar capacity. The transmission facilities comprise 330 and 132 kV lines.

According to information received by the Electricity Corporation of Nigeria, energy costs in the future will be lowest in the Port Harcourt region, varying between \$0.013 and \$0.014 per kWh.

III.2 Fuel

III.2.1. Coal

Nigeria is the only coal-producing country in West Africa. Reserves are estimated at 350 million tons, distributed as follows:

(Millions of tons)

Locality	Known reserves	Inferred reserves	Total resources
Enugu	42.7	12.2	54.9
Ezimo	29.5	17.3	46.8
Orukta	50.8	7.1	57.9
Okaba	54.9	19.3	74.2
Ogboyoga	83.4	25.4	108.8
Oti	-	6.1	6.1
Inyi	10.2	-	10.2
Total	271.5	87.4	358.9

At the present time, coal is mined in the Enugu region by the Nigerian Coal Corporation in three mines at Okpara, Ekula and Ribadu. Total production for the period 1960-1964 is as follows:

(thousand of tons)

1960 .....	571.4
1961 .....	607.3
1962 .....	634.3
1963 .....	595.5
1964 .....	684.2

The coal produced is not regarded as suitable for coking purposes, but extensive experiments carried out recently could cause this opinion to be revised.

III.2.2. Petroleum

Petroleum is already an important factor in Nigeria's national wealth, placing the country in second place among Commonwealth producers. Crude petroleum is exploited in the neighbourhood of Port Harcourt. Reserves of fuel oil are estimated as follows:

Known reserves:	$68 \times 10^6$ tons
Inferred reserves:	$270 \times 10^6$ tons



These are rough figures only, and it is possible that they will be revised as new oilfields are discovered. Over-all production of crude petroleum during the period 1961-1964 shows the following figures:

	(Thousands of tons)
1960 .....	861
1961 .....	2270
1962 .....	3327
1963 .....	3372
1964 .....	5953

It is thought that oil production will increase in 1965 to a figure of 10 million tons. Most of this oil is carried by pipelines. The fuel oil has a very low sulphur content, but it is waxy and paraffinic. The selling price should be about \$14.20 per ton.

A refinery with a capacity of 2 million tons of fuel oil a year is under construction at Eleme, near Port Harcourt. The question whether and to what extent this plant could be incorporated in a future chemical industry to be set up cannot be answered as yet.

### III.2.3. Natural gas

Natural gas, associated or non-associated, is found in the Port Harcourt region, and also as far as Forqu in the north and Ughelli in the west. The discovery offers very interesting possibilities. Confirmed reserves ( $85 \times 10^9 \text{ m}^3$ ) should be sufficient to cover practically all needs. The gas is now being used in industry in Southern Nigeria. A scheme for liquefying the gas at Bonny is being studied actively by a consortium entrusted with the task.

Over-all production of associated natural gas over several years has been as follows:

	(Millions of cu. ft.)
1960 .....	5,095
1961 .....	10,943
1962 .....	17,179
1963 .....	22,106
1964 .....	36,333

Estimated production in 1965 is 75,000 million cu.ft. Non-associated gas is not yet being used. With regard to the quality of the gas, the following assurance is given:

Minimum calorific value is 950 BTU per cu.ft.;

The minimum methane content is 75 to 80 per cent by volume

(in some wells it is as high as 95 per cent);

Pressure is not below 14.7 psi (lbs per square inch) at 60°F.

(at the place of consumption);

The gas contains only traces of sulphur. In the normal way there is no sulphur and hence purification does not call for complex equipment.

Prices quoted to date are \$0.175 - \$0.232 per 1000 cu.ft. for large-scale consumption and \$0.28 to \$0.35 per 1000 cu.ft. for smaller quantities. The study carried out by the Battelle Institute <sup>1/</sup> takes the basic price of \$0.175 per 1000 cu.ft. It is possible that natural gas may be used as a source of hydrogen, and Nigeria could produce nitrogenous fertilizers on a large scale.

### III.3. Water

The problem of fresh water supply in Nigeria is adequately provided for under the six-year plan. Once the investments planned materialize, it should be possible to cater for a general expansion of demand. Provision has been made, for example, for spending \$5.6 million on the development of water supply in the Lagos region. Water production is scheduled to increase to 182,000 m<sup>3</sup> a day by 1968 (the 1961 daily figure was 63,600 m<sup>3</sup>). In Western Nigeria, water supply for rural requirements is due to rise from a daily level of 5,850 m<sup>3</sup> prior to the plan to 75,000 m<sup>3</sup> by the end of the plan, the present figure being 30,000 m<sup>3</sup> a day. Water supply for urban needs will increase from the present daily figure of 56,700 m<sup>3</sup> to 123,000 m<sup>3</sup> by the end of the plan. Scheduled investments are \$17.4 million.

In Northern Nigeria it is proposed to invest a sum of \$33.6 million in fresh water supply. Western Nigeria spent approximately \$5 million in 1962/1963 and about \$2.3 million in 1963/1964. Total estimated investments are \$25 million.

## IV. EXISTING INDUSTRY

IV.1. Industry as it already exists in Nigeria can be divided into two categories. The first is that concerned with raw materials, and comprises abattoirs, processing of cotton and tin ores in Northern Nigeria; rice hulling, soap and palm oil production in Eastern Nigeria; and natural rubber enterprises and sawmills in Western and South Western Nigeria. The other category comprises enterprises directed towards the market; cement works in the east and west (and under construction in the north), bicycle assembly, cement and asbestos production and bitumen processing in the east and west. This category also includes textile mills, breweries, cigarette factories, workshops for furniture, metal products, tyres, electric appliances, etc. already installed throughout the various regions of the country.

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<sup>1/</sup> Basic Chemicals and Fertilizers (E/CN.14/INR/73).

The figures showing the breakdown of manpower give some indication of the relative importance of the various branches of industry in Nigeria's economy. The trend between 1960 and 1962 was as follows:

	1960	1961	1962
Agriculture	40,113	37,254	31,308
Mining and quarrying	43,105	27,347	47,817
Manufacturing	32,821	34,263	53,125
Construction	112,719	89,303	100,793
Electricity, gas and water	8,340	11,248	16,545
Commerce	39,974	37,551	38,925
Transport, communications	39,272	42,737	49,831
Services	183,604	143,172	180,461
TOTAL	499,948	422,875	518,805

Source: Annual Abstract of Statistics Nigeria 1964, Federal Office of Statistics, Lagos, 1965

Table 2

Principal indicators relating to industry in Nigeria, 1962:

Industry	Number of establish- ments	Total employed	Value of production at current prices	Value added at current prices
Meat	3	553	2,714	700
Dairy products	3	193	980	524
Fruit canning	3	176	286	196
Bakeries	44	1,626	5,339	2,476
Beer and soft drinks	16	2,078	12,675	9,011
Miscellaneous food products <sup>1/</sup>	12	2,550	41,168	25,101
Textiles	25	6,720	12,078	6,972
Footwear	9	743	2,311	1,112
Apparel	8	375	2,123	476
Sawmilling	45	8,786	19,011	13,227
Furniture	47	3,129	5,272	2,700
Printing and publishing	68	5,753	9,118	5,031
Tanning	6	271	672	199
Rubber products	25	5,304	10,997	4,319
Gas manufacture	3	115	703	566
Vegetable oils	42	3,423	31,821	12,193
Soap	6	1,824	6,490	1,874
Paints	4	152	1,286	378
Perfume and cosmetics	12	975	4,695	1,557
Miscellaneous chemical products <sup>2/</sup>	9	756	2,941	1,045
Bricks and tiles	5	564	515	261
Pottery and glass products	4	193	59	39
Cement and concrete products	8	1,669	10,196	5,319
Metal products	27	2,975	13,798	4,566
Machinery, except electrical	3	120	440	120
Electrical machinery and appliances	5	96	53	22
Boat-building and repairs	3	530	782	560
Vehicle assembly	3	1,177	5,952	1,353
Motor vehicle repairs	65	4,934	21,275	12,493
Cycle assembly	4	112	2,039	64
Plastic products	7	425	919	426
Total	524	58,277	228,708	114,880

Source: Industrial Survey Nigeria 1962, Federal Office of Statistics, Lagos, 1965.

<sup>1/</sup> Includes two grain mills, two sugar confectionery and three cigarette factories and five food product establishments.

<sup>2/</sup> Includes two bitumen plants.

The indicators assembled in the above table are the findings of an inquiry concerning industrial and commercial establishments carried out during 1963.

Industrial enterprises in Nigeria are as a rule fairly small. Only a few employ more than 2,000 persons, namely a tobacco plant at Ibadan in western Nigeria, two textile mills at Zaria and Kaduna in Northern Nigeria, a furniture workshop at Kaduna, a timber mill and a rubber plant at Sepele in South West Nigeria, a rubber plant at Calabar and two palm oil mills in Eastern Nigeria. Most of the industrial enterprises are in private hands. Public establishments comprise three cement works, textile factories, a distillery, a glass works, an oil refinery and a sugar mill.

The amount of public and private investment between 1958/59 and 1962/63 was as follows:

(Thousands of dollars)

	1958/59	1959/60	1960/61	1961/62	1962/63
Public sector	140	179	171	157	154
Private sector	165	176	185	225	230
Total	305	355	356	382	384

As a result of Nigeria's drive in the direction of industrial development at the federal and regional levels, a large part of the country's resources will have to be spent on the establishment of new industries. Under the six-year Plan, the amount of public investment earmarked for carrying out new industrial schemes is as follows (in rounded figures):

Federal Government	.....	\$104 million
Northern Nigeria	.....	\$22 "
Eastern Nigeria	.....	\$30 "
Western Nigeria	.....	\$43 "

Source: National Development Plan 1962-1968, Federal Ministry of Economic Development, Lagos.

The projects included in the federal Plan comprise a metallurgical complex, an oil refinery, a paper mill, two tyre factories, salt and fertilizer plants, and a distillery. The metallurgical complex to be installed at Onitsha or Ilokja should produce 125 - 250 million tons of steel a year. An oil refinery with a capacity

of 2 million tons of fuel oil a year is under construction at Eleme, in the Port Harcourt area. A paper mill to be set up in the Jebba-Bacita region will produce 12,000 tons of paper annually. Two plants (Dunlop Rubber Company Ltd. and Michelin Tyre Company Ltd.) are to be installed for the production of tyres and tubes. Schemes for salt and fertilizer production are being studied. A distillery under the administration of the Nigerian Fermentation Company Ltd. is scheduled to produce approximately 1,100 m<sup>3</sup> of alcohol a year for industrial use, for alcoholic beverages, and for pharmaceutical purposes.

Among the industries provided for under the regional plans and either already being set up or at the stage where economic surveys have already been undertaken are fertilizer mixtures, glass manufacture, wall-boards, paper bags, corrugated paper boxes, tanning extracts, paints, textiles, cement, insecticides, cigarettes, matches, etc.

During 1965, thirty new plants were installed in Nigeria, representing an investment of \$70 million.

#### IV.2. The chemical industry in Nigeria

There are a number of enterprises in Nigeria utilizing chemical products on a considerable scale.

##### Oxygen, acetylene and carbon-dioxide

Oxygen, acetylene and associated gases are manufactured at Apapa (Federal Territory), Enugu Port Harcourt (Eastern Nigeria) and Kano (Northern Nigeria). Installed capacity is approximately 2.1 million m<sup>3</sup> of oxygen and 700,000 m<sup>3</sup> of acetylene annually at Apapa, about 600,000 m<sup>3</sup> of oxygen at Port Harcourt and about 230,000 m<sup>3</sup> of oxygen at Enugu. Thirty five per cent of the installed capacity is utilized; an annual increase of 15 per cent is forecast.

##### Paints, varnishes and lacquers

There are seven concerns manufacturing paints, varnishes and lacquers. One is situated at Lagos (Federal Territory), three at Ikeja and one at Ibadan (Western Region). There are also two operating in the Eastern Region, at Enugu and Port Harcourt. The total annual capacity of the existing undertakings is approximately 4.5 million m<sup>3</sup>. Local production has considerably reduced imports of these products.

##### Vegetable oils

Palm oil production is carried on in more than 120 public and private establishments, most of them situated in Eastern Nigeria. The biggest unit, employing at least 100 persons, are situated at Aba, Calabar, Port Harcourt and

Abonnema (Eastern Nigeria), Sapele (South Western Nigeria) and Zaria (Northern Nigeria). Groundnut oil is produced by seven undertakings in Northern Nigeria. Fairly large establishments have been installed at Kano, Kano Abade, Maidurugi and Zaria.

#### Soap

There are twelve concerns manufacturing soap. Most of them are in Eastern Nigeria (four at Aba, two at Uyo, one at Umahia-Ikebu and one at Ikot-Ekpene). Two are situated in Western Nigeria (one at Ibadan and one at Ogbomoso); and there is an undertaking at Apapa, in the Federal Territory, and one at Kano in Northern Nigeria. The largest factories (Aba, Apapa and Kano) produce about 40,000 tons of common soap and a large quantity of toilet soap. These factories received the sum of \$400,000 in 1962 for the promotion of exports of glycerine.

#### Perfumes and cosmetics

The perfumery and cosmetics industry comprises about eighteen undertakings, most of them located in the Federal Territory. The largest are at Kano, Aba and Apapa.

#### Medicinal and pharmaceutical products

Some fourteen undertakings, including the largest, situated at Vom, Kano and Apapa, manufacture a certain number of products put up in the form of syrups, tablets, pomades and glass ampoules: vitamins, sulphonamides, aspirin, anti-malaria tablets, etc. Two workshops produce sera and vaccines. A laboratory at Vom produces vaccines and sera for cattle; another, at Yaba, manufactures preparations against yellow fever and smallpox.

The undertakings producing medicinal and pharmaceutical products are spread over the country as follows:

Nine in the Federal Territory (four at Apapa, three at Yaba, two at Ikeja);

Two in Eastern Nigeria (at Aba and Port Harcourt);

Three in Northern Nigeria (at Vom, Jos and Kano).

#### Miscellaneous chemical products

There is at the moment one undertaking which produces and puts up insecticides, situated at Ikeja. There is an establishment producing phenolic resin at Enugu and a workshop for floor and leather wax at Lagos. There are two bone meal factories at Ibadan and Nguru, and a charcoal factory at Lagos. Three workshops (two at Port Harcourt and one at Apapa) manufacture candles, total capacity being approximately 1,000 tons a year.

### Plastics

Five undertakings (at Apapa, Abokuta, Ibadan, Aba and Kano) manufacture a variety of plastic articles -- household appliances, industrial containers, polyethylene tubes, etc. Two establishments, at Apapa and Lagos, produce travelling cases, plastic handbags and fibreboards, and two others, at Ikeja and Onitsha, manufacture bags and bicycles seat covers. Three factories (two at Apapa, one at Muskin) produce plastic and rubber footwear. Plastic shoe production is estimated at about 2 million pairs a year.

### Rubber and rubber products

About forty undertakings manufacture crepe rubber and smoked rubber sheet. Most of them (thirty-three in fact) are located in the South-Western Region. Six others are installed in the Eastern and one in the Western Region. The largest undertakings are at Sapele, Kalabar and Elele. Two concerns (at Ibadan and Ikeja) produce foam rubber products. A factory at Onitsha produces rubber sandals. Three others (at Apapa, Ijora and Kano) manufacture plastic and rubber shoes. Two workshops at Ebute Motta and Sapele make footwear of rubber and canvas, and two other establishments at Aba and Onitsha produce rubber and leather shoes. Production of rubber shoes is estimated at about 2 million pairs a year.

Nine enterprises carry out tyre retreading. There are three workshops in the Western Region (two at Ibadan and one at Ijebu-Ode) and three others in the Eastern Region (two at Onitsha and one at Aba). There are two establishments in the Northern region (one at Kano and one at Jos) and one concern operates at Lagos.

The first factories in West Africa to manufacture tyres and tubes are now functioning at Ikeja and Port Harcourt. Their total capacity is 3 million tyres and tubes a year.

### Tanned and treated hides and skins and leather products

Nigeria has three tanneries (two at Kano and one at Sokoto) and four workshops (three at Kano and one at Maidiguri) for dressing hides and skins. All of them are situated in the Northern region. Two establishments (one at Kano and



one at Oyo) manufacture leather products. Three enterprises (at Ikeja, Kano and Maiduguri) make leather footwear. Two enterprises, at Aba and Onitsha, produce leather and rubber shoes. The production of leather footwear is estimated at approximately 2 million pairs a year.

#### Products of petroleum and coal

It is estimated on the strength of the projections that in 1965 the petroleum refinery at Alesa Eleme, Port Harcourt should produce 280,000 tons of motor fuel, 185,000 tons of kerosene, 510,000 tons of fuel distillates (light oils) and 612,000 tons of residual fuel oils (heavy oils). There are two establishments at Lagos and Port Harcourt producing bituminous blends on a basis of asphalt.

#### Matches

Matches are manufactured in Nigeria in a single undertaking at Ilorin. Production is entirely automatic. Annual capacity is approximately 800,000 large boxes.

More detailed data concerning the number of chemical and related enterprises, their production and value added and their names and whereabouts, are shown in tables 3 and 4. The data compiled in table 3 concerns only those chemical and related enterprises included in a survey carried out during 1963.

Table 3

Chemical and related industries: number of enterprises surveyed and number of persons employed, gross production and value added:

Products	Number of enterprises surveyed	Number of persons employed	Gross production at current prices	Value added at current prices
(Thousands of dollars)				
Tanned and treated hides and skins and leather products	6	271	672	199
Rubber and rubber products	25	5,304	10,997	4,319
Miscellaneous chemical products <sup>1/</sup>	9	736	2,941	1,045
Vegetable oils	42	3,423	31,821	12,193
Paints, varnishes and lacquers	4	152	1,286	378
Soaps	6	1,824	6,490	1,874
Perfumes and cosmetics	12	975	4,695	1,557
Plastics	7	425	919	426
Oxygen, acetylene and carbon-dioxide	3	115	703	566

Source: Industrial Survey, Nigeria, 1962, Federal Office of Statistics, Lagos, 1965

<sup>1/</sup> Including two bitumen workshops.

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
<b>1. BEER</b>			
<u>Federal Territory</u>			
Nigerian Brewery Ltd. (1946)	Apapa Rd, Lagos	Beer	G
<u>Western Region</u>			
Guinness (Nig.) Ltd. (1962)	Industrial Estate, Ikeja	Stout	F
West African Breweries Ltd. (1964)	Lafenwa-Lagos Highway, Abeokuto	Beer	F
<u>Eastern Region</u>			
Independence Brewery Ltd. (1963)	Aba Rd, Umuahio	Beer	E
Nigerian Breweries Ltd. (1962)	Aba	Beer	G
<u>Northern Region</u>			
Nigerian Breweries Ltd. (1963)	Industrial Area, Kaduna	Beer	F
<b>2. SOFT DRINKS AND CARBONATED WATER</b>			
<u>Federal Territory</u>			
Kole James and Co. Ltd. (1945)	12 Abibu - Oki St. Lagos	Bottled beverages	D
London and Kano Trading Co. (1938)	11 Dockyard Rd. Apapa	Fri-Cola Sword Brand	E
Nigerian Bottling Co. Ltd. (1963)	10 Wharf Rd. Apapa	Coca-Cola Fanta	F

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
Nigerian Breweries Ltd. (1959)	Apapa Rd., Ebute-Metta	Krola, Tango, Sundowner, Schweppes	D
Seven-up Bottling Co. Ltd. (1960)	251 Apapa Rd., Apapa	Seven-up Howdy	D
West African Industrial Ventures Ltd. (1961)	17 Mc Even St., Yaba	Mission	B
<u>Western Region</u>			
Arigbabu Aerated Water supply syndicate (1955)	Lagos Rd. Ijebu-Ode	Kola, aerated waters	B
Ibadan Mineral Water Co.	Ibadan	Bottled beverages	C
Nigerian Bottling Co. Ltd. (1962)	Oyo Rd., Ibadan	Coca-Cola, Fanta, Sprite	D
Pepsi Cola Project W.N.D.C. (1960)	Ibadan	Pepsi-Cola, Mirinda	D
<u>Eastern Region</u>			
J.N. Agwunobi and Sons	15 Bright Street, Onitsha	Mineral water	B
Beabird Aerated Water Factory	20 Potts Johnson St. Port Harcourt	Mineral water	B
Mineral Water Manufacturing	105 Bende St., Port Harcourt	Mineral water	B
Nigerian Brewing Co.	28 Owerri Rd., Asata, Enugu	Mineral water	B

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
Nigerian Breweries Ltd. (1952)	Aba	Krola, Tango, Sundowner	F
M.A. Okeke Odinukwe Ltd.	14 Amobi St. Onitsha	Mineral water	B
Pepsi-Cola Bottling Project (1961)	Awka Rd., Onitsha	Pepsi-Cola, Mirinda	E
Eta Brothers and Co.	Onitsha	Mineral water	E
<u>Northern Region</u>			
Bottling Co. Ltd.	128 Mission Rd. Kano	Bottled beverages	-
Nigerian Bottling Co. (1956)	36137 Hadejia Rd. Kano	Coca-Cola, Fanta, Sprite	D
Nigerian Breweries Ltd.	Kaduna	Krola, Tango, Sundowner, Schweppes	D
Sword Brand Bottling Co. Ltd. (1959)	128 Mission Rd. Kano	Sword Brand, Pepsi-Cola, Mirinda	E
Sword Brand Bottling Co.	Jos	Sword Brand	-
3. CIGARETTES			
<u>Western Region</u>			
Nigerian Tobacco Co. Ltd. (1951)	Ibadan	Cigarettes	I
<u>Eastern Region</u>			
Nigerian Tobacco Co. Ltd. (1956)	Industrial Rd., Port Harcourt	Cigarettes	

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
<u>Northern Region</u>			
Kwora Tobacco Co. (1944)	Industrial Area, Ilorin	Cigarettes	F
Nigerian Tobacco Co. Ltd. (1958)	Zaria	Cigarettes	F
4. FOOTWEAR			
<u>Federal territory</u>			
Bata Shoe Co. (Nig.) Ltd. (1960)	7 Wharf Rd, Apapa	Plastic and rubber shoes	F
Britind Footwear (Nig.) Ltd. (1960)	Ijora Causeway, Ijora	Plastic and rubber shoes	C
Metalloplastica (Nig.) Ltd. (1962)	8 Queen's Barracks Road, Apapa	Plastic shoes	F
Utribon Industries (Nig.) Ltd. (1960)	13 Burma Road, Apapa	Plastic shoes	D
<u>Western Region</u>			
Akinsanya Shoe Factory (1953)	NW 4/398 Salvation Army Road, Ibadan	Footwear	B
Bata Shoe Co. (Nig.) Ltd. (1964)	Ikorodu Road, Ikeja	Leather shoes	G
Polymera industries (Nig.) Ltd. (1963)	Agege Motor Road, Mushin	Plastic shoes	E
Salvi Shoe MFG Co. Ltd. (1964)	77 Apapa Road, Ebute Metta	Rubber and canvas shoes	D
<u>South Western Region</u>			
Co-operative Shoe Makers Society Ltd. (1961)	7 Forestry Road, Benin City	Shoes	B
Omimi Shoe Co. Ltd. (1963)	Ogorode, Sapele	Rubber and canvas shoes	E

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
<u>Eastern Region</u>			
Eastern Shoe Industry	88 Asikiwe Road Aba	Rubber and leather shoes	B
The Modern Shoe Industry Ltd.	Owerri	Shoes	-
Niger City Shoe Industry (1956)	46 Moore Street, Onitsha	Rubber and leather shoes	B
Okwuba Commercial Syndicate Beach Sandal Factory (1962)	4 Amobi St., Onitsha	Sandals	B
<u>Northern Region</u>			
Nigerian Leather Works Co. Ltd. (1963)	2 Bourdillon Road, Kano	Leather shoes	D
Nigerian Shoe Factory Ltd. (1959) (Rubber Industries Ltd.)	157-9 Club Rd. Kano	Plastic, rubber and canvas shoes	F
Tomsu Shoe Manufacturers (1958)	Maiduguri	Leather shoes	B
5. PAPER			
<u>Northern Region</u>			
Nigerian Paper Mills Ltd.	Jebba	Paper	-
6. ARTICLES OF PAPER			
<u>Federal Territory</u>			
Bordpack Nigeria Ltd. (1964)	Dockyard Rd; Apapa	Cardboard boxes, cartons	F
Nigerian Paper Converters (1962)	23 Warehouse Rd; Apapa	Toilet paper	C
Nigerpack Ltd.	37 Warehouse Rd; Apapa	Wrapping paper	C
Wiggins Teope (W.A.) Ltd. (1957)	23 Burma Rd; Apapa	Stationery	D

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
<u>Western Region</u>			
Apex Paper Product Ltd. (1961)	Eleiyele Rd., Ibadan	Stationery	D
Caxton Press (W.A) Ltd.	Eleiyele Rd., Ibadan	Stationery	D
Nigerian Travel goods Factory (1962)	Muskin (Lagos)	Toilet paper	B
Paper Converters Ltd.	Industrial Park, Ikeja	Paper bags, cardboard boxes	C
Eastern Nigerian Printing Corporation	Ijebu - Bye-Pass Oke-Bola, Ibadan	Stationery	B
<u>Eastern Region</u>			
Apex (Eastern Nigeria Ltd.) (1962)	Port Harcourt	Stationery	D
Paper products (Nig.) Ltd.	Port Harcourt	Paper bags	-
Thomas Wyatt and Sons (W.A) Ltd. (1963)	Trans-Amadi Industrial Estate Port Harcourt	Stationery	C
<u>Northern Region</u>			
Thomas Wyatt and Sons (W.A.) Ltd. (1961)	New Industrial Area, Kaduna	Stationery	C
7. TANNED AND TREATED HIDES AND SKINS AND LEATHER PRODUCTS			
<u>Northern Region</u>			
Alhaji Abubakar (1953)	30 Cediye-terero Rd. Kano	Dressed leather	B
Bornu Tannery Ltd.	Avenue of the Sudan, Maiduguri	Dressed leather	-



Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
Great Northern Tanning Co. Ltd.	22 Douglas Rd., Bompai, Kano	Tanned hides and skins	D
Holts Nigerian Tanneries Ltd. (1949)	Barth Rd., Kano	Tanned hides and skins	D
Ministry of animals and Forest resources (1959)	Experimental tannery, Sokoto	Tanned hides and skins	B
Darum Enterprises Ltd. (1961)	Douglas Rd., Bompai, Kano	Dressed leather	B
United Africa Co. of Nig. Ltd.	Victory Rd., Kano	Dressed leather	-
Alhaji Ahmadu Trader and Sons (1938)	51-55 Gwanmaja, Kano	Leather products	C
Ibrahim Rahi (1933)	Kano	Leather products	B
<u>Western Region</u>			
Oyo Co-operative Leather Workers Society (1960)	Oyo	Leather products	D
8. RUBBER AND RUBBER PRODUCTS			
<u>Federal Territory</u>			
J.A. Zarpos Tyres Ltd. (1957)	144 Moloney Bridge Street, Lagos	Retread tyres	C
<u>Western Region</u>			
Bambo and Sons (1952)	143 Akarigbo St., Shagamu	Smoked rubber sheet	B
Dunlop Nigerian Industries Ltd. (1963)	Industrial Estate, Ikeja	Tyres and tubes	G
Nigerian Foam Rubber Co. Ltd. (1958)	5-7 New Court Trading Plot Rd. Ibadan	Foam rubber products	B

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
Odutola Tyresoles Co. Ltd. (1951)	Ijebu - Bye-Pass, Ibadan	Retread tyres	C
Odutola Tyresales Co. Ltd. (1958)	206 Tolagbode St., Ijebu-Ode	Retread tyres	C
Vitafoam (Nig.) Ltd. (1963)	Industrial Estate Ikeja	Foam rubber products	D
West African Tyre Retreading Co. Ltd. (1956)	5-7 New Court Trading Plot Rd., Ibadan	Retread tyres	D
<u>South Western Region</u>			
Afro-Nigerian Export and Import Co. (1959)	Sapele	Sheet and crepe rubber	E
E.J. Aroko and Sons (1947)	Benin City	Crepe rubber	C
J.A. Asaboro (1954)	Sapele	Sheet and crepe rubber	J
Bata Shoe Co. (Nig.) Ltd. (1961)	Benin City	Crepe rubber	D
Carafres Bros. Ltd. (1960)	Sapele	Crepe rubber	D
Daarnhouwer and Co. (Nig.) Ltd. (1959)	Sapele	Crepe rubber	E
D.C.C. Co. Ltd. (1959)	Sapele	Crepe rubber	D
John Edokpolo and Sons (1956)	Benin City	Smoked rubber sheet and crepe	F
Ethiope River Rubber Co. Ltd. (1957)	Sapoba, Sapele	Sheet and crepe rubber	E
John Hott Co. Ltd.	Enerke, Warri	Crepe rubber	-
John Hott Co. Ltd. (1959)	Decima Rd., Sapele	Smoked rubber sheet	E

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
John Hott Co. Ltd. (1962)	Ologbo, Benin City	Crepe rubber	F
Ikpoba Rubber Factory (1954)	Benin City	Crepe rubber	E
Itagbo-Uno Rubber Estates Ltd.	Itagbo-Uno	Sheet and crepe rubber	-
Mandilas and Karaberis Ltd.	Benin City	Sheet and crepe rubber	D
New Independent Rubber Co. Ltd. (1961)	Amukpe, Sapele	Crepe rubber	E
New York African Corp.	Ikpoba, Benin City	Crepe rubber	B
Nigerian Rubber Co. Ltd. (1961)	Decima Rd., Sapele	Sheet and crepe rubber	E
Chief H. . Obaseki	Benin City	Sheet and crepe rubber	B
A.O. Obasuyi and Sons	Benin City	Crepe rubber	-
D.O. Oghene and Sons (1961)	Sapele	Sheet and crepe rubber	D
Pamol (Nig.) Ltd. (1909)	Sapele Rubber Estate Sapele	Sheet and crepe rubber	G
Phoebus Economides (1959)	Ogba, Benin City	Crepe rubber	D
Sapele Rubber and Trading Co. (1952)	Benin City	Sheet and crepe rubber	C
F.G. Spiropoulos and Co. Ltd. (1956)	Agenube, Sapele	Crepe rubber	F
S. Thonopoulos Rubber Co. Ltd. (1953)	Sapele	Crepe rubber	G
United Africa Co. of Nig. Ltd. (1952)	Amukpe, Sapele	Crepe rubber	E
United States African Corp.	Benin City	Crepe rubber	D

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
Uodubi Rubber Industrial Co. (1956)	Okpara Waterside, Sapele	Crepe rubber	D
Warri Co-operative Produce Marketing Union	Co-operative Office Warri	Sheet and crepe rubber	E
Western Nigeria Development Corporation (1963)	Ikpoba, Benin City	Sheet and crepe rubber	E
<u>Eastern Region</u>			
Dunlop Nigerian Plantations Ltd (1962)	Akankpa, Calabar	Sheet rubber	I
E.N.D.C. Rubber Estate	Owerri	Sheet and crepe rubber	F
E.N.D.C. Rubber Estate	Elele	Sheet and crepe rubber	G
Ejogham Rubber Estate of Nigeria (1958)	Oban, Calabar	Sheet and crepe rubber	C
Michelin (Nig.) Ltd. (1962)	Trans-Amadi Industrial Estate, Port Harcourt	Tyres and tubes	F
Oban (Nig.) Rubber Estates Ltd. (1952)	Mamfe/Calabar Rd., Calabar	Sheet and crepe rubber	B
Odutola Tyresoles Co. Ltd. (1957)	Fegge Industrial Layout, Onitsha	Retread tyres	D
Pamol (Nig.) Ltd. (1912)	Iko-Mbo, Calabar	Sheet and crepe rubber	G
Mgochukwu Tyres Ltd. (1958)	Fegge Industrial Area, Onitsha	Retread tyres	D
West Africa Tyre Retreading Co.Ltd. (1960)	Industrial Area, Aba	Retread tyres	D

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
<u>Northern Region</u>			
Odutola Tyresoles Co. Ltd.	Mission Rd., Kano	Retread tyres	C
Terco (Nig.) Ltd. (1955)	13 Bukuru Bye-Pass, Jos	Retread tyres	D
9. VEGETABLE OILS			
<u>Western Region</u>			
Western Nigeria Development Corporation	Ijebu Farm Project, Apaje, Ijebu-Igbo	Palm oil	D
Western Nigeria Development Corporation (1958)	Irele Via Okitipupa	Palm oil	D
Western Nigeria Development Corporation (1959)	Araromi-Lomiro	Palm oil	D
<u>South Western Region</u>			
Bulk Oil Plants of Nigeria Ltd. (1956)	Koko	Palm oil	C
Kusa Co-operative Oil Mill Society Ltd. (1959)	Benin City	Palm oil	B
Pamol (Nig.) Ltd. (1940)	Cowan Palm Oil Estate, Sapele	Palm oil	G
Western Nigeria Development Corporation	Umunede, Oguaski-Uku	Palm oil	B
<u>Eastern Region</u>			
Adule Vegetable Oil Processing (1958)	Omumanzor Village, Oxu Clan, Aba	Palm oil	D
Alala Industries Co. Ltd. (1953)	Amawon Oboro, Umuakia	Palm oil	C

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
Associated Industrial Ltd. (1948)	East Aba	Palm oil	G
Bulk Oil Plants of Nig. Ltd. (1956)	Abonnema	Palm oil	E
Bulk Oil Plants of Nig. Ltd. (1956)	Opobo	Palm oil	D
Bulk Oil Plants of Nigeria Ltd.	Port Harcourt	Palm oil	F
Bulk Oil Plants of Nigeria Ltd.	Calabar	Palm oil	E
Eastern Nigeria Development Corporation (Pioneer Oil Mill Scheme) (93 Mills) (1947)	Enugu	Palm oil	I
Ibesikepo Oil Mill (1965)	Mbierere Akpowat, Oyo	Palm oil	B
Ibibio Farming and Trading Co. Ltd. (1958)	Ikot-Ekpene, Oniong- Nung, Ndem	Palm oil	C
J.O. Ihekwoaba and Sons Ltd. (1956)	Port Harcourt	Palm oil	E
Ikedum Co-operative Oil Mill Union (1956)	Ikeduru	Palm oil	C
Item Merchants Association Ltd. (1958)	Amockwe Item, Aba	Palm oil	C
T.N. Nadu and Sons Co. Ltd. (1963)	Aba	Palm oil	E
L.N. Obioha and Sons Ltd. (1931)	Abakpa, Okigwi	Palm oil	D
Okon-Ika Co-operative (1963)	Ikot-Ekpene	Palm oil	B
L.O. Okoro and Co. Ltd. (1950)	Aba	Palm oil	D
E.C.J. Onuigbo Sons and Co. Ltd. (1952)	Aba	Palm oil	D

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
E.C.J. Onuigbo Sons and Co. Ltd.	Ufuma, Awka	Palm oil	C
A.N. Okoye and Sons Co. Ltd. (1961)	Nkwo Ezinifitte via Nnewi	Palm oil	C
Palm Industrial Association Ltd. (1957)	Imo River, Owerri	Palm oil	-
Pamol (Nig.) Ltd. (1941)	Calabar, Palm Oil Estate, Calabar	Palm oil	G
Maurinco Nig. Ltd. (1961)	Plot 1A Aba	Palm oil	J
<u>Northern Region</u>			
Kano Oil Millers Ltd. (1951)	Kano	Groundnut oil	E
P.S. Mandrides and Co. Ltd. (1950)	Kano	Groundnut oil	E
Maiduguri Oil Mills Ltd. (1964)	Maiduguri	Groundnut oil	F
Anguria Oil Mills	Kano	Cotton seed	-
K. Maroun Ltd. (1953)	Kano	Groundnut oil	G
Nigerian Oil and Cake Mills Ltd. (1952)	Kano	Groundnut oil	F
Northern Nigerian Development Corporation Oil Mill	Abade, Idah	Palm oil	-
Northern Nigerian Development Corporation Oil Mill (1952)	Qaria	Palm oil	E
Northern Nigerian Development Corporation Oil Mill	Ayangba	Palm oil	-

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
Northern Nigerian Development Corporation Oil Mill	Ola	Palm oil	-
Northern Oil Seed Processing Development (1954)	Qaria	Groundnut oil	E
Road and Fadoul Ltd. (1953)	Kano	Groundnut oil	E
10. BASIC INDUSTRIAL CHEMICALS			
<u>Federal Territory</u>			
Industrial Gases (Nig.) Ltd. (1961)	224 Apapa Rd., Apapa	Oxygen, acetylene	D
Apapa Chemical Industries Ltd. (1959)	Jetly Rd., Apapa	Carbon dioxide	C
<u>Eastern Region</u>			
Port Harcourt Gas Producers Ltd. (1960)	2 Asinobi St., Port Harcourt	Oxygen, acetylene	B
Niger Gas Co. Ltd (1962)	19 Emene, Enugu	Oxygene	B
Pepsi-Cola Bottling Project (1961)	Awka Rd., Onitsha	Carbon dioxide	E
<u>Northern Region</u>			
Moukorim Metawood Factory Ltd. (1959)	102 Barth Rd., Kano	Oxygen	D
Nigerian Carbon Dioxide Co. Ltd. (1958)	14 Kadejia Rd., Kano	Carbon dioxide	B
11. PAINTS, VARNISHES AND LACQUERS			
<u>Federal Territory</u>			
Regeney (Overseas) Co. Ltd. (1963)	Lagos	Paints	C



Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
<u>Western Region</u>			
Askar of Nig. Ltd. (1962)	Eleiyele, Ibadan	Paints	B
British Pains W.A. Ltd. (1962)	Industrial Estate Ikeja	Paints	E
Imperial Chemical Industries Ltd. (1962)	Industrial Estate Ikeja	Paints	C
International Paints (W.A.) Ltd. (1962)	Industrial Estate Ikeja	Paints	D
<u>Eastern Region</u>			
Denchukwu Ltd.	13 Owa St., Ogbete, Enugu	Paints	F
Permacec (Nig.) Ltd. (1962)	Trans-Amadi Industrial Area, Port Harcourt	Cement paint	B
12. SOAP, PERFUME AND COSMETICS			
<u>Federal Territory</u>			
Chesebrough-Ponds International Ltd. (1960)	Apapa	Vaseline and cosmetics	C
Cosmetics Nig. Ltd. (1961)	Ijora Causeway	Cosmetics	B
Del Fella (Nig.) Ltd.	17 Commerical Av., Yoba	Perfume and cosmetics	C
Esther Beauty Aids Co. (1960)	5 Onike Road, Yoba	Cosmetics and toiletries	B
Lover Brothers (Nig.) Ltd. (1958)	15 Dockyard Rd., Apapa	Soap and toiletries	F
Nigerian Food Supply and Cold Storage Co. Ltd.	Harbour Road, Apapa	Talcum powder	-

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
Pharco Production Ltd. (1960)	27 Warehouse Road, Apapa	Cosmetics	E
West African Perfumeries Ltd. (1960)	15 Dockyard Rd.,	Perfume, pomade and soap powder	C
<u>Western Region</u>			
Metropolitan Syndicate (1960)	54/502 Eleckuwo St., Ibadan	Soap	C
Ogbomosko Co-op. Soap Makers Society Ltd. (1954)	Ogbomosho	Soap	C
<u>Eastern Region</u>			
Akpan and Co. Ltd. (1962)	Ikot-Ekpene	Soap	C
Associated Industries Ltd. (1948)	Margaret Av. East Aba	Soap, perfume, cosmetics	G
Denchukwu Ltd. (1962)	13 Owa Street, Enugu	Cosmetics	D
International Equitable Association Ltd. (1952)	Omuna Road Aba	Soap	E
Lever Brothers (Nig.) Ltd.	Factory Road Aba	Soap and glycerine	F
Star Brand Soap Manufacturing Industry	Aka Road, Uyo	Soap	B
Udo Star Brand Soap Making Industry (1954)	Aka Road, Uyo	Soap	B
Ukiwe Brothers and Co. (1957)	1 Accra Lane, Umuahia-Ibeku	Soap	B
Wellingtons Industrial Home (1960)	138 Hospital Road, Aba	Soap	B

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
<u>Northern Region</u>			
Geha Trading Co. Ltd. (1952)	168/169 Mission Road Kano	Perfumes and cosmetics	E
Haco Perfume Factory Ltd. (1954)	46 Ibo Rd., Kano	Perfumes and cosmetics	F
Road and Fadoul Ltd. (1955)	147/148 Mission Rd., Kano	Soap	E
A.J. Seward (Nig.) Ltd. (1963)	Qaria	Toiletries and cosmetics	D
Q. Famman (1963)	Kano	Perfumes	C
Furaren N'Housawa Ltd. (1959)	13 Liverpool Road Kano	Perfumes and pomade	C
United Perfumery Co. (Nig.) Ltd. (1962)	Douglas Road Kano	Perfume	B
13. MEDICINES AND PHARMACEUTICAL PRODUCTS			
<u>Federal Territory</u>			
Drugs and Pharmaceutical Industry Ltd. (1960)	1 Aerodrome Rd.	Pharmaceutical products	B
Dumex Pharmaceuticals Ltd. (1960)	21 Creek Rd. Apapa	Pharmaceutical products	B
Federal Ministry of Health (1962)	Medical Compound Yaba	Pills and ointments	B
Glaxo Laboratories (Nig.) Ltd. (1960)	41 Creek Rd., Apapa	Pharmaceutical products	C
Lepetit Nigeria Ltd.	Ikeja Industrial Estate	Pharmaceutical products	-
Major and Co. Ltd. (1962)	14 Burma Rd., Apapa	Pharmaceutical products	D
Pharco Production Ltd. (1960)	27 Warehouse Rd., Apapa	Pharmaceutical products and cosmetics	E
Smallpox Vaccine Laboratory (1962)	Ministry of Health Yaba	Sera and vaccines	-

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
<u>Western Region</u>			
Major and Co. Mfg. Nigeria Ltd.(1964)	Industrial Estate Ikeja	Pharmaceutical products	-
<u>Eastern Region</u>			
Major and Co. Mfg. Nigeria Ltd. (1964)	Industrial Layout, Aba	Pharmaceutical products	D
Pfizer Products Ltd. (1962)	Industrial Layout, Port Harcourt	Pharmaceutical products	D
<u>Northern Region</u>			
Federal Department of Veterinary Research	Vom	Serums and vaccines	F
Northern Chemists Ltd. (1950)	31 Queen Elizabeth Way, Jos	Medicines and toiletries	D
Pharmaceutical Co. of Nigeria Ltd. (1964)	Kano	Pharmaceutical products	F
14. MISCELLANEOUS CHEMICAL PRODUCTS			
<u>Federal Territory</u>			
Nigerian Charcoal Ltd. (1940)	66 Broad St. Lagos	Charcoal	B
Pharco Production Ltd. (1960)	27 Warehouse Rd. Apapa	Candles	E
Shinol Manufacturing Co. (1960)	63 Foresythe St. Lagos	Floor and leather wax	B
<u>Western Region</u>			
Imperial Chemical Industries Ltd.(1962)	Industrial Estate, Ikeja	Insecticides	C
United Development Trading Co. (1954)	Stone Rd., Oniseke, Ibadan	Bone meal	C

Table 4

Name, whereabouts, products manufactured, and manpower employed by chemical and related undertakings

Name	Address	Products	Classification by number of employees
<u>Eastern Region</u>			
Eastern Nigeria Development Corporation	Oghe, Enugu	Phenolic resin	E
Harrison's Industrial Co.	Port Harcourt	Candles	-
Nigerian Industrial Co. (1962)	Port Harcourt	Candles	B
<u>Northern Region</u>			
Darum Enterprises	Nguru	Bone meal	B
15. PLASTICS			
<u>Federal Territory</u>			
Metalloplastica (Nig.) Ltd. (1961)	8 Queen's Barracks Rd. Apapa	Articles of plastic	F
Seidler (Nig.) Ltd. (1959)	38 Burma Rd. Apapa	Travelling cases, handbags	E
<u>Western Region</u>			
Fibre Glass Reinforced Plastic Co. Ltd.	Ibara Rd. Abeokuta	Articles of plastic	B
Modern Signs (Nig.) Ltd. (1961)	Industrial Estate Ikeja	Articles of plastic	D
Nigerian Plastic Co. Ltd. (1957)	Abeokuta Rd. Ibadan	Tubes and pipes	E
Nigerian Travel Factory (1962)	Muskin	Travelling cases	D
<u>Eastern Region</u>			
Christopher Okpala and Bros. Manufacturing Co.	Onitsha	Bags and bicycle seat covers	C
Pfizer Products Ltd. (1962)	Industrial Layout, Aba	Articles of plastic	D

# V. THE PRESENT MARKET FOR CHEMICAL PRODUCTS

The tables below were prepared by selecting chemicals and related products on the basis of the customs statistics for 1960 to 1964 taken as base reference years. Growth rates are calculated over a period of four years as a rule, except where a figure is missing or is of no consequence. Table 5 relates to import tonnages; table 6 gives their value in dollars. Table 7 shows export tonnages, and table 8 their value in dollars. Table 9 gives the values for imports, exports and re-exports of chemical products and the proportion which each of these chemicals represents in Nigeria's foreign trade.

Table 5

Imports: chemicals and related products (tonnage)

Classification	(Tons)					Annual rate
	1960	1961	1962	1963	1964	
Group 271. Crude fertilizers						
271. Grade for fertilizers	495	83	184	819	797	13%
Group 274. Sulphur and unroasted iron pyrites						
274. Sulphur and unroasted iron pyrites						
Group 276. Other crude minerals					17	?
276.3 Salt	106707	112805	115447	126021	133661	6%
Section 5. Chemicals						
Group 512. Organic chemicals						
512.1 Hydrocarbons and their derivatives				98	815	?
512.2(1) Methylalcohol (methanol) - m3				254	135	?
512.2(4) Ethylalcohol (m3)	248	394	562	137	416	14%
512.2(6) Glycerol - m3				35	6	?
512.2(9) Derivatives of phenols or phenol-alcohols (m3)	22	11	59	7	18	Minus
512.3 Ethers, epoxides, acetols				7	26	?
512.4 Aldehyde-, ketone- and quinone-function compounds				5	27	?

Table 5 (continued)

Classification	(Tons)					Annual rate
	1960	1961	1962	1963	1964	
512.5 Acids and their derivatives	574	476	459	660	1078	17%
512.6 Inorganic esters, their salts and derivatives				9	45	?
512.7 Nitrogen - function compounds					1	?
512.8 (8) Saccharine				2	17	?
512.8 (9) Other organo-mineral compounds				405	29	?
512.9 Other organic chemicals				679	1291	?
Group 513. Inorganic chemicals						
513.1 Oxygen, nitrogen, hydrogen				89	162	?
513.2 Chemical elements n.e.s.				2966	2340	?
513.3 Inorganic acids and oxygen compounds of metalloids	372	525	594	800	811	21%
513.4 Halogen or sulphur derivatives of metalloids				10	6	?
513.5 Metallic oxides, of type principally used in paints				119	170	?
513.6(1) Ammonia, anhydrous or in aqueous solution				118	197	?
513.6(2) Caustic soda (sodium hydroxyde)	5847	4298	6568	7079	9186	12%
513.6(9) Other inorganic bases and metallic oxides, hydroxides and peroxides				2428	1042	?
Group 514. Other inorganic chemicals						
514.9(4) Calcium carbide	1469	1891	2398	1136	2205	11%
514.9(9) Other inorganic compounds ...	...	...	...	2152	7182	?
Group 515. Radioactive and associated materials						
515. Radioactive and associated materials				1	2	?

Table 5 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
Group 521. Mineral tar and crude chemicals from coal, petroleum and natural gas						
521.1 Mineral tar	1341	1133	1138	1281	713	Minus
521.9 Crude chemicals from coal, petroleum and natural gas	264	178	224	414	146	Minus
Group 531. Synthetic organic dyestuffs, natural indigo and colour lakes						
531. Synthetic organic dyestuffs and natural indigo	609	610	640	1048	1155	18%
Group 532. Dyeing and tanning extracts and synthetic tanning materials						
532. Dyeing and tanning extracts and synthetic tanning materials	213	94	96	289	128	Minus
Group 533. Pigments, paints, varnishes and related materials	10775	10995	10979	9438	11145	1%
533.1 Colouring materials, n.e.s.	4110	3463	5042	4208	3965	Minus
533.2 Printing inks	182	207	220	241	301	14%
533.3(1) Prepared pigments, opacifiers, enamels, glazes, lustres, etc.	6483	7325	5717	3495	4609	Minus
533.3(2) Varnishes, distempers, water pigments, stamping foils and dyes put up for retail sale	-	-	-	685	1541	?
533.3(3) Artists colours	-	-	-	128	74	?



Table 5 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
533.3(4) Prepared driers	-	-	-	133	152	?
533.3(5) Putty, painters' fillings, etc.	-	-	-	548	503	?
Group 541. Medicinal and pharmaceutical products						
541.1 Vitamins and provitamins	-	-	-	-	-	-
541.3 Penicillin, streptomycin, tyrocidine and other antibiotics	-	-	-	-	-	-
541.4 Opium alkaloids, cocain, caffen, quinine and other vegetable alkaloids, their salts and other derivatives	-	-	-	-	-	-
541.5 Hormones	-	-	-	-	-	-
541.6 Glycosides; glands and their extracts; sera, vaccines	-	-	-	-	-	-
541.7(1) Antimalalaria medicines	-	-	-	-	-	-
541.7(2) Ointments, liniments	-	-	-	-	-	-
541.7(9) Other medicaments	-	-	-	-	-	-
541.9(1) Bandages, etc., impregnated or coated with pharmaceutical products or put up for retail sale	-	-	-	-	-	-
541.9(9) Other pharmaceutical goods	-	-	-	-	-	-
Group 551. Essential oils, perfume and flavour materials						
551. Essential oils and resinoids; synthetic perfume and flavour materials and concentrates, and enfleurage greases and mixtures of alcohol and essential oils	355	348	397	502	456	6%

Table 5 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
Group 553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)						
553.1 Perfumery (m3)	9	14	14	8	569	182%
553.2 Dentifrices	102	89	137	140	125	5%
553.3 Talc and powders	368	335	308	356	385	1%
553.4 Pomades	160	137	106	24	18	Minus
553.9 Other perfumes, cosmetics and toilet preparations	426	414	339	287	286	Minus
Group 554. Soaps, cleansing and polishing preparations						
554.1(1) Toilet soap	895	887	1029	1910	1491	14%
554.1(2) Common soaps	461	267	1090	1614	585	8%
554.2 Surface-acting agents and washing preparations	1321	1408	2627	3715	1599	5%
554.3 Polishes, pastes, powder and similar preparations for polishing and preserving leather, wood, metal, glass and other materials	1044	1224	1138	1209	1129	2%
Group 561. Manufactured fertilizers	13178	5651	19882	16654	28408	21%
561.1 Nitrogenous fertilizers	1747	1132	4212	3089	8963	51%
561.2 Phosphatic fertilizer and phosphatic fertilizing materials	1365	1998	12017	9418	13231	76%
561.3 Potassic fertilizers and potassic fertilizer materials	1813	1423	1290	666	848	Minus
561.9 Fertilizers, n.e.s.	8253	1098	2363	3481	5366	Minus

Table 5 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
Group 571. Explosives and pyrotechnic products	1358	1644	1566	1257	1751	7%
571.1 Propellant powders and other prepared explosives	1265	1455	1133	859	1285	Variable
571.2 Fuses, primers and detonators	93	189	433	398	466	50%
571.3 Pyrotechnical articles	-	-	-	-	-	-
571.4 Hunting and sporting ammunition	-	-	-	-	-	-
Group 581. Plastic materials, regenerated cellulose and artificial resins						
581. Plastic materials, regenerated cellulose and artificial resins	645	933	2467	3922	4167	59%
Group 599. Chemical materials and products, n.e.s.	940	967	2569	6107	7716	69%
599.2(1) Disinfectants	940	967	2569	1105	1385	10%
599.2(2) Insecticides	-	-	-	4172	5083	?
599.2(3) Fungicides	-	-	-	830	1248	?
599.2(9) Special products for sheep and cattle dressing	-	-	-	-	-	-
599.5 Starches, insulin, gluten; albuminoidal substances and glues	-	-	-	-	-	-
599.6 Wood and resin-based chemical products	-	-	-	-	-	-
599.7 Organic chemical products, n.e.s.	-	-	-	-	-	-
599.9 Chemical products and preparations, n.e.s.	-	-	-	-	-	-

Table 6

Imports:

Chemical and related products (value)

(Thousands of dollars)

Classification	1960	1961	1962	1963	1964	Annual rate
Group 271. Crude fertilizers						
271. Crude fertilizers	31.2	5.5	18.6	28.9	45.8	10%
Group 274. Sulphur and un- roasted iron pyrites						
274. Sulphur and unroasted iron pyrites	-	-	-	-	4.4	?
Group 276. Other crude minerals						
276.3. Salt	5223.5	5888.8	5636.7	6377.1	5813.6	3%
Section 5. Chemicals						
Group 512. Organic chemicals						
512.1. Hydrocarbons and their derivatives	-	-	-	19.6	173.8	?
512.2(1) Methyl alcohol (methanol)	-	-	-	79.8	49.9	?
512.2(4) Ethyl alcohol	71.3	134.9	172.0	55.9	137.7	18%
512.2(6) Glycerol	-	-	-	20.3	2.7	?
512.2(9) Derivatives of phenols or phenol-alcohols	51.7	21.6	17.8	4.2	19.3	Minus
512.3. Ethers, epoxides, acetols	-	-	-	4.2	14.5	?
512.4. Aldehyde-ketone and quinone-function compounds	-	-	-	2.8	13.9	?
512.5. Acids and their derivatives	194.1	167.9	162.8	224.4	256.2	7%
512.6. Inorganic esters, their salts and derivatives	-	-	-	2.8	15.0	?
512.7. Nitrogen function compounds	-	-	-	-	2.8	?

Table 6 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
512.8(8) Saccharin	-	-	-	2.5	9.7	?
512.8(9) Other inorganic compounds	-	-	-	9.5	17.6	?
512.9. Other organic chemicals	118.0	209.4	299.8	324.6	458.7	40%
Group 513. Inorganic chemicals						
513.1. Oxygen, nitrogen, hydrogen	-	-	-	60.1	87.2	?
513.2. Chemical elements, n.e.s.	-	-	-	580.4	681.8	?
513.3. Inorganic acids and oxygen compounds of metalloids	108.5	137.1	140.1	176.3	225.8	20%
513.4. Halides, oxyhalides and sulphides of metalloids	-	-	-	4.2	3.2	?
513.5. Metallic oxides of kinds principally used in paints	-	-	-	33.4	61.5	?
513.6(1) Ammonia, anhydrous or in solution	-	-	-	32.2	68.9	?
513.6(2) Caustic soda (sodium hydroxide)	728.9	506.3	645.5	734.2	943.7	7%
513.6(9) Other inorganic bases and metallic oxides, hydroxides and peroxides	-	-	-	241.1	253.1	?
Group 514. Other inorganic chemicals						
514.9(4) Calcium carbide	249.1	274.5	319.3	214.8	305.9	5%
514.9(9) Other inorganic compounds, n.e.s.	1368.1	1324.4	1428.0	372.6	1140.8	Minus

Table 6 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
Group 515. Radio- active and associated materials						
515. Radioactive and associated materials	-	-	-	0.5	0.9	?
Group 521. Mineral tar and crude chemicals from coal, petroleum and natural gas						
521.1. Mineral tar	112.3	86.9	75.2	70.0	53.8	Minus
521.9. Chemicals from coal, petroleum and natural gas	27.6	26.0	26.3	36.4	16.8	Minus
Group 531. Synthetic organic dyestuffs, natural indigo and colour lakes						
531. Synthetic organic dye- stuffs and natural indigo	1197.3	1355.4	1440.8	1993.0	2341.8	1%
Group 532. Dyeing and tanning extracts, and synthetic tanning materials						
532. Dyeing and tanning extracts, and synthetic tanning materials	115.1	60.5	66.6	45.3	111.8	Variable
Group 533. Pigments, paints, varnishes and related materials	4524.9	4721.4	4183.5	3887.1	4081.4	Minus
533.1. Colouring materials, n.e.s.	1043.1	924.3	1306.9	1202.3	1331.8	6%
533.2. Printing inks	119.3	152.3	167.5	180.4	225.7	17%
533.3(1) Prepared pigments, opacifiers, enamels, glazes, lustres, etc.	3362.5	3644.8	2709.1	1785.8	1515.4	Minus

Table 6 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
533.3(2) Varnishes, distempers, water pigments, stamping foils and dyes, put up for retail sale	-	-	-	421.4	758.9	?
533.3(3) Artists colours	-	-	-	55.3	42.8	?
533.3(4) Prepared driers	-	-	-	56.6	82.9	?
533.3(5) Putty, painters' fillings, etc.	-	-	-	185.3	123.9	?
Group 541. Medicinal and pharmaceutical products	12982.9	14373.7	12987.4	14232.6	14287.2	3%
541.1. Vitamins and provitamins	144.4	118.9	164.5	254.1	158.5	2%
541.3. Penicillin, streptomycin, tyrocidine and other antibiotics	1380.0	1140.4	889.3	1179.1	1259.8	Variable
541.4. Opium alkaloids, cocaine, caffeine, quinine and other vegetable alkaloids, their salts and other derivatives	113.1	142.1	154.9	330.2	156.1	8%
541.5. Hormones	-	-	-	5.4	17.5	?
541.6. Glycosides; glands and their extracts; sera; vaccines	60.3	85.7	83.2	81.4	161.4	28%
541.7(1) Antimalaria medicines	-	-	-	135.7	132.1	?
541.7(2) Ointments, liniments	2108.2	1959.2	1644.2	1481.5	984.0	Minus
541.7(9) Other medicaments	-	-	-	4483.2	5849.2	?
541.9(1) Bandages, etc., impregnated or coated with pharmaceutical products or put up for retail sale	603.8	590.9	546.1	685.2	591.8	-
541.9(9) Other pharmaceutical goods	8573.1	10336.5	9505.2	5596.8	4976.8	Minus
Group 551. Essential oils, perfume and flavour materials						
551. Essential oils and resinoids; synthetic perfume and flavour materials and concentrates and enfleurage greases and mixtures of essential oils	864.2	1062.2	1206.7	1380.6	1347.2	12%

Table 6 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
Group 553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)	1520.2	1426.3	1043.4	883.9	964.1	Minus
553.1. Perfumery	51.3	77.6	58.9	61.5	73.0	9%
553.2. Dentifrices	213.3	175.1	203.4	145.9	177.8	Minus
553.3. Talc and powders	330.6	341.3	219.2	243.0	172.3	Minus
553.4. Pomades	129.6	112.6	97.4	31.5	30.8	Minus
553.9. Other perfumes, cosmetics and toilet preparations	795.4	719.7	464.5	402.0	510.2	Minus
Group 554. Soaps, cleansing and polishing preparations						
554.1(1) Toilet soap	731.5	651.1	634.0	867.9	821.5	3%
554.1(2) Common soap	146.6	96.7	253.2	723.3	243.1	14%
554.2. Surface-acting agents and washing preparations	578.8	636.9	732.8	291.2	249.4	Minus
554.3. Polishes, pastes, powder and similar preparations for polishing and preserving leather, wood, metal, glass and other materials	686.4	788.4	701.3	764.9	681.5	-
Group 561. Manufactured fertilizers	967.5	362.0	690.6	941.6	1713.7	15%
561.1. Nitrogenous fertilizers	144.3	58.8	188.2	195.7	472.2	34%
561.2. Phosphatic fertilizers and phosphatic fertilizer materials	74.7	131.6	220.1	403.4	636.0	71%
561.3. Potassic fertilizers and potassic fertilizer materials	104.5	90.5	105.3	54.6	96.5	Minus
561.9. Fertilizers, n.e.s.	644.0	81.1	177.0	287.9	509.0	Minus



Table 6 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
Group 571. Explosives and pyrotechnic products	1590.1	1668.8	1492.8	1498.0	1591.2	Minus
571.1. Propellant powders and other prepared explosives	797.1	994.6	724.1	763.8	397.1	Minus
571.2. Fuses, primers and detonators	330.4	369.9	535.2	356.9	693.0	20%
571.3. Pyrotechnical articles	245.4	142.1	71.3	91.6	130.9	Minus
571.4. Hunting and sporting ammunition	217.2	162.2	162.2	285.7	370.2	14%
Group 581. Plastic materials, regenerated cellulose and artificial resins						
581. Plastic materials, regenerated cellulose and artificial resins	626.9	720.9	1371.5	2397.8	2319.4	39%
Group 599. Chemical materials and products, n.e.s.						
599.2(1) Disinfectants	530.3	504.5	590.0	567.6	633.9	5%
599.2(2) Insecticides )				3007.6	3568.2	
599.2(3) Fungicides }	2815.2	2619.9	2254.7	450.1	1157.2	14%
599.2(9) Special products for sheep and cattle dressing	-	-	-	346.2	148.1	?
599.5. Starches, inulin, gluten; albuminoidal substances; glues	1350.2	1348.0	1608.1	821.8	1036.0	Minus
599.6. Wood and resin- based chemical products	-	-	-	31.0	36.4	?
599.7. Organic chemical products, n.e.s.	-	-	-	89.0	515.0	-
599.9. Chemical products and preparations, n.e.s.	-	-	-	2554.4	4938.9	?
Section 5, total	34258	35286	34544	41091	47802	

Table 7

Exports:

Chemical and related products (tonnage)

(Tons)

Classification	1960	1961	1962	1963	1964
Group 271. Crude fertilizers					
271.1. Natural fertilizers	-	-	-	782	384
Group 274. Sulphur and un- roasted iron pyrites					
274. Sulphur and unroasted iron pyrites	-	-	-	9	-
Group 276. Other crude minerals					
276.3. Salt	-	-	-	85	-
Section 5. Chemicals					
Group 512. Organic chemicals					
512.2(6) Glycerol (m3)	-	-	-	1099	550
512.9. Other organic chemicals	-	-	-	-	-
Group 513. Inorganic chemicals					
513.1. Oxygen, nitrogen, hydrogen	-	-	-	50	-
513.2. Chemical elements, n.e.s.	-	-	-	27	4
513.3. Inorganic acids and oxygen compounds of metalloids	-	-	-	-	1
513.6(9) Other inorganic bases and metallic oxides, hydroxides and peroxides	-	-	-	8	-
Group 514. Other inorganic chemicals					
514.9(9) Other inorganic compounds, n.e.s.	-	-	-	-	-

Table 7 (continued)

Classification	1960	1961	1962	1963	1964
Group 521. Mineral tar and crude chemicals from coal, petroleum and natural gas.					
521.9 Crude chemicals from coal, petroleum and natural gas.	-	-	-	-	16
Group 531. Synthetic organic dyestuffs, natural indigo and colour lakes.					
531. Synthetic organic dyestuffs, natural indigo and colour lakes.	-	-	-	16	8
Group 532. Dyeing and tanning extracts, and synthetic tanning materials.					
532. Dyeing and tanning extracts, and synthetic tanning materials	-	-	-	-	-
Group 533. Pigments, paints varnishes and related materials					
533.1 Colouring materials, n.e.s.	-	-	-	-	-
533.3(1) Prepared pigments, opacifiers, enamels, glazes, lustres, etc.					
533.3(5) Putty, painters' fillings, etc.	-	-	-	-	1
Group 541. Medicinal and pharmaceutical products					
541.7(2) Ointments, liniments	-	-	-	-	-
541.7(9) Other medicaments	-	-	-	-	-
541.9(9) Other pharmaceutical goods	-	-	-	-	-
Group 551. Essential oils, perfume and flavour materials					
551.1 Essential oils and resinoids	-	-	-	-	4

Table 7 (continued)

Classification	1960	1961	1962	1963	1964
Group 553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)					
553.9 Other perfumes, cosmetics and toilet preparations	-	-	-	2	3
Group 554. Soaps, cleansing and polishing preparations					
554.1(1) Toilet soap	-	-	-	1	2
554.1(2) Common soap	-	-	-	713	756
554.2. Surface-acting agents and washing preparations	-	-	-	-	-
554.3. Polishes, pastes, powder and similar preparations for polishing and preserving leather, wood, metal, glass and other materials	-	-	-	-	-
Group 561. Manufactured fertilizers					
561.9 Fertilizers, n.e.s.	-	-	-	152	264
Group 571. Explosive and pyrotechnic products					
571. Explosive and pyrotechnic products	-	-	-	-	-
Group 599. Chemical materials and products, n.e.s.					
599.2(1) Disinfectants	-	-	-	-	-
599.2(2) Insecticides	-	-	-	-	6
599.5. Starches, inuline, gluten; albuminoidal substances; glues	-	-	-	-	-

Table 8

Exports:

Chemical and related products (value)

(Thousands of dollars)

Classification	1960	1961	1962	1963	1964
Group 271. Crude fertilizers					
271.1 Natural fertilizers	-	-	2.8	32.0	28.5
Group 274. Sulphur and unroasted iron pyrites					
274. Sulphur and unroasted iron pyrites	-	-	-	0.6	-
Group 276. Other crude minerals					
276.3 Salt	-	-	-	5.3	-
Section 5. Chemicals					
Group 512. Organic chemicals					
512.2(6) Glycerol	595.5	464.7	400.9	265.9	127.5
512.9 Other organic chemicals	-	-	12.1	0.1	-
Group 513. Inorganic chemicals					
513.1. Oxygen, nitrogen, hydrogen	-	-	-	33.1	-
513.2. Chemical elements, n.e.s.	2.5	10.4	30.9	16.6	2.2
513.3. Inorganic acids and oxygen compounds of metalloids	-	-	-	0.1	0.2
513.6(9) Other inorganic bases and metallic oxides, hydroxides and peroxides	-	-	-	0.9	0.2
Group 514. Other inorganic chemicals					
514.9(9) Other inorganic compounds, n.e.s.	-	-	-	0.1	-
Group 521. Mineral tar and crude chemicals from coal, petroleum and natural gas					
521.9 Crude chemicals from coal, petroleum and natural gas	-	-	1.4	-	1.5

Table 8 (continued)

Classification	1960	1961	1962	1963	1964
Group 531. Synthetic dyestuff, natural indigo and colour lakes					
531. Synthetic organic dyestuffs, natural indigo and colour lakes	-	-	-	3.6	0.5
Group 532. Dyeing and tanning extracts, and synthetic tanning materials					
532. Dyeing and tanning extracts, and synthetic tanning materials	0.6	0.2	4.0	0.1	-
Group 533. Pigments, paints, varnishes and related materials					
533.1 Colouring materials, n.e.s.	-	-	-	-	0.2
533.3(1) Prepared pigments, opacifiers, enamels, glazes, lustres, etc.	-	-	-	0.3	-
533.3(5) Putty, painters' fillings, etc.	-	-	-	-	0.6
Group 541. Medicinal and pharmaceutical products					
541.7(2) Ointments, liniments	-	-	-	-	0.6
541.7(9) Other medicaments	-	-	-	-	2.1
541.9(9) Other pharmaceutical goods	0.5	0.3	0.9	2.2	4.6
Group 551. Essential oils, perfume and flavour materials					
551.1 Essential oils and resinoids	1.3	-	3.5	-	5.5
Group 553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soap)					

Table 8 (continued)

Classification	1960	1961	1962	1963	1964
553.9. Other perfumes, cosmetics and toilet preparations	-	-	-	1.4	2.0
Group 554. Soaps, cleansing and polishing preparations					
554.1(1) Toilet soap	-	-	-	0.3	1.6
554.1(2) Common soap	5.9	6.4	192.9	191.1	130.2
554.2. Surface-acting agents and washing preparations	-	-	-	0.1	-
554.3 Polishes, pastes, powder and similar preparations for polishing and preserving leather, wood, metal, glass and other materials	-	-	-	0.1	-
Group 561. Manufactured fertilizers					
561.9 Fertilizers, n.e.s.	0.4	-	-	4.3	29.3
Group 571. Explosive and pyrotechnic products					
571. Explosive and pyrotechnic products	9.1	-	-	-	18.4
Group 599. Chemical materials and products, n.e.s.					
599.2(1) Disinfectants	-	-	-	-	0.3
599.2(2) Insecticides	-	-	-	-	3.3
599.5. Starches, inuline, gluten; albumiroidal substances, glues	-	-	-	0.1	-
Section 5, total	615.8	482.0	646.6	520.4	350.8

Table 9

Chemicals as a component of Nigeria's foreign trade

Value in thousands of dollars

Year	Imports (c.i.f.)		Exports (f.o.b.)		Reexports (f.o.b.)	
	Totals	Chemicals	Totals	Chemicals	Totals	Chemicals
1960	604,770 100%	34,258 5.7%	463,919 100%	616 0.13%	11,471 100%	196 1.7%
1961	621,885 100%	35,286 5.7%	476,395 100%	482 0.10%	9,591 100%	137 1.4%
1962	569,238 100%	34,544 6.1%	459,420 100%	647 0.14%	12,669 100%	375 3.0%
1963	581,168 100%	41,091 7.1%	517,829 100%	520 0.10%	13,541 100%	403 3.0%
1964	711,148 100%	47,802 6.7%	589,529 100%	331 0.06%	11,731 100%	479 4.1%



## VI. PLANNING THE CHEMICAL INDUSTRY IN NIGERIA

On the basis of the preceding tables it is possible to estimate:

- (1) The relative extent of the need for chemicals at the present time;
- (2) The future trend of the market.

In the case of certain groups of products, tonnages and values recorded in 1960 and 1961 were extremely low, and hence the growth rate is abnormally high. Correctives will therefore have to be applied in order to arrive at more reasonable estimates.

### VI.1. Medicinal and pharmaceutical products

Consumption of medicinal and pharmaceutical products is steadily increasing. The average growth rate, reckoned over a period of four years (3 per cent by value) is extremely low. This is explained by the fact that there are local enterprises producing sera and vaccines and manufacturing certain products put up in the form of syrups, tablets, pomades and glass ampoules.

If the figures for imports and local production are rounded off, applying an adjusted growth rate comparable to those adopted for the other countries, a sober estimate would give the following figures:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	5,000*	Adjusted 10%	5,500	8,900	14,300	23,000
Value (\$1000)	16,000	Adjusted 10%	17,600	28,300	45,600	73,500

\* Estimated

If we compare expenditure on pharmaceutical and medical products per head of population in Nigeria (1963: \$0.29; 1980: \$0.81) with those of the other West African countries (Ghana 1963: \$1.15; Liberia 1963: \$1.0; Ivory Coast 1963: \$1.0, etc.), it will be found that the estimates for Nigeria are very conservative.

There are plans for the installation of a "Pharmaceutical Manufacturing Laboratory" which should make it possible to supply hospitals and dispensaries much more adequately; and a further extension of this Laboratory is under consideration with a view to enabling the bulk of medicines needed in Nigeria to be produced locally at the earliest possible moment.

## VI.2 Soap

In spite of considerable local production, imports are expanding. The annual growth rates calculated (14 per cent by weight for toilet soap and 8 per cent for common soap; 3 per cent by value for toilet soap and 14 per cent for common soap) seem fairly normal, but in studying the local market situation, account must be taken first and foremost of local production, which is quite adequate for the needs of the population and allows for a certain level of exports.

Soap consumption in 1964 can be estimated as follows:

	Local Production	Imports	Exports	Consumption
Quantity (tons)	50,000*	2,076	758	51,318
Value (\$1000)	20,000*	1,065	132	20,933

\* Estimated

If we apply an annual rate of 9 per cent by weight and 7 per cent by value, we get the following estimates:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	51,318	Adjusted 9%	55,900	86,000	132,000	204,000
Value (\$1000)	20,933	Adjusted 7%	22,360	31,400	44,000	61,700

The market is expanding, and there are prospects of developing the existing units and installing new soap factories.

## VI.3 Perfumes and cosmetics

Imports of these products are falling, probably as a result of the activity of local enterprises. To obtain the figures for demand in 1964, we must also take into account local production and the small quantities exported.

	Local production	Imports	Exports	Consumption
Value (\$1000)	5,500*	964.1	2.0	6,462

\* Estimated

Assuming an annual growth rate of 5 per cent, estimates would show the following picture:

	1964	Annual rate	1965	1970	1975	1980
Value (\$1000)	6,460	Adjusted 5%	6,780	8,660	11,000	14,100

The domestic market would justify the expansion of the existing enterprises and the installation of new establishments.

#### VI.4 Pigments, paints and varnishes

Local production (4,500 tons and \$1.6 million per annum) has reduced imports, which have been at a standstill round about 11,000 tons and \$4 million a year since 1960. The value of exports is negligible. The trend in this sector can be stated as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	15,645	Adjusted 8%	16,900	24,800	36,500	53,600
Value (\$1000)	5,680	Adjusted 8%	6,130	9,000	13,200	19,400

The market is sufficiently large to justify the development of local production. New schemes under way should make it possible to supply 80 per cent of the local market, though certain special types of paint would continue to be imported.

#### VI.5. Caustic soda

Consumption of caustic soda is increasing steadily. This product has been linked so far with the manufacture of soap. The annual rates calculated (12 per cent by weight and 7 per cent by value) would appear to be fairly normal. If we take into account only the caustic soda required for soap production, consumption would be as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	5,000	5,500	8,600	13,200	20,040
Value (\$1000)	515	565	885	1,360	2,100

The market is in full expansion, but the problem involved is a matter for the sub-region as a whole.

#### VI.6 Calcium carbide

Consumption of calcium carbide has been increasing at an annual rate of 11 per cent by weight and 5 per cent by value. This product has been used up to the present in the production of acetylene for autogenous welding. It would seem reasonable to adopt a growth rate of 7 per cent by weight and value in making estimates:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	2,205	Adjusted 7%	2,360	3,300	4,650	6,500
Value (\$1000)	306	Adjusted 7%	327	460	640	900

Thus the market offers prospects for the future. Over the next few years this problem, like that of caustic soda production, will have to be considered in the framework of the sub-region.

#### VI.7 Explosives

The chief consumers of explosives in Nigeria so far have been the mining industry, prospecting and oil drilling. If we bear in mind the scheme for geological prospecting, the exploitation in the near future of iron ore, limestone and other minerals, and the public works scheduled under the seven-year plan, it would seem advisable to adopt annual growth rates of 5 per cent by weight and value in making estimates:

	Base year 1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	1,751	5%	1,840	2,340	3,000	3,800
Value (\$1000)	1,591	5%	1,670	2,130	2,720	3,470

The market is expanding and is sufficiently large to justify the study of a scheme for local production.

#### VI.8 Plastics

The annual growth rate for plastics is fairly high (59 per cent by quantity and 39 per cent by value). If, as in the case of the other countries, we adopt the more realistic rates of 35 per cent as of the present time, 25 per cent after 1965, and 20 per cent after 1970, the estimated demand for plastics in Nigeria would be as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	4,167	5,620	17,200	42,700	106,400
Value (\$1000)	2,319	3,130	9,580	23,800	59,300

It should be remembered that the tonnages indicated include other materials besides plastics as such. According to certain estimates, consumption of polyvinylchloride by the existing enterprises would give the following picture (rounded figures):

	1963	1964	1968
Bata Shoe Company (Nig.) Ltd	600	700	900
Rubber Industries Ltd	500	600	900
Metalloplastica (Nig.) Ltd	300	500	900
Polymera Industries (Nig.) Ltd	60	100	200
Utrilon Industries (Nig.) Ltd	40	50	200
Britind Footwear (Nig.) Ltd	-	50	200
Others	-	-	200
	<u>1,500</u>	<u>2,000</u>	<u>3,500</u>

Consumption of polyethylene is estimated for 1963 at 800 tons.

On the basis of the above data, demand in the near future for basic products such as polyvinylchloride and polyethylene can be estimated as follows (in tons):

	1964	1965	1970	1975	1980
Polyvinylchloride	2,000	2,500	6,000	13,000	28,000
Polyethylene	1,000	1,250	4,500	12,000	28,000

Thus the market offers prospects for the future. During the next few years the problem should be taken up at the sub-regional level. It should be possible to develop extrusion and injection units in all regions of the country.

#### VI.9 Fertilizers

According to the customs statistics, the over-all trend in this sector can be estimated as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	28,408	21%	34,360	89,130	231,200	599,800
Value (\$1000)	1,714	15%	1,970	3,965	7,975	16,030

These figures call for analysis by type of fertilizer (nitrogenous, phosphatic and potassic), and for comparison with more accurate estimates, using other sources of information. It may be pointed out that the over-all figures for 1980 tally very closely with the estimates produced by FAO<sup>1/</sup>, which gave a figure of 500,000 tons of fertilizers as a minimum for the same period. The FAO estimates are shown in tables 10 and 15.

Table 10

Demand for fertilizers for cocoa plantations<sup>2/</sup>

(In tons)	1963/64	1964/65	1969/70	1974/75	1979/80	
					Min.	Max.
N	156	234	1,066	2,718	4,986	10,336
Ammonium sulphate (21% N)	743	1,114	5,076	12,943	23,743	49,219
P <sub>2</sub> O <sub>5</sub>	78	117	533	1,359	2,493	5,168
Single superphosphate (18% P <sub>2</sub> O <sub>5</sub> )	433	650	2,961	7,550	13,850	28,711

Source: <sup>1/</sup> FAO: Agricultural Development in Nigeria 1964-1980, Rome, 1965;  
<sup>2/</sup> ibid.

Table 11

Demand for fertilizers for natural rubber plantations<sup>1/</sup>

(In tons)	1963/64		1964/65		1969/70		1974/75		1979/80	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
N	848	848	1329	1329	2619	3373	2664	7092	2226	8521
Ammonium sulphate (21% N)	4038	4038	6328	6328	12471	16061	12685	33771	10600	40576
P <sub>2</sub> O <sub>5</sub>	848	848	1329	1329	2619	3373	2664	7092	2226	8521
Single super- phosphate (18% P <sub>2</sub> O <sub>5</sub> )	4711	4711	7383	7383	14550	18738	14800	39400	12366	47338
K <sub>2</sub> O	848	848	1329	1329	2619	3373	2664	7092	2226	8521
Potassium chloride (60% K <sub>2</sub> O)	1413	1413	2215	2215	4365	5622	4440	11820	3710	14202

Table 12

Demand for fertilizers for the palm oil production development programme<sup>1/</sup>

(In tons)	1963/64	1964/65	1969/70	1974/75	1979/80
N	426	663	2,166	3,146	3,026
Ammonium sulphate (21%N)	2,029	3,159	10,315	14,980	14,410
K <sub>2</sub> O	1,117	1,706	6,900	16,740	27,291
Potassium chloride (60% K <sub>2</sub> O)	1,862	2,844	11,500	27,900	45,485

Source:

<sup>1/</sup> FAO: Agricultural Development in Nigeria 1964-1980, Rome, 1965.

Table 13

Demand for fertilizers for cotton plantations<sup>1/</sup>

(In tons)	1963/64	1964/65	1969/70	1974/75	1979/80
N	387	502	1,290	2,701	5,416
Ammonium sulphate (21%N)	1,845	2,390	6,145	12,860	25,790
P <sub>2</sub> O <sub>5</sub>	332	430	1,106	2,315	4,642
Single superphosphate (18% P <sub>2</sub> O <sub>5</sub> )	1,845	2,390	6,145	12,860	25,790

Table 14

Demand for fertilizers for groundnut plantations<sup>1/</sup>

(In tons)	1963/64	1964/65	1969/70	1974/75	1979/80
P <sub>2</sub> O <sub>5</sub>	142	297	2,074	5,983	11,678
Single superphosphate (18% P <sub>2</sub> O <sub>5</sub> )	790	1,650	11,520	33,240	64,880

Source:

<sup>1/</sup> FAO: Agricultural Development in Nigeria 1964-1980, Rome, 1965.



Table 15

Over-all demand for fertilizers, period 1963/64 - 1979/80<sup>1/</sup>

	1963/64	1964/65	1969/70	1974/75	1979/80
	<u>Tons of N</u>				
Cocoa	156	234	1,066	2,718	4,986
Rubber	843	1,329	2,619	2,664	2,226
Palm kernels and palm oil	426	663	2,166	3,146	3,026
Cotton	387	502	1,290	2,701	5,416
Grains	300 <sup>x)</sup>	500 <sup>x)</sup>	4,000 <sup>x)</sup>	12,000 <sup>x)</sup>	20,000
Other crops	150 <sup>x)</sup>	300 <sup>x)</sup>	1,300 <sup>x)</sup>	4,200 <sup>x)</sup>	8,000 <sup>x)</sup>
Total N	2,267	3,523	12,941	27,429	43,654
	<u>Tons of ammonium sulphate (21% N)</u>				
Nitrogenous fertilizers	10,795	16,800	61,623	130,614	207,876
	<u>Tons of P<sub>2</sub>O<sub>5</sub></u>				
Cocoa	78	117	533	1,359	2,493
Rubber	848	1,329	2,619	2,664	2,226
Groundnuts	142	297	2,074	5,983	11,673
Cotton	332	430	1,106	2,315	4,642
Grains	1,020 <sup>x)</sup>	1,500 <sup>x)</sup>	6,000 <sup>x)</sup>	16,000 <sup>x)</sup>	28,000
Other crops	350 <sup>x)</sup>	450 <sup>x)</sup>	2,500 <sup>x)</sup>	6,000 <sup>x)</sup>	9,000 <sup>x)</sup>
Total P <sub>2</sub> O <sub>5</sub>	2,770	4,123	14,832	34,321	58,039
	<u>Tons of single superphosphate (18% P<sub>2</sub>O<sub>5</sub>)</u>				
Phosphatic fertilizers	15,588	22,905	82,400	190,672	322,438
	<u>Tons of K<sub>2</sub>O</u>				
Rubber	848	1,329	2,619	2,664	2,226
Palm kernels and palm oil	1,117	1,706	6,900	16,740	27,291
	1,965	3,035	9,519	19,404	29,517
	<u>Tons of potassium chloride (60% K<sub>2</sub>O)</u>				
Potassic fertilizers	3,275	5,058	15,865	32,340	49,195

x) Estimated

<sup>1/</sup> Source : FAO : Agricultural Development in Nigeria 1964-1980, Rome, 1965.

The estimates produced by the Shell International Chemical Company are shown below:

Table 16

Over-all demand for nitrogenous and phosphatic fertilizers, period 1964-1975

	1964	1965	1970	1975
(Tons)				
<u>Nitrogenous fertilizers</u>				
N	1,155	1,890	5,145	12,180
Ammonium sulphate (21%N)	5,500	9,000	24,500	58,000
<u>Phosphatic fertilizers</u>				
P <sub>2</sub> O <sub>5</sub>	2,250	3,420	7,470	13,860
Single superphosphate (18% P <sub>2</sub> O <sub>5</sub> )	12,500	19,000	41,500	77,000

Source: Shell International Chemical Ltd.: Fertilizers in Nigeria, London, 1963.

The results of all the known estimates made are summarized in the following table, with indication of source of the data:

Source of estimate	1964	1965	1970	1975	1980
<u>Tons of N</u>					
Shell 1/	1,155	1,890	5,145	12,180	...
FAO 2/	2,267	3,528	12,941	27,429	43,654
F.W. Hauck 3/	...	...	12,000	...	...
ECA Survey 4/	...	...	4,620	...	...
ECA Survey 5/	...	...	2,000*	...	...
<u>Tons of P<sub>2</sub>O<sub>5</sub></u>					
Shell 1/	2,250	3,420	7,470	13,860	...
FAO 2/	2,770	4,123	14,832	34,321	58,039
F.W. Hauck 3/	...	...	16,000	...	...
ECA Survey 4/	...	...	2,268	...	...
ECA Survey 5/	...	...	1,500*	...	...
<u>Tons of K<sub>2</sub>O</u>					
FAO 2/	1,965	3,035	9,519	19,404	29,517
F.W. Hauck 3/	...	...	8,000	...	...

\* Figures based on a study by the Société sénégalaise d'engrais et de produits chimiques (SSEPC).

Notes of the preceding table

- 1/ Shell International Chemical Co., Ltd.: Fertilizers in Nigeria, London, 1963.
- 2/ FAO: Agricultural Development in Nigeria 1964-1980, Rome, 1965.
- 3/ F.W. Hauck: Soil Fertility and Fertilizers in West Africa (E/CN.14/INR/71).
- 4/ Chemical Products and Basic Fertilizers (E/CN.14/INR/73).
- 5/ Report of the West Africa Industrial Co-ordination Mission (E/CN.14/246).

The figures based on the SSEFC Survey (5/) would appear to be extremely pessimistic. The use of fertilizers is getting under way, and the figures for 1970 estimated in this report have already been overtaken by current consumption. The ECA estimates (4/) and those of Shell (1/) are likewise rather pessimistic. Obviously no estimate can be made with any assurance where the data are so varied. However, it would seem reasonable to adopt the estimates as given in the FAO report (2/), based on the Nigerian agricultural development programme itself and on tests carried out on cultivated areas. These estimates tally fairly closely with F.W. Hauck's estimates (3/) and with the growth rates as calculated on the basis of the statistics.

If we round off these figures, an average estimate would give the following picture:

	Tons				
	1964	1965	1970	1975	1980
N	2,270	3,500	12,900	27,400	43,600
P <sub>2</sub> O <sub>5</sub>	2,770	4,120	15,000	34,000	58,000
K <sub>2</sub> O	1,960	3,030	9,500	19,400	29,500

The above estimates can be used as a basis for the study of a scheme for installing a fertilizer plant in Nigeria. Under the six-year plan, provision is made for such a plant to be financed by the Federal Government. The scheme is being studied. Under the regional plans, the industries which are already being set up or for which general economic surveys are now in progress include plants for fertilizer mixtures.

# VI.10. Disinfectants, insecticides and fungicides

Consumption of insecticides and fungicides has increased rapidly during the last few years and has attained a considerable level. It therefore seems likely that in the future there will be a large increase in demand in connexion with the agricultural development Plan. Estimates indicate that production figures for the various products concerned will increase as follows:

	(Thousands of tons)	
	<u>1963/64</u>	<u>1979/80</u>
Grains	7,725	14,080
Root crops and tubers	21,490	30,300
Leguminous plants	632	1,050
Oleaginous plants	370	675
Vegetables	285	770
Fruits	117	355
Sugar	30	200

The annual rates calculated on the strength of the statistics (69 per cent by weight and 13 per cent by value) are not significant, since the tonnages and values recorded in 1960 were very low. If we apply more reasonable growth rates, we get the following figures:

	1964	1965	1970	1975	1980
Quantity (tons)	7,716	9,000	14,500	23,300	37,600
Value (\$1000)	5,359	6,290	10,140	16,290	26,290
including:					
Tons of DDT (50%)	300	400	1,200	3,000	6,000
Tons of BHC (25%)	800	1,000	2,700	6,500	12,000

The market is expanding and is sufficiently large to justify the development of local production. The manufacture of basic products calls for examination in respect of the sub-region as a whole.

#### VI.11. Salt

Consumption of salt is increasing steadily. If we take into account the demand for salt in the other countries as well, it would seem feasible to adopt an annual growth rate of 8 per cent by weight and 6 per cent by value:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	133,661	Adjusted 8%	144,700	212,500	312,200	459,000
Value (\$1000)	5,814	Adjusted 6%	6,170	8,170	11,000	14,800

The market is expanding and is sufficiently large to justify a study of all the possibilities for developing local production. In any event, this problem calls for examination within the framework of the sub-region.

#### VI.12. Surface-acting agents and washing preparations

This is a field in which the difficulty of making assessments is particularly evident. No data are available concerning local production or putting up. Imports fell in 1964, but this must be explained as a temporary halt rather than a regression. If we take the 1963 import figures as a basis for calculations, and pay due heed to the trend of demand in the other countries, it would seem reasonable to apply a rate of 17 per cent, or:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	3,715	Adjusted 17%	5,090	11,170	24,490	53,700
Value (\$1000)	1,200*	Adjusted 17%	1,640	3,600	7,900	17,300

\* Estimated

The market is expanding and is sufficiently large to warrant studying not only putting up, but also production at the local level.

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## B. GHANA

### I. GENERAL CHARACTERISTICS

#### I.1 Population

7,340,000 inhabitants (1963)

Annual growth rate 1958 - 1963: 2.6 per cent

Population projection (thousands of inhabitants):

1965 ..... 7,740

1970 ..... 8,975

1975 ..... 10,400

1980 ..... 12,130

#### I.2 Area

238,500 km<sup>2</sup>

#### I.3 Population density

31 inhabitants per km<sup>2</sup> (1963)

I.4 Judged by the number of persons employed and the share in total production and in exports it represents, agriculture is by far the most important sector of the economy of Ghana. The equatorial forest zone covers approximately one-fifth of the country - the Ashanti triangle situated to the south west of Kumasi. This is the vital region of the country; its wealth is based primarily on cocoa and coffee, with exports of over 430,000 tons, and secondarily on timber and equatorial plant cultivation (bananas, pineapples and oil palms). Food crops are based on tubers (cassava, sweet potatoes, yams, etc.). More than three-fifths of the country, to the north of the forest area, belongs to the Sudanian (grasslands) zone; here agriculture has not been developed commercially to any great extent, it is based on the cultivation of millet, with livestock-rearing as an auxiliary. Agriculture along the eastern part of the coast, in the neighbourhood of Accra, the capital, consists partly of grain crops (millet, rice and maize) and partly of tubers.

Ghana enjoys a very favourable geographical position, which has enabled it to make rapid if somewhat superficial development, and will no doubt continue to do so still. Agriculture in the equatorial plantations has made it possible to increase exports at a tremendous rate. Mining resources too have been exploited, although for export purposes rather than with a view to the industrialization of the region.

Ghana's mineral wealth has been known and exploited for a relatively long time. Gold, which gave the British colony of the Gold Coast its name, has been exploited industrially since 1877, and still yields over 20 tons a year, while diamonds provide an almost equally important export item. The very rich manganese ore found at Nsuta has been known since 1914, and because of it, in 1939 Ghana was the third producer in the world, with 11 per cent of world production. (Today Ghana furnishes only about 5 per cent.) Bauxite was discovered in 1921-1922, and has been mined since the Second World War, up to the present in its crude form.

The harnessing of the Volta at Akosombo will make it possible in a few years for Ghana to produce 220,000 tons of aluminium a year. The scheme now under way should provide industry with cheap energy in virtually unlimited quantities, agriculture with vast irrigation possibilities, and transport with an inland lake 480 km in length, from the Akosombo dam to the confluence of the two Voltas.

Ghana is the most highly developed country in West Africa. With a per capita income of \$200 it is foremost among the countries of West Africa, only the Ivory Coast coming close to this figure with \$170. Forty years of development based on cocoa has enabled Ghana to install a very sound infrastructure, and judging from its school attendance rate of 60 per cent in 1960, it should be the first country in tropical Africa to attain the goal of universal primary education of satisfactory quality.

The harnessing of the Volta should make it possible in the fairly near future to carry out a thorough industrialization of the country and give a real fillip to the economy as a whole, since for the first time in West Africa a large-scale integrated scheme has been undertaken in which the considerable effects of personnel training should bring about a breakthrough in regard to the country's economy as a whole, always provided of course that this development can be part of a larger whole.

Ghana is not yet truly industrialized, any more than the other West African countries. All they have achieved is a varying degree of development of the colonial type, i.e. founded on agriculture for export, and mining, likewise carried on with a view to export. Table 1 shows the role of agricultural and mining products in Ghana's exports. We see once again that in 1964, as in the years prior to 1964, the main sources of foreign currency were cocoa, timber, gold, diamonds and manganese.



Table 1

Exports from Ghana

(Value in millions of dollars)

Product	1961		1962		1963		1964	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Cocoa and cocoa products (thousands of tons)	411	198	446	198	427	201	410	204
Timber	-	43	-	34	-	36	-	41
Bauxite (thousands of tons)	196	1.3	287	1.9	207	1.4	264	1.8
Manganese (thousands of tons)	385	17	476	15	388	11	498	12
Diamonds (thousands of carats)	2,854	20	3,327	21	1,514	9	2,569	17
Gold (thousands of ounces)	970	30	946	32	910	32	831	29
Cola nuts (thousands of tons)	15	3	9	4	17	2	4	1
Other products	-	5	-	7	-	6	-	11
Total	-	317	-	313	-	299	-	317

Source: Economic Survey 1964, Central Bureau of Statistics, Accra, 1965.

The extraordinarily rapid development of export crops has given Ghana a very considerable spending capacity. The flow of foreign capital has been limited to a few of the private sectors, and has merely reinforced these domestically-earned financial resources. It has thus been possible over the last ten years to finance an enormous investment programme, practically without foreign aid - a phenomenon unique in tropical Africa. The investments in question have been concentrated

almost exclusively on infrastructure and social development, while the level of investments for productive purposes has been relatively low. This type of development, however, cannot continue indefinitely, for the simple reason that investments in infrastructure such as have been made over the last ten years have been extremely costly, and will tend to become more and more so. These infrastructural investments have involved recurring operational costs, which have increased at a faster rate than public revenue, parallel to the gross domestic product, and in their turn have led to the present crisis in public finance. The budget which showed a surplus of 33 millions in 1955, showed a deficit of 33 millions in 1964.

No doubt the drop in world prices for cocoa has played an important part in this crisis, but it seems certain that even without this factor, the policy of infrastructural investment would have brought about a crisis in public finance, though possibly not until a few years later.

Thus the only solution is to switch over to productive investments and to break through the vicious circle by forging ahead as quickly as possible with the process of modernizing agriculture and industrializing, marking time for a few years as regards unproductive investment in the economic and social infrastructure, until the present imbalance has been overcome.

The Government of Ghana is well aware of these basic problems and the principles underlying them, and realizes the extent to which the seven-year plan 1963/64 - 1969/70 now being put into practice constitutes a break with the ancient system of economic development of the country. The following data concerning the annual level of public investment and its distribution over the various sectors of activity<sup>1/</sup> explain more clearly the differences between the previous plans and the current plans:

Plan	Annual public investment (in millions of dollars)	Percentage breakdown of public investment	
		Agriculture and industry	Social services and infrastructure
First Plan	43.4	11.2%	88.8%
Second Plan	140.0	20.3%	79.7%
Seven-Year Plan	190.5	37.3%	62.7%

<sup>1/</sup> Ghana Seven-Year Development Plan 1963/64 to 1969/70, Office of the Planning Commission, Accra, 1964.

## II. MINERAL RESOURCES

### II.1 Manganese

At the present time there is one manganese ore deposit being exploited in Ghana - at Nsuta, with ore containing 48-52 per cent manganese. The mined ore is transported by rail to Takoradi, and from there it is exported. Over-all production figures are as follows (rounded figures):<sup>1/</sup>

	1960	1961	1962	1963	1964
Thousands of tons	545	432	373	401	455

The entire production tonnage was earmarked for export, the value of the tonnage exported being as follows:<sup>1/</sup>

	1960	1961	1962	1963	1964
Millions of dollars	18	17	15	11	12

According to the statistical services<sup>2/</sup>, approximately 2,078 persons are employed on manganese production in the African Manganese Co.Ltd., a private company. Manganese ore of high quality is not plentiful at Nsuta. According to the company which works the deposit, production could go on for another five years. However, there are considerable reserves of medium-rich ore which, according to the Ministry for Industrial Affairs, could be enriched. These reserves are estimated at 50 million tons, containing 34-40 per cent manganese.

There are also other deposits in Ghana, such as the Kalimbi deposit near Sakpa, Goniya, and the Yakou deposit forty km from Takoradi. The last-named, with reserves of 10 million tons of manganese containing 40-52 per cent Mn, could be extremely important; it is regarded as a basic source of raw materials for production of ferro-manganese in Ghana in the near future. Transport difficulties have been an obstacle to exploitation of the deposit up to the present, but the creation of an artificial lake on the Volta by the Akosombo dam might provide a solution to this problem.

<sup>1/</sup> Economic Survey 1964, Central Bureau of Statistics, Accra, 1965.

<sup>2/</sup> Industrial Statistics 1962-64, Central Bureau of Statistics, Accra 1965.

Under the seven-year Plan, manganese production is scheduled to attain 700,000 tons by 1970, and the value of the quantity exported is estimated at \$20 million.

## II.2 Iron

There is no rich iron ore exploited in Ghana on a commercial scale. There is a deposit in the Northern Region near Shiene, with ore containing 35-45 per cent iron (dry method). The phosphorous content is between 0.3 and 0.6 per cent. The Shiene reserves are estimated at between 100 and 200 million tons. The existence of a deposit is also reported near Tsito, west of Ho, and another west of Todse. Likewise, a deposit has been found at Apon Valley, close to the Takoradi - Kumasi railway. In this recently-discovered deposit there are 60 million tons of known reserves, and prospecting is not yet finished. The deposit extends over a distance of about 40 km, parallel to the railway line. The iron content would appear to be 55 per cent (dry method) and 45-50 per cent (wet method). The silica content appears to be low, but no precise figure has been put forward. No information is available on the manganese, alumina or phosphorous content. Nor are there yet any detailed estimates of the cost of exploiting the ore.

## II.3 Bauxite

Total reserves would appear to be more than 400 - 500 million tons (alumina content 47 per cent), spread over several deposits (Yenahin - 200 million tons, Awaso - Wiawso - 160 million tons, and Kibi - 60 million tons).

The British Aluminium Co. Ltd. (BAL) began to exploit the Kanoyerebo deposit in 1941 and until 1963 was the only bauxite producer in Ghana. The British Aluminium Company at present employs 478 persons, and the entire volume of production is earmarked for export. Over-all production and export values are as follows (rounded figures):<sup>1/</sup>

	1960	1961	1962	1963	1964
Production (1000 tons)	191	201	239	309	246
Exports (\$1 million)	1.5	1.3	1.9	1.4	1.8

<sup>1/</sup> Economic Survey 1964, Central Bureau of Statistics, Accra, 1965.

According to the seven-year Plan, bauxite production should reach the figure of 400,000 tons by 1970. The enormous bauxite reserves, combined with the reserves of hydro-electric energy, hold promise of a prosperous aluminium industry. Every effort is being made to ensure that an aluminium plant will be in operation by 1966. In the first few years, imported alumina will be processed, but once the plant at Tema is constructed, it will process the semi-produce obtained locally.<sup>1/</sup>

#### II.4 Diamonds

Alluvial diamonds have been found in Ghana since 1919. Prospecting and exploitation are carried on in the Birim and Bonsa river basins. Isolated diamond crystals can be found in practically every river and stream in Ghana. Diamond production is in the hands of individual gold washers and small groups of professional prospectors, in addition to a large English mining company - the Consolidated African Selection Trust Ltd. (CAST).

Over-all production and value of exports are estimated as follows (rounded figures):<sup>1/</sup>

	1960	1961	1962	1963	1964
Production (millions of carats)	3.3	3.2	3.2	2.7	2.7
Exports (\$1 million)	27.6	20.0	20.7	9.3	17.1

It is estimated that diamond production could increase by 1970 to 5 million carats and that the export value of the diamonds exported will amount to \$31 million.

#### II.5 Gold

Gold has been mined industrially in Ghana since 1877. It gave the name to the former British colony, the Gold Coast. According to the Statistical Bureau<sup>2/</sup> approximately 19,770 persons are at present employed in gold production in Ghana. Nearly 50 per cent of the value of Ghana's gold production comes from the English mining company Ashanti Gold-fields Corporation Ltd., with headquarters at Obuasi. The gold reserves at Obuasi are estimated at 2,990,000 short tons containing approximately 1.0925 ounces of gold per ton.

<sup>1/</sup> Economic Survey 1964, Central Bureau of Statistics, Accra, 1965.

<sup>2/</sup> Industrial Statistics 1962-1964, Central Bureau of Statistics, Accra, 1965.

In 1961 the Ghanaian Government decided to nationalize the following five private mines:

Amalgamated Banket Areas Ltd. (ABA), Torkwa, Western Region.

Ariston Gold Mines Ltd. (Ariston), Prestea, Western Region.

Bibiani (1927) Ltd. (Bibiani), Bibiani, Western Region.

Bremang Gold Dredging Co. Ltd. (Bremang), Dunkwa, Central Region.

Ghana Main Reef Ltd. (GMR), Bondaye, Western Region.

In April 1961 the concession was taken over by a new company, the Ghana State Mining Corporation. The gold reserves represented by these companies are estimated as follows:

	Short tons	Average gold content (ounces per ton)
ABA	491,569	0.2699
Ariston	1,298,558	0.3465
Bibiani	94,000	0.2275
Bremang	77,148,900	0.266
GMR	235,895	0.4295

Over-all production and the value of the gold exported may be stated as follows (rounded figures):<sup>1/</sup>

	1960	1961	1962	1963	1964
Production (thousands of ounces)	879	834	888	921	865
Exports (millions of dollars)	31.1	30.1	31.5	31.6	28.9

Under the seven-year Plan it is assumed that gold production will reach the figure of 1,100 thousand ounces (1.1 million ounces) by 1970 and that the value of gold exports will amount to \$39.2 million.

<sup>1/</sup> Economic Survey 1964, Central Bureau of Statistics, Accra, 1965.

## II.6. Salt

Salt is produced in small quantities at Daboya and along the coast (Apam, Elmina, Sakumo Lagoon, Weiija). The largest salt works is at Sakumo Lagoon, Weiija, south west of Accra. According to the Statistical Bureau,<sup>1/</sup> some 210 persons are employed in salt production in Ghana. The salt is collected by solar evaporation from sea water. The production methods used are, however, unsuitable for large-scale salt production to meet future industrial needs. Salt production is shown below, in rounded figures:

	1960	1961	1962	1963	1964
Thousands of tons	12	18	19	20	31

The Government intends, within the framework of the seven-year Plan to establish a new saltern near the coast between Accra and Sakumo Lagoon. The tonnage of salt which can be produced depends on the surface area available for evaporation and crystallization. According to a survey carried out on this subject, it should be possible to produce 250,000 tons a year. A production target of 100,000 tons is laid down for the first phase. Salt for industrial requirements has to be very pure (up to 100 per cent NaCl), a degree of purity obtainable only by fractionized crystallization. Tonnages, quality and prices are estimated as follows:

For domestic consumption:

10,000 tons of high quality table salt, put up in 40 lb jute bags.

Price \$92 per ton.

30,000 tons of coarse salt, packed in 2 cwt cocoa bags.

Price \$54.5 per ton.

For export to the neighbouring countries or for local industrial use:

60,000 tons of coarse salt at a competitive price of \$16 per ton.

An increase in production of 250,000 tons of salt a year is planned during the second phase, as well as a reduction in price. According to the Battelle Institute,<sup>2/</sup> the selling price of \$16 per ton estimated in Ghana for coarse salt

<sup>1/</sup> Industrial Statistics 1962-1964, Central Bureau of Statistics, Accra, 1965.

<sup>2/</sup> E/CN.14/INR/73.

for export would appear to be a realistic figure for industrial use, in view of production conditions, which are less favourable in Ghana than in Senegal. If these tonnages and prices can be attained, the saltern is expected to be a profitable venture. In view of the transport costs from the saltern to the chemical plants likely to be set up in the industrial area near Tema, salt prices will be approximately \$17 per ton.

#### II.7. Limestone

There are several known limestone deposits in Ghana. One of the largest is that of Buipe in the north, with 5-6 million tons of high-grade limestone, 12 million tons of lower grade, and 100 million tons of dolomitic limestone. At the present moment, this deposit is difficult of access from the point of view of transport. The completion of the Akosombo dam will involve the creation of a vast lake which will extend along the course of the Black Volta as far as Morno, where a river port will be established. Morno is only 10 miles from Buipe, but the road is at present in a primitive condition and will have to be put in order. The Volta lake would enable vessels to navigate as far as Akosombo; its depth will vary between 15 and 20 feet, so that shipping will have no trouble. From Akosombo, the limestone would have to be conveyed to Accra by rail. It should also be pointed out that the Buipe resources are earmarked for the production of high alumina cement.

There is likewise a deposit in the west of the country, on the coast at Nauli, this being an outcrop of a stratum forming the sea bed. It is estimated that this deposit contains sufficient reserves to supply all Ghana's cement requirements for an indefinite length of time. However, before it can be exploited, a transport problem will have to be solved. At the present time, Nauli is isolated from the rest of Ghana. If the exploitation of the deposit is to be profitable, either a new port will have to be constructed, or a railway linking the deposit to a gold-mine already served by a railway and situated about 100 km to the north west. According to the Ministry of Industry, the geographical conditions do not lend themselves to the instalation of a seaport.

It may be noted that since 14 May 1965, a plant for clinker grinding has been in operation at Tema and is producing 200,000 tons of cement a year. It is estimated that this figure will be doubled in 1966. There is also a project for establishing a cement works with an annual capacity of 250,000 tons which would use the limestone reserves at Nauli.



## II.8. Other mineral occurrences

Prospecting to date has located the following:

Beryl in a number of areas (Cape Coast, Anomabu, Saltpond, Mauri, Hinneba, Abodzi, Senya Beraku, Berekum);

Columbo-tantalite in the Asubou zone (Central Region);

Lithium in the Ejisu area (Ashanti);

Ilmenite in the Mpoho, Labadi and Mankwadzi areas;

Graphite in the Bibiani and Ariston zones.

Export figures for silver are estimated as follows:

	1960	1961	1962	1963	1964
Ounces	16,839	14,160	7,027	4,443	4,827

Apart from salt and limestone, the foregoing products are of no direct interest as raw materials for the chemical industry.

## III. ELECTRIC ENERGY, FUEL AND WATER

### III.1. Electric energy

Production of electric energy in Ghana is shown in the table below (in thousands of kWh)<sup>1/</sup>:

Region	1961	1962	1963	1964
Accra Capital District	98,199	118,595	146,095	174,114
Eastern Region	3,113	4,482	5,540	6,228
Western Region	32,300	34,640	36,318	38,640
Central Region	6,592	6,298	6,901	8,320
Ashanti Region	30,801	32,529	36,194	40,143
Brong-Ahafo Region	117	789	1,134	1,448
Northern Region	2,562	2,878	3,140	3,141
Upper Region	385	412	432	520
Volta Region	1,324	1,664	1,908	2,176
Total Regions	175,393	202,287	237,662	274,720
Mines	214,593	230,259	232,657	209,816
Grand Total	390,174	432,546	470,319	484,536

<sup>1/</sup> Economic Survey 1964, Central Bureau of Statistics, Accra, 1965.

The paramount factor in regard to the future situation is the Akosombo dam. This very important scheme now in the course of construction will allow of a general expansion of facilities and consumption by the aluminium plant (334 MW) to be set up in conjunction with the dam. At the same time arrangements have been made to interconnect the networks by means of a line Akosombo - Tema - Accra - Takoradi - Kumasi - Akosombo.

Tables 2 and 3 show the installed capacity and electric energy figures for the Akosombo dam.

Table 2

Akosombo dam: installed capacity and electric energy production (in MW)<sup>1/</sup>

I. On the assumption that the aluminium plant reaches full capacity by 1972:

Year	Installed capacity	Total production	Requirements of the aluminium plant	National requirements	Reserves	Surplus
1966	589	232	-	85	147	357
1967	589	412	166	99	147	177
1968	589	481	223	111	147	108
1969	589	496	223	126	147	93
1970	589	570	223	140	147	79
1971	589	526	223	156	147	63
1972	736	656	334	175	147	80
1973	736	676	334	195	147	60
1974	736	698	334	217	147	38
1975	736	721	334	240	147	15
1976	883	747	334	266	147	136

<sup>1/</sup> Ghana Seven-Year Development Plan 1963/64 - 1969/70, Office of the Planning Commission, Accra, 1964.

Table 3

Akosombo dam: installed capacity and electric energy (in MW)<sup>1/</sup>

II. On the assumption that the aluminium plant reaches full capacity by 1969:

Year	Installed capacity	Total production	Requirements of the aluminium plant	National requirements	Reserves	Surplus
1966	589	232	-	85	147	357
1967	589	412	166	99	147	177
1968	589	481	223	111	147	108
1969	736	607	334	126	147	129
1970	736	621	334	140	147	115
1971	736	637	334	156	147	99
1972	736	656	334	175	147	80
1973	736	676	334	195	147	60
1974	736	698	334	217	147	38
1975	736	721	334	240	147	15
1976	883	747	334	266	147	136

<sup>1/</sup> Ghana Seven-Year Development Plan 1963/64 to 1969/70, Office of the Planning Commission, Accra, 1964.

Thus electricity supplies for chemical plants present no problems. The future requirements of the chemical industry would easily be catered for by the development already planned.

Electricity prices estimated for these industries are \$0.0054 to \$0.011 per kWh. However, the competent authorities state that the sea salt and electrolysis installations, and other major consumers, could be granted more favourable conditions, representing about \$0.00265 per kWh.

### III.2. Fuel

So far no petroleum deposits have been discovered in Ghana. At the present time there is a petroleum refinery, the Ghana-Italian Petroleum Co. Ltd. (GHAIP), the first of its kind, functioning at Tema, with an annual capacity of 1,250,000 tons of fuel oil. All its products, with the exception of 1-2 per cent of LP gas, are sold without difficulty.

It is impossible at present to quote prices for acetylene and hydrogen. In the event of demand arising, however, these products could be supplied once production procedures have been adjusted to a certain extent.

### III.3. Water

Water supply during the period 1961-1964 is shown in the table below (in thousands of m<sup>3</sup>)<sup>1/</sup>:

Region	1961	1962	1963	1964
Ashanti	4,823	5,263	5,745	6,623
Brong-Ahafo	355	445	568	600
Upper	1,314	545	673	864
Northern	1,264	1,509	1,636	2,264
Western	3,145	3,618	3,918	5,191
Central	1,636	1,700	1,709	2,109
Eastern	1,227	1,436	1,509	1,805
Accra	15,418	17,518	18,850	21,423
Volta	750	868	1,083	1,268
	29,932	32,907	35,691	42,147

1/ Economic Survey 1964, Central Bureau of Statistics, Accra, 1965.

At the present time, 2,442,000 persons in Ghana (less than 30 per cent of the total population of the country) are supplied with fresh water. Since the attainment of independence, the figure has increased by 250 per cent. Under the Seven-Year Plan, the sum of \$55.2 million has been set aside for developing fresh water supplies in the near future, the main source of supplies being the great Volta River reservoir.

## IV. EXISTING INDUSTRY

IV.1. Industrial production is developing in Ghana more rapidly than in many countries; nevertheless it is relatively unimportant as a factor in the formation of the national revenue. In 1964, 27 per cent of industrial production in Ghana came from the mining industry, which works almost exclusively for export. Thus the part played by mining in Ghana's industrial production is exceptionally large (for the world as a whole the proportion is 10 per cent). This is the economic result of the promptness with which foreign capital has developed primary production with a view to exports to the metropolitan countries. But even if we

take the remaining proportion (73 per cent) into account as well, industrial production in Ghana cannot be regarded as a modern system of manufacture. To a great extent it consists of small one-man enterprises with low productivity and a negligible level of capital employed. Data on employment in this sector make it clear that 85 per cent of the existing enterprises employ fewer than six persons. The manpower figures for all industries (manufacturing, mining and power production) is still hardly more than 80,000 workers.

Distribution of manpower employed by industry (enterprises employing more than 10 persons) shows the following percentage trend:

	1963	1964
	(Percentage)	
Agriculture	12.5	13.2
Mining and quarrying	8.1	7.4
Manufacturing	8.5	8.1
Construction	15.8	17.1
Electricity	4.0	4.0
Commerce	9.4	8.4
Transport	8.9	8.9
Services	32.8	32.9
Total	100.0	100.0

Source: Economic Survey 1964, Central Bureau of Statistics, Accra, 1965.

Table 4 gives the basic data on the industry existing in Ghana today.

Table 4

Number of enterprises and persons employed, gross production and value added, by sector of activity<sup>1/</sup>:

	Mining	Manufacturing	Electricity, gas, power	Industry as a whole
1. Number of enterprises				
1962	16	167	20	203
1963	16	176	21	213
1964	15	187	21	223
2. Number of persons employed (thousands)				
1962	28.0	29.3	3.6	60.9
1963	28.6	31.9	3.9	64.4
1964	26.3	35.8	3.8	65.9
3. Gross production (sales) at current prices (in \$1000)				
1962	61,336	99,958	10,090	171,384
1963	59,204	130,328	12,812	202,344
1964	59,952	149,877	15,361	225,190
4. Value added at current prices (in \$1000)				
1962	48,280	57,406	8,073	113,759
1963	46,283	73,459	10,249	129,991
1964	46,874	82,740	12,291	141,905

<sup>1/</sup> Industrial Statistics 1962-1964, Central Bureau of Statistics, Accra, 1965.

The above data refer only to enterprises employing fewer than thirty persons; and no account is taken of the following branches of industry: construction, diamond prospecting (African Diamond Diggers Company), production of non-distilled gin (akpetishi), quarries, clay pits and sand pits, and motor repair workshops.

It is impossible within the scope of this report to give an accurate account of the 187 enterprises at present existing in the manufacturing industry; all that can be given is the gross value of production at current prices (see table 5) and the quantities of the major industrial production items (see table 6).

Table 5

Growth of industrial production by production sectors, 1962-1964:

	1962	1963	1964
Food industry (excluding beverages)	5,873	6,069	6,597
Beverages	14,417	19,456	19,975
Tobacco	17,827	20,387	23,052
Textiles	469	2,433	3,573
Apparel	2,363	4,656	6,113
Timber (excepting furniture)	28,564	28,254	30,238
Furniture	3,546	3,914	4,867
Paper-making	349	1,190	1,368
Printing and publishing	3,425	5,730	4,366
Leather	751	622	637
Rubber	752	745	2,018
Chemicals	7,913	14,084	18,862
Petroleum	-	2,860	6,902
Non-metallic mineral products	1,339	1,832	1,524
Metallurgy	743	763	987
Metal industry	8,040	10,015	10,944
Transport	3,011	5,952	5,366
Miscellaneous	580	1,370	2,488
Total	99,962	130,328	149,877

Source: Economic Survey 1964, Central Bureau of Statistics, Accra, 1965.

Table 6

Principal industrial products, 1964

Product	Unit	Quantity
1. Acetylene	m3	69,380
2. Matches	gross	172,838
3. Articles of enamel	article	5,290,188
4. Cocoa butter	ton	12,526
5. Beer	m3	25,167
6. Biscuits	ton	702
7. Cement blocks	piece	3,439,863
8. Blouses	dozen	51,090
9. Sawnwood	m3	360,470
10. Alcoholic beverages	m3	1,484
11. Soft drinks	m3	14,133
12. Cardboard boxes	piece	2,065,107
13. Candles	ton	1,025
14. Cattle and sheep	ton	183
15. Brilliantine	container	444,984
16. Lime	m3	2,787
17. Footwear of textile fabric	pair	868,887
18. Shirts	dozen	28,773
19. Cigarettes	thousand	2,124,455
20. Steel nails	ton	2,042
21. Blankets	piece	121,034
22. Steel building components	dollar	258,900
23. High carbon steel wire	ton	868
24. Crude oil	m3	1,503
25. Palm oil	m3	1,240
26. Refined oil	m3	1,423
27. Insecticides	m3	1,270
28. Furniture	dollar	364,551
29. Oxygen	m3	320,980



Table 6 (continued)

Product	Unit	Quantity
30. Bread	dollar	152,345
31. Baskets	piece	121,034
32. Perfume	container	996,456
33. Cocoa paste	ton	16,531
34. Veneer	m3	1,080
35. Pomades	container	3,987,913
36. Household utensils	piece	60,889
37. Powders	container	2,026,265
38. Deep-frozen meat products	ton	427
39. Suitcases and handbags	piece	260,869
40. Sandals	pair	375,009
41. Soap	ton	23,000
42. Buckets	piece	577,876
43. Towels, etc.	piece	3,263,964
44. Confectionery	ton	417
45. Tobacco	ton	334
46. Paints (enamel)	ton	441
47. Paints (emulsion)	ton	498
48. Shirtings	metre	3,748,058
49. Aluminium utensils	piece	1,583,839
50. Apparel	dozen	313,231
51. Plywood	m3	21,050

Source: Industrial Statistics 1962-1964, Central Bureau of Statistics, Accra, 1965.

The Republic of Ghana has embarked on a seven-year plan 1963/64 - 1969/70 designed to create a sound basis for the rapid industrialization of the country. It is the third economic and social development plan to be undertaken since the achievement of independence. Investments under the plan will be \$364 million a year. Public investment during the entire period will be \$1,332 million, including \$306 million for the mining and manufacturing industries, and \$190 million for agriculture, forestry and fisheries.

#### IV.2 The chemical industry in Ghana

The chemical industry in Ghana is not as yet highly diversified. Among the existing concerns related to the chemical industry, the following may be mentioned.

Paints, varnishes and lacquers: a plant at Tema, with an annual production of 940 tons (1964). Value of tonnage produced \$890,000; value added \$401,000; number of persons employed 110.

Soap: six soap factories, including two fairly large plants, one at Accra, the other at Tema. Production is approximately 23,000 tons a year (1964). Value of tonnage produced approximately \$10,419,000; value added approximately \$4,168,000; approximate number of persons employed 861.

Perfumes and cosmetics: six undertakings, including three fairly large concerns at Accra, manufacturing perfume, powder and brilliantine. Value of production approximately \$226,000. Value added approximately \$34,000. Number of persons employed about 77.

Medicinal and pharmaceutical products: six workshops, including two fairly large plants, one at Bolgatanga, the other at Bonhwakrom, manufacturing medicinal herbs and local medicines. Value of production approximately \$2,312,000; value added approximately \$1,110,000; approximate number of persons employed 363.

Miscellaneous chemical products: four plants, including one at Tema and two at Accra, manufacturing insecticides (1,270 m<sup>3</sup> of gamma line in 1964); candles (1,025 tons in 1964) and incense. Value of production \$2,598,000; value added \$767,000; number of persons employed about 363.

Petroleum products: a refinery at Tema. Production capacity 1,250,000 tons of fuel oil a year. Value of tonnage produced \$6,902,000; value added \$6,350,000; number of persons employed 398.

Matches: a plant at Kade. Annual production 172,838 gross (1964). Value of production \$533,000; value added \$320,000; number of persons employed 200.

Oxygen and acetylene: an enterprise at Takoradi. Annual production 320,980 m<sup>3</sup> of oxygen and 69,380 m<sup>3</sup> of acetylene (1964); number of persons employed about 40.

Fuller details concerning the number of chemical and related enterprises, their production and value added, as well as their names and addresses, are shown in tables 7 and 8. The data in table 7 are exclusively concerned with chemical and related enterprises employing fewer than thirty persons.

Table 7

Chemical and related industries: number of enterprises and persons employed, gross production and value added.

Products	Number of existing enterprises	Number of persons employed	Gross production (sales) at current prices (in \$1,000)	Value added at current prices (in \$1,000)
1. Spirits				
1962	2	292	3,091	1,469
1963	2	353	4,314	1,409
1964	2	378	4,153	1,371
2. Beers				
1962	2	813	9,898	6,967
1963	2	824	12,717	8,992
1964	2	898	13,059	9,272
3. Soft drinks and aerated waters				
1962	4	322	1,428	637
1963	4	471	2,422	1,260
1964	4	1,120	2,762	1,549
4. Smoking tobacco				
1962	-	-	-	-
1963	-	-	-	-
1964	2	684	294	132
5. Cigarettes and cigars				
1962	2	580	17,827	13,920
1963	2	608	20,387	16,406
1964	2	841	22,758	18,206

Table 7 (continued)

Products	Number of existing enterprises	Number of persons employed	Gross production (sales) at current prices (in \$1,000)	Value added at current prices (in \$1,000)
6. Cellulose and paper				
1962	1	61	164	98
1963	1	59	215	102
1964	1	50	184	87
7. Paper products				
1962	1	53	185	87
1963	2	168	974	629
1964	2	294	1,184	670
8. Raw natural rubber				
1962	3	350	210	202
1963	3	603	300	296
1964	3	400	204	202
9. Products of natural or synthetic rubber				
1962	-	-	-	-
1963	-	-	-	-
1964	1	315	1,263	291
10. Retread tyres				
1962	2	112	542	276
1963	2	106	445	289
1964	2	109	550	358
11. Copra oil				
1962	1	137	522	211
1963	1	138	774	259
1964	1	159	948	313
12. Groundnut oil				
1962	-	-	-	-
1963	1	-	42	33
1964	2	41	180	169

Table 7 (continued)

Products	Number of existing enterprises	Number of persons employed	Gross production (sales) at current prices (in \$1,000)	Value added at current prices (in \$1,000)
13. Palm oil				
1962	1	245	351	273
1963	1	315	429	341
1964	1	338	413	331
14. Vegetable oil				
1962	1	50	332	88
1963	1	48	305	129
1964	1	59	349	91
15. Paints, varnishes and lacquers				
1962	1	83	328	85
1963	1	200	767	346
1964	1	110	890	401
16. Soap and soap products				
1962	1	69	184	75
1963	2	656	5,482	2,219
1964	2	861	10,419	4,168
17. Perfumes and cosmetics and other toilet preparations				
1962	3	136	471	123
1963	3	123	571	217
1964	3	77	228	84
18. Medicinal and pharmaceutical products				
1962	2	307	3,790	2,172
1963	2	428	2,622	1,259
1964	2	368	2,312	1,110

Table 7 (continued)

Products	Number of existing enterprises	Number of persons employed	Gross production (sales) at current prices (in \$1,000)	Value added at current prices (in \$1,000)
19. Other chemical products				
1962	3	137	1,447	677
1963	4	165	2,604	803
1964	4	198	2,589	767
20. Petroleum products				
1962	-	-	-	-
1963	1	221	2,860	2,630
1964	1	398	6,902	6,350
21. Matches				
1962	1	213	487	303
1963	1	236	488	292
1964	1	200	533	320
22. Oxygen and acetylene				
1962	1	40**		
1963	1	40**		
1964	1	40**		
23. Salt				
1962	3	266	803	639
1963	3	263	1,315	1,004
1964	3	210	2,743	2,094

Source: Industrial Statistics 1962-1964, Central Bureau of Statistics, Accra, 1965.

\* Not including production of non-distilled gin (akpetishi)

\*\* Estimations

Table 8

Name, number and whereabouts of chemical and related enterprises

Undertakings employing at least 30 persons		Establishments employing 10 to 29 persons
Name	Address	Number and region
1. Distilled spirits		
Ghana Distilleries Corporation	Ring Road West, Accra (Accra Capital Region)	153 - Eastern Region 70 - Volta Region
Sei Kwesi	Presbyterian Primary School Compound, Oyoko-Adamiegya (Eastern Region)	55 - Central Region 40 - Brong Ahafo Region 39 - Western Region 39 - Ashanti Region
Sekyere East Distillers Association	On main road to Nkwankwenu (Ashanti Region)	9 - Accra Capital District 8 - Upper Region 4 - Northern Region
Senagbe Kwasi	Near Asukyere Chief's House (Eastern Region)	
The Truth Fears not Alcoholic Distillers Association	Near Nubourtser Kopey (Eastern Region)	
Twi Kwaine	Putubiwei (Central Region)	
Aboso-Fiase Co-op.	4/No.39 Aboso (Western Region)	
Amasah C.S.	Panpanso No. 1 (Eastern Region)	
Asuboi Co-op. Distillers Society No.2498	H/No. MM21, near main road (Eastern Region)	
Ghana Co-op. Distillers Association	George Amenako's House Denu-Aflao Road (Volta Region)	
Ghana Co-op. of Alcohol Distillers	Distillers Camp Abofuor Zongo (Ashanti Region)	

Table 8 (continued)

Undertakings employing at least 30 persons		Establishments employing 10 to 29 persons
Name	Address	Number and region
Gomoa Enyeme Distillers Co-op. Society	Odina Road Gomoa Enyeme (Central Region)	
Poase Cement Co-op. Distillers Society	Near Water Supply on Hill top (Volta Region)	
Pokoase Co-op. Spirit Distillers Society	On Accra-Nsowam Road (Accra Capital District)	
Ltd. Abaido Kweku	Apesewa Apewosika (Central Region)	
Afeomo Distillers Association	Near the President's Aburi Lodge (Eastern Region)	
Aycho Kojo	H/No.66/2 Asaka (Western Region)	
Co-op. Association of Alcohol Distillers	Near Water Works (Volta Region)	
Dapaah Norman Kwame	1/4 mile from Mpatase along Mpatase-Koto Lorry road (Brong Ahafo Region)	
Dosu Kodzo and Co.	Agbosume (Volta Region)	
Ekute Kwasi	Apewosika (Central Region)	
Ghana Association of Alcohol Distillers	Tadsewu-Xevi Road (Volta Region)	
Ghana Co-op. Association of Alcohol Distillers	Near Central Market (Volta Region)	
Ghana Nyive Akpeteshie Distillers Association	Near L/C Primary School (Volta Region)	



Table 8 (continued)

Undertakings employing at least 30 persons		Establishments employing 10 to 29 persons
Name	Address	Number and region
Gomoa Pinanko Co-op. Distillers	Opposite Methodist Middle School Pinanko (Central Region)	
Komegbe Helmunst	Near H/No.A/Wu 88 (Volta Region)	
Mankrong Group Co-op. Distillers Society	H/No.MW 19 main street (Eastern Region)	
Okum Kofi	In Osom, the C.P.P. Chairman's House (Eastern Region)	
Panpanso No.1 Distillers Group	Teshie Villa, Nsawam (Eastern Region)	
Teye Emmanuel	On the road to Jumapo (Eastern Region)	
"Warabeba"	Okanta Road (Volta Region)	
Weliso Tei	Village near Kyeiaso market 1/2 mile (Eastern Region)	
<b>2. Beer</b>		
Accra Brewery (Overseas Brewery Ltd.)	Brewery Road, Agbogbloshie (Accra Capital District)	13 - Upper Region 3 - Northern Region 1 - Brong Ahafo Region
Kumasi Brewery Ltd.	Lake Road, Kumasi (Ashanti Region)	
<b>3. Soft drinks and carbonated water</b>		
Ghana Bottling Company Ltd.	H/No.B12/9, Weijsa Road, Accra (Accra Capital District)	6 - Accra Capital District 2 - Eastern Region 2 - Central Region
Ghana National Training Corporation Bottling Co.	Near Kingsway Stores on Kwame Nkrumah Avenue (Accra Capital District)	1 - Western Region 1 - Ashanti Region

Table 8 (continued)

Undertakings employing at least 30 persons		Establishments employing 10 to 29 persons
Name	Address	Number and region
Nicols Mineral Waters Factory Ltd.	H/No. 12.2, Clifind Road (Western Region)	
U.T.C. Mineral Waters Factory	Kumasi (Ashanti Region)	
<u>4. Tobacco</u>		
Pioneer Tobacco Co.	At mile 93 on the Kumasi Wenchi Road (Brong Ahafo Region)	11 - Ashanti Region 6 - Upper Region 2 - Brong Ahafo Region
Pioneer Tobacco Co.	Behind mile 62, on Kumasi Tamale Road (Ashanti Region)	
<u>5. Cigarettes and cigars</u>		
Pioneer Tobacco Co.	Along Cape Coast Road (Western Region)	1 - Kohomlembe, Accra Capital District
Grand Tobacco Corporation Ltd.	Tema Community 1, Industrial Area (Accra Capital District)	
<u>6. Cellulose and paper</u>		
Ghana Fibre Industry Ltd.	Behind Regal Cinema, X'Bory (Accra Capital District)	-
<u>7. Articles of paper</u>		
Lift Paper Bag	Bannerman Road, Accra (Accra Capital District)	1 - Accra Capital District
Paper Conversion Corporation	Industrial Plots No. 5, Sekondi-Takoradi Road (Western Region)	
<u>8. Natural raw rubber</u>		
Ghana State Farms	Mile 7 on Link Road to Main Takoradi-Axim Road (Western Region)	2 - Western Region

Table 8 (continued)

Undertakings employing at least 30 persons		Establishments employing 10 to 29 persons
Name	Address	Number and region
Holland Rubber Plantations Ltd.	Fischer Rubber Plantations (Eastern Region)	
Offin River Estate Ltd.	Behind the Railway Quarters at the banks of River Offin, Dunkwa (Central Region)	
<u>9. Products of natural and synthetic rubber</u>		
Ghana Rubber Products Ltd.	Ring Road Industrial Area, Plot No. 1, Accra (Accra Capital District)	1 - Central Region 1 - Accra Capital District 1 - Brong Ahafo Region
<u>10. Retread tyres</u>		
Terco Ghana Ltd.	Lake Road, Kumasi (Ashanti Region)	2 - Accra Capital District
Vacu-Lug W.A. Ltd.	Poase Road, Sekondi (Western Region)	
<u>11. <del>Cocoa</del> oil</u>		
Nzima Oil Mills	Franza (Western Region)	11 - Western Region 1 - Volta Region 1 - Central Region
<u>12. Groundnut oil</u>		
Attebubu Groundnuts Oil Factory	Attebubu (Brong Ahafo Region)	-
<u>13. Palm oil</u>		
Ghana State Farms Corporation	Sese (Western Region)	10 - Eastern Region 2 - Central Region 1 - Volta Region 1 - Ashanti Region 1 - Western Region
<u>14. Vegetable oil</u>		
Crystal Oil Mills Ltd.	Behind the Surf Factory Accra (Accra Capital District)	1 - Northern Region 1 - Volta Region 1 - Upper Region

Table 8 (continued)

Undertakings employing at least 30 persons		Establishments employing 10 to 29 persons
Name	Address	Number and region
Vegetable Oil Mills Corporation	Franza (near Esiana) (Western Region)	1 - Brong Ahafo Region 1 - Eastern Region
<u>15. Paints, varnishes and lacquers</u>		
Ghana Paint Corporation	Industrial Area, Tema (Accra Capital District)	-
<u>16. Soap and soap products</u>		
Lever Brothers (Ghana) Ltd.	Aneley Laryea Street, Accra (Accra Capital District)	2 - Accra Capital District 2 - Ashanti Region
Lever Brothers (Ghana) Ltd.	Tema (Accra Capital District)	
<u>17. Perfumery, cosmetics and other toiletries</u>		
Ghana Powder and Cosmetics Factory	Kwame Nkrumah Avenue, Accra (Accra Capital District)	2 - Accra Capital District 1 - Western Region
Seward A.f. (Ghana) Ltd.	High Street, (Accra Capital District)	
United Perfumery Co. (Ghana) Ltd.	Labadi Industrial Estate, Accra (Accra Capital District)	
<u>18. Medicines and pharmaceutical products</u>		
Asakeyine's Witchcraft Doctor	Near Kawlogo Dam, Navrongo Road, Bolgatanga (Upper Volta)	1 - Volta Region 1 - Eastern Region 1 - Western Region
Adomako Ebenezer	Abankwakrom (Ashanti Region)	1 - Ashanti Region
<u>19. Other chemical products</u>		
Imperial Chemical Industries Ltd.	Industrial Area, Tema (Accra Capital District)	-
Ghana Candle Co. Ltd.	H/No.B 56/2, Zabon Zongo, Ring Road, Abossey Okei, Accra (Accra Capital District)	

Table 8 (continued)

Undertakings employing at least 30 persons		Establishments employing 10 to 29 persons
Name	Address	Number and region
Ghana Incense Factory	Accra (Accra Capital District)	
<u>20. Petroleum products</u>		
Ghaip Company Ltd. (Tema Oil Refinery)	Tema (Accra Capital District)	-
<u>21. Matches</u>		
Ghana Match Company	Kade Zongo, about 150 yds. from Birim Bridge, Kade (Eastern Region)	-
<u>22. Oxygene and acetylene</u>		
L'air liquide	Takoradi (Western Region)	-
<u>23. Salt</u>		
Apam Salt Industry Ltd.	Akwamu-Apam (Central Region)	-
Elmina Sea Salt Co.	Near Cape-Coast Sekondi Road, Elmina (Central Region)	
Panbros Salt Industry Ltd.	Sakumo Lagoon, Weiija (Accra Capital District)	

Source : Directory of Industrial Enterprises and Establishments, Central Bureau of Statistics, Accra, October 1963.

## V. THE PRESENT MARKET FOR CHEMICAL PRODUCTS

The tables below were prepared by selecting chemicals and related products on the basis of the customs statistics for 1960 to 1964 taken as reference years. Growth rates are calculated over a period of four years as a rule, except where a figure is missing or is of no consequence.

Table 9 refers to import tonnages; table 10 shows their value in dollars; table 11 shows export tonnages; and table 12 their value in dollars. The tables also indicate export and re-export values for chemical products (table 13) and the proportion represented by chemicals in Ghana's foreign trade (table 14).

Table 9

Imports: chemical and related products (tonnage)

Classification	1960	1961	1962	1963	1964	Annual rate
Group 271. Crude fertilizers						
271.1. Natural fertilizers of animal or vegetable origin	3.0	6.1	5.1	...	240.1	200%
271.2. Natural sodium nitrate	...	9.2	...	...	...	?
271.3. Natural phosphates	52.0	50.8	20.8	81.3	4.7	Variable
271.4. Natural potassic salts, crude	403	406	437	759	353	Variable
Group 274. Sulphur and unroasted iron pyrites						
274.1. Sulphur	...	5.6	26.0	50.8	12.9	32%
Group 276. Other crude minerals						
276.3. Salt	8,510	7,930	353	2,652	2,101	Minus
Section 5. Chemicals						
Group 512. Organic chemicals						
512.1. Hydrocarbons and their derivatives	...	2.5	10.3	79.5	57.5	184%
512.2. Alcohols, phenols, glycerine	...	157	119	222	206	9%
512.3. Ethers, epoxides, acetals	...	19.7	5.0	8.0	0.3	Minus
512.4. Aldehyde, ketone- and quinone-function compounds	...	...	0.2	16.1	1.4	160%
512.5. Acids and their derivatives	13.6	101.9	60.0	105.0	29.4	21%

Table 9 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
512.6. Inorganic esters, their salts and derivatives	...	0.8	0.4	...	...	?
512.7. Nitrogen-function compounds	...	...	...	0.3	0.5	?
512.8. Organo-inorganic and heterocyclic compounds	...	40.2	2.6	...	...	Minus
512.9. Other organic chemicals	...	207	306	333	385	23%
Group 513. Inorganic chemicals						
513.1.(1) Oxygen	...	8.1	1.1	3.5	1.1	Minus
513.1.(2) Nitrogen	...	21.9	...	45.4	13.9	Minus
513.1.(3) Hydrogen	...	21.9	57.5	86.8	107.9	70%
513.2. Chemical elements n.e.s.	...	177	93	112	48	Minus
513.3 Inorganic acids and oxygen compounds of metalloids	320	427	225	397	338	1.2%
513.4. Halides, oxyhalides and sulphides of metalloids	...	6.9	...	3.6	...	?
513.5. Metallic oxides, of kinds principally used in paints	...	11.1	12.3	181	786	315%
513.6.(1) Ammonia, anhydrous or in aqueous solution	...	83.6	44.2	75.8	21.7	Minus
513.6.(2) Caustic soda (sodium hydroxide)	161	311	273	2,449	2,465	98%
513.6.(3) Caustic potash	...	41	20	...	124	45%
513.6.(4) Oxides, hydroxides and peroxides of strontium, barium or magnesium	...	0.3	30.7	0.8	...	Variable
513.6.(5) Aluminium oxide and hydroxide	...	...	63	...	...	?
513.6.(7) Chromium oxides and hydroxides	...	0.3	...	...	...	?
513.6.(8) Tin oxides	...	50	...	...	...	?
513.6.(9) Other inorganic bases and metallic oxides, hydroxides and peroxides	...	93	25	141	2,302	191%
Group 514. Other inorganic chemicals						
514.1. Metallic salts and peroxy salts of inorganic acids	...	113	201	79	288	36%

Table 9 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
514.2.(1) Sulphides (including polysulphides)	...	3.1	0.5	14.0	...	Variable
514.2.(2) Dithionites; sulphyxylates	...	...	...	...	...	
514.2.(3) Sulphites and thiosulphates	...	1.6	1.6	3.0	2.5	16%
514.2.(4) Sulphates (including alums) and persulphates	...	2,608	3,783	830	4,950	24%
514.2.(5) Nitrites and nitrates	...	103	262	267	311	45%
514.2.(6) Phosphites, hypo-phosphites and phosphates	...	1.9	3.3	3.6	30.9	153%
514.2.(7) Arsenites and arsenates	...	10	...	...	...	?
514.2.(8) Neutral sodium carbonate (soda ash)	...	235	274	125	256	3%
514.2.(9) Other carbonates and percarbonates	...	19.6	44.8	24.8	40.6	27%
514.3. Other metallic salts and peroxysalts of inorganic acids	...	690	627	763	523	Minus
514.9.(1) Liquid air	...	...	...	...	403	?
514.9.(2) Hydrogen peroxide	...	5.9	0.7	13.5	63.4	120%
514.9.(4) Calcium carbide	607	1,149	827	907	1,360	23%
514.9.(5) Other carbides	...	7.2	14.2	...	2.9	Minus
514.9.(6) Hydrides, nitrides and azides, silicides and borides	...	0.4	2.0	...	56.8	Variable
514.9.(9) Other inorganic compounds, n.c.s.	...	891	1,156	743	477	Minus
Group 515. Radio-active and associated materials						
515.1. Radioactive chemical elements and their compounds and mixtures	...	...	...	...	...	
515.3. Compounds and mixtures, n.c.s., of thorium, of uranium, of rare earth metals, of yttrium or of scandium	...	...	...	31	...	?



Table 9 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
Group 521. Mineral tar and crude chemicals from coal, petroleum and natural gas						
521.1. Mineral tar	519	836	338	940	140	Minus
521.3. Ammoniacal gas liquors and spent oxide produced in coal gas purification	...	0.9	...	...	...	?
521.4. Oils and other products of the distillation of coal tar	659	97	115	140	12	Minus
Group 531. Synthetic organic dye-stuffs, natural indigo and colour lakes						
531.(1) Synthetic organic dyestuffs and natural indigo	26	62	153	100	135	51%
Group 532. Dyeing and tanning extracts, and synthetic tanning materials						
532.1. Dyeing extracts (vegetable and animal)	6.3	12.6	2.4	6.1	2.5	Minus
532.3. Synthetic tanning materials	...	0.9	2.7	1.1	0.1	Minus
532.4. Tanning extracts of vegetable origin	...	0.1	...	...	0.4	Variable
532.5. Tannic acids (tannins) and derivatives	...	2.4	0.4	...	...	?
Group 533. Pigments, paints, varnishes and related materials						
533.1. Colouring materials, n.e.s.	1,585	1,574	957	226	415	Minus
533.2. Printing inks	59	74	65	77	88	10%
533.3.(1) Prepared pigments, opacifiers, enamels, glazes, lustres, etc.	4,117	3,772	2,746	2,486	3,405	Minus
533.3.(2) Varnishes, distempers, water pigments, stamping foils and dyes put up for retail sale	-	1,746	1,387	2,765	476	Minus
533.3.(3) Artists' colours	-	27.6	16.9	12.2	80.4	43%
533.3.(4) Prepared driers	-	52.3	10.5	8.9	7.7	Minus

Table 9 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
533.3.(5) Putty, painters' fillings, etc.		113	134	149	34	Minus
Group 541. Medicinal and pharmaceutical products		3,488.0	5,334.6	5,830.8	3,500.4	
541.1. Vitamins and pro-vitamins	-	21.4	23.4	32.0	9.3	Minus
541.3. Penicillin, streptomycin, tyrocidine and other antibiotics	-	109.7	172.4	169.2	43.1	Minus
541.4. Opium alkaloids, cocaine, cafein, quinine and other vegetable alkaloids, their salts and other derivatives	-	42.2	38.6	58.3	15.3	Minus
541.5. Hormones	-	0.6	0.5	1.2	1.5	36%
541.6.(1) Glycosides and their derivatives	-	1.2	0.5	7.9	-	Variable
541.6.(2) Organo-therapeutic glands and other organs and their extracts	-	0.4	0.1	0.3	0.1	Minus
541.6.(3) Bacteriological products, sera, vaccines	-	3.9	4.1	89.9	16.1	60%
541.7. Medicaments	-	2,824	3,512	3,756	2,239	Variable
541.9.(1) Bandages, etc., impregnated or coated with pharmaceutical products or put up for retail sale	-	202	269	287	145	Variable
541.9.(9) Other pharmaceutical goods	-	2,862	1,314	1,429	1,031	Minus
Group 551. Essential oils, perfume and flavour materials						
551.1. Essential oils and resinoids	-	100	64	72	60	Minus
551.2. Synthetic perfume and flavour materials and concentrates, and enfleurage greases and mixtures of alcohol and essential oils	-	143	198	246	243	19%

Table 9 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
Group 553. Perfumery and cosmetics, dentrifices and other toilet preparations (except soap)						
553. Perfumery and cosmetics, dentrifices and other toilet preparations (except soap)	903	861	316	344	136	Minus
Group 554. Soaps, cleansing and polishing preparations						
554.1.(1) Toilet soap	1,868	2,439	2,945	1,850	1,550	Minus
554.1.(2) Common soap	21,994	25,653	28,514	10,562	6,695	Minus
554.2. Surface-acting agents and washing preparations	1,160	1,747	2,162	2,072	2,548	22%
554.3. Polishes, pastes, powder and similar preparations for polishing and preserving leather, wood, metal, glass and other materials	665	697	933	954	645	Variable
Group 561. Manufactured fertilizers	851	1,460	2,439	3,934	3,500	42%
561.1.(1) Ammonium sulphate	271	207	513	944	757	29%
561.1.(2) Other nitrogenous fertilizers	19	426	94	7	7	Minus
561.2.(1) Superphosphates	45	66	47	118	50	3%
561.2.(9) Other phosphatic fertilizers	210	459	1,595	1,059	192	Variable
561.3. Potassic fertilizers	107	273	25	457	954	73%
561.9. Fertilizers, n.e.s.	199	29	165	349	1,540	67%
Group 571. Explosive and pyrotechnic products						
571.1.(1) Propellant powders	154	299	125	127	247	13%
571.1.(2) Other prepared explosives	2,444	2,445	2,888	2,828	2,056	Variable
571.2.(1) Mining, blasting and safety fuses	-	257	184	269	156	Minus
571.2.(2) Percussion and detonating caps, igniters, detonators	249	317	31	75	23	Minus

Table 9 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
571.3. Pyrotechnical articles	-	-	-	-	-	
571.4. Hunting and sporting ammunition	-	-	-	-	-	
Group 581. Plastic materials, regenerated cellulose and artificial resins						
581.1. Products of condensation, polycondensation and polyaddition	-	-	13	64	36	66%
581.2. Products of polymerization and copolymerization	-	27	32	8	111	60%
581.3.(1) Vulcanized fibre	-	0.1	-	0.2	2.4	188%
581.3.(2) Regenerated cellulose and chemical derivatives of cellulose	-	4.3	0.9	18.9	30.7	92%
581.9.(1) Hardened proteins	-	-	-	-	1.5	?
581.9.(2) Modified natural resins, ester gums, etc.	-	-	70	659	1,026	283%
581.9.(9) Other artificial plastic materials	120	58	39	104	106	Minus
Group 599. Chemical materials and products, n.e.s.						
599.2.(1) Disinfectants	348	563	404	599	634	16%
599.2.(2) Insecticides	-	2,352	1,230	1,510	1,214	Minus
599.2.(3) Fungicides	-	53	71	210	119	31%
599.2.(4) Special products for sheep and cattle dressing	-	4.0	0.3	-	-	?
599.5.(1) Starches and inulin	-	107	64	195	263	35%
599.5.(2) Gluten and gluten flour	-	7.3	2.1	3.6	3.4	Minus
599.5.(3) Casein, caseinates and other casein derivatives	-	4.6	12.8	1.0	6.9	15%
599.5.(4) Albumins, albuminates and other albumin derivatives	-	-	-	-	-	
599.5.(5) Gelatin and gelatin derivatives, etc.	-	-	73	0.4	71	Variable
599.5.(6) Peptones and other protein substances and their derivatives	-	-	-	-	-	

Table 9 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
599.5.(7) Dextrins, soluble or roasted starches or starch glues	-	1.4	-	3.2	40.1	206%
599.5.(9) Prepared glues, n.e.s.		443	717	867	1,281	43%
599.6.(3) Spirits of turpentine, etc.	-	-	-	-	-	
599.6.(5) Wood tar, wood tar oils, etc.	-	-	-	-	-	
599.6.(9) Other tars and resins	-	159	176	188	111	Variable
599.7. Organic chemical products, n.e.s.	-	458	421	1,349	628	11%
599.9. Chemical products and preparations, n.e.s.	-	1,380	1,609	4,592	4,104	44%

Table 10

Imports: chemical and related products (value)

Classification	(Thousands of dollars)					Annual rate
	1960	1961	1962	1963	1964	
Group 271. Crude fertilizers						
271.1. Natural fertilizers of animal or vegetable origin	1.3	1.0	0.7	-	10.6	69%
271.2. Natural sodium nitrate	-	1.0	-	-	-	?
271.3. Natural phosphates	4.0	5.2	1.6	4.2	6.4	13%
271.4. <b>Natural potassic salts, crude</b>	44.3	55.3	<b>50.8</b>	<b>62.8</b>	<b>44.8</b>	
Group 274. Sulphur and unroasted iron pyrites						
274.1. Sulphur	-	0.6	2.3	4.5	1.0	18%
Group 276. Other crude minerals						
276.3. Salt	368	230	33	182	92	Minus
Section 5. Chemicals						
Group 512. Organic chemicals						
512.1. Hydrocarbons and their derivatives	-	1.7	3.6	20.2	22.9	140%
512.2. Alcohols, phenols, glycerine	72.6	38.2	49.5	91.6	94.2	7%
512.3. Ethers, epoxides, acetols	-	7.6	2.6	4.6	2.3	Minus
512.4. Aldehyde, ketone- and quinone-function compounds	-	0.1	-	5.7	2.4	Variable
512.5. Acids and their derivatives	6.2	35.2	27.5	22.8	31.6	50%
512.6. Inorganic esters, their salts and derivatives	-	1.0	0.6	-	-	?
512.7. Nitrogen-function compounds		0.2	0.1	0.6	0.9	65%
512.8. Organo-inorganic and hetero-cyclic compounds	-	11.2	1.8	-	-	?
512.9. Other organic chemicals	94	98	215	152	267	30%

Table 10 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
Group 513. Inorganic chemicals						
513.1. (1) Oxygen	-	12.5	1.9	1.8	2.4	Minus
513.1. (2) Nitrogen	-	9.1	-	27.1	8.9	Variable
513.1. (3) Hydrogen	-	9.1	23.4	27.9	54.3	82%
513.2. Chemical elements, n.e.s.	-	58.4	70.3	63.5	27.4	Minus
513.3. Inorganic acids and oxygen compounds	69.8	113.3	60.9	94.2	81.0	4%
513.4. Halides, oxyhalides and sulphides of metalloids	-	1.4	-	1.9	-	?
513.5. Metallic oxides, of kinds principally used in paints	-	3.6	4.6	78.3	270.7	322%
513.6. (1) Ammonia, anhydrous or in aqueous solution	-	30.1	12.0	17.7	11.4	Minus
513.6. (2) Caustic soda (sodium hydroxide)	26.0	52.2	37.3	225.9	270.5	80%
513.6. (3) Caustic potash	-	4.4	3.7	-	21.2	69%
513.6. (4) Oxides, hydroxides and peroxides of strontium, barium or magnesium	-	0.4	9.7	0.4	-	Variable
513.6. (5) Aluminium oxides and hydroxides	-	-	3.6	-	-	?
513.6. (7) Chromium oxides and hydroxides	-	0.5	-	-	-	?
513.6. (8) Tin oxides	-	11.5	-	-	-	?
513.6. (9) Other inorganic bases and metallic oxides, hydroxides and peroxides	-	55.9	10.9	29.9	33.8	Minus
Group 514. Other inorganic chemicals						
514.1. Metallic salts and peroxysalts of inorganic acids	-	17.6	40.5	19.0	29.5	19%
514.2. (1) Sulphides (including polysulphides)	-	1.1	1.6	4.0	-	Variable
514.2. (2) Dithionites, sulphonylates	-	-	-	-	-	
514.2. (3) Sulphites and thiosulphates	-	0.6	0.8	0.8	0.6	

Table 10 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
514.2. (4) Sulphates (including alums) and persulphates	-	145	227	74	189	9%
514.2. (5) Nitrites and nitrates	-	23.3	63.4	103.2	64.9	41%
514.2. (6) Phosphites, hypo-phosphites and phosphates	-	1.2	1.1	1.9	9.1	96%
514.2. (7) Arsenites and arsenates	-	1.9	-	-	-	?
514.2. (8) Neutral sodium carbonate (soda ash)	-	35.7	42.7	15.1	21.1	Minus
514.2. (9) Other carbonates and percarbonates	-	4.4	7.6	7.1	13.2	44%
514.3. Other metallic salts and peroxy salts of inorganic acids		196.3	167.4	206.4	123.1	Minus
514.9. (1) Liquid air	-	-	-	-	0.5	?
514.9. (2) Hydrogen peroxide	-	3.9	0.6	8.9	15.7	59%
514.9. (4) Calcium carbide	102	218	173	133	170	14%
514.9. (5) Other carbides		2.3	3.2	-	1.3	Minus
514.9. (6) Hydrides, nitrides and azides, silicides and borides	-	0.5	0.3	-	5.6	Variable
514.9. (9) Other inorganic compounds, n.e.s.	921	213	285	320	236	Minus
Group 515. Radioactive and associated materials						
515.1. Radioactive chemical elements and isotopes and their compounds and mixtures	-	-	0.4	-	0.4	?
515.3. Compounds and mixtures, n.e.s. of thorium, of uranium, of rare earth metals, of yttrium or of scandium	-	-	-	1.6	-	?
Group 521. Mineral tar and crude chemicals from coal, petroleum and natural gas						
521.1. Mineral tar	45.8	85.1	38.4	76.9	14.0	Minus
521.3. Ammoniacal gas liquors and spent oxide produced in coal gas purification	-	0.7	-	-	-	?
521.4. Oils and other products of the distillation of coal tar	76.0	15.7	15.2	29.2	1.3	Minus



Table 10 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
Group 531. Synthetic organic dyestuffs, natural indigo and colour lakes						
531. (1) Synthetic organic dyestuffs and natural indigo	83.1	153	234	233	225	28%
Group 532. Dyeing and tanning extracts, and synthetic tanning materials						
532.1. Dyeing extracts (vegetable and animal)	12.4	25.1	3.7	8.4	3.3	Minus
532.3. Synthetic tanning materials	-	2.5	1.9	5.5	0.2	Minus
532.4. Tanning extracts of vegetable origin	-	0.1	-	-	0.7	?
532.5. Tannic acids (tannins) and derivatives	-	0.5	1.1	0.1	-	Minus
Group 533. Pigments, paints, varnishes and related materials						
533.1. Colouring materials, n.e.s.	422	540	484	184	268	Minus
533.2. Printing inks	47.6	48.5	48.2	64.9	83.2	15%
533.3. (1) Prepared pigments, opacifiers, enamels, glazes, lustres, etc.	2323	1664	1505	1449	1296	Minus
533.3. (2) Varnishes, distempers, water pigments, stamping foils and dyes put up for retail sale	-	679	442	554	169	Minus
533.3. (3) Artists' colours	-	20.2	21.2	14.1	61.5	45%
533.3. (4) Prepared driers	-	29.4	7.7	10.8	5.2	Minus
533.3. (5) Putty, painters' fillings, etc.	-	28.8	31.7	42.3	18.1	Minus
Group 541. Medicinal and pharmaceutical products	6838.5	7271.2	7292.5	8420.2	5659.8	
541.1. Vitamins and pro-vitamins	71.5	77.5	76.3	122.4	58.0	Minus
541.3. Penicillin, streptomycin, tyrocidine and other antibiotics	426	518	462	367	163	Minus
541.4. Opium alkaloids, cocaine, caffeine, quinine and other vegetable alkaloids, their salts and other derivatives	41.0	151.1	241.6	165.3	39.9	Variable

Table 10 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
541.5. Hormones	-	3.9	6.2	15.3	18.1	67%
541.6. (1) Glycosides and their derivatives	-	1.0	0.2	3.7	-	Variable
541.6. (2) Organo-therapeutic glands or other organs and their extracts	-	3.7	1.2	2.5	2.8	Minus
541.6. (3) Bacterial products, sera, vaccines	103	145	52	156	68	Minus
541.7. Medicaments	1336	2310	3200	4055	2577	18%
541.9. (1) Bandages, etc., impregnated or coated with pharmaceutical products or put up for retail sale	364	457	626	487	350	Variable
541.9. (9) Other pharmaceutical goods	4527	3604	2627	3046	2383	Minus
Group 551. Essential oils, perfume and flavour materials						
551.1. Essential oils and resinoids	-	218	219	387	357	18%
551.2. Synthetic perfume and flavour materials and concentrates, and enfleurage greases and mixtures of alcohol and essential oils	-	502	532	793	773	15%
Group 553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)						
553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)	1546	1326	673	631	290	Minus
Group 554. Soaps, cleansing and polishing preparations						
554.1. (1) Toilet soap	1358	1521	1926	1234	1005	Minus
554.1. (2) Common soap	4727	5279	5908	2059	1186	Minus
554.2. Surface-acting agents and washing preparations	608	868	882	617	782	6%
554.3. Polishes, pastes, powder and similar preparations for polishing and preserving leather, wood, metal, glass and other materials	443	471	528	486	342	Variable

Table 10 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
Group 561. Manufactured fertilizers	59.6	134.4	327.0	252.2	176.9	31%
561.1. (1) Ammonium sulphate	12.2	19.3	27.1	128.8	67.0	53%
561.1. (2) Other nitrogenous fertilizers	2.2	53.5	38.3	1.3	3.8	15%
561.1.2. (1) Superphosphates	3.8	3.1	8.1	5.8	2.0	Minus
561.2. (9) Other phosphatic fertilizers	15.2	39.6	234.0	64.6	10.2	Variable
561.3. Potassic fertilizers	7.1	13.5	3.6	21.3	65.3	74%
561.9. Fertilizers, n.e.s.	18.9	5.4	15.9	30.4	28.6	11%
Group 571. Explosives and pyrotechnic products						
571.1. (1) Propellant powders	108	146	93	69	105	Minus
571.1. (2) Other prepared explosives	1317	1237	1175	1206	989	Minus
571.2. (1) Mining, blasting and safety fuses	-	247	244	299	190	Minus
571.2. (2) Percussion and detonating caps, igniters, detonators	306	673	82	102	65	Minus
571.3. Pyrotechnical articles	213	174	13.5	1.7	0.6	Minus
571.4. Hunting and sporting ammunition	353	439	289	82	137	Minus
Group 581. Plastic materials, regenerated cellulose and artificial resins						
581.1. Products of condensation, polycondensation and polyaddition	-	-	18.7	32.1	33.5	34%
581.2. Products of polymerization and copolymerization	-	28.0	11.3	12.1	97	51%
581.3. (1) Vulcanized fibre	-	0.2	-	-	1.6	?
581.3. (2) Regenerated cellulose, chemical derivatives of cellulose	-	5.9	1.6	27.8	45.1	97%
581.9. (1) Hardened proteins	-	-	-	-	1.1	?
581.9. (2) Modified natural resins, ester gums, etc.	-	-	43.4	419.8	482.9	233%
581.9. (9) Other artificial plastic materials	176	79.7	62.2	87.6	96.5	Minus

Table 10 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
Group 599. Chemical materials and products, n.e.s.						
599.2. (1) Disinfectants	205	294	252	382	247	5%
599.2. (2) Insecticides	-	1544	747	1016	738	Minus
599.2. (3) Fungicides	-	29.3	27.2	123.8	46.0	16%
599.2. (4) Special products for sheep and cattle dressing	-	5.0	0.7	-	-	?
599.5. (1) Starches and inulin	-	34.2	21.5	35.0	40.3	5%
599.5. (2) Gluten and gluten flour	-	3.4	0.5	1.4	1.0	Minus
599.5. (3) Casein, caseinates and other casein derivatives	-	3.4	3.0	0.6	5.0	14%
599.5. (5) Gelatin and gelatin derivatives, etc.	-	-	32.6	1.1	27.8	Variable
599.5. (7) Dextrins, soluble or roasted starches and starch glues	-	0.4	-	1.0	9.6	188%
599.5. (9) Prepared glues, n.e.s.	-	201	296	355	383	24%
599.6. (3) Spirits of turpentine, etc.	-	2.1	7.2	3.5	5.8	40%
599.6. (5) Wood tar, wood tar oils, etc.	-	0.1	1.2	-	-	?
599.6. (9) Other tars and resins	-	49.3	50.8	53.6	43.1	Variable
599.7. Organic chemical products, n.e.s.	-	224	243	335	382	19%
599.9. Chemical products and preparations, n.e.s.	842	634	716	2864	2002	24%
Section 5. Total	26673	28357	27107	26824	20975	

Table 11

Exports: chemical and related products (tonnage)

(Tons)

Classification	1960	1961	1962	1963	1964
Group 271. Crude fertilizers					
271.4. Natural potassic salts, crude	...	0.1	...	...	...
Group 276. Other crude minerals					
276.2. Salt	...	175	35	7	...
Section 5. Chemicals					
Group 512. Organic chemicals					
512.8. Alcohols, phenols, glycerine	...	...	...	430	2011
Group 514. Other inorganic chemicals					
514.9. (9) Other inorganic compounds, etc.	...	...	...	0.3	...
Group 531. Mineral tar and crude chemicals from coal, petroleum and natural gas					
531.1. Mineral tar	...	...	...	...	...
Group 531. Synthetic organic dyestuffs, natural indigo and colour lakes					
531.1. (1) Synthetic organic dyestuffs and natural indigo	...	...	0.05	...	...
Group 532. Dyeing and tanning extracts, and synthetic tanning materials					
532.1. Dyeing extracts (vegetable and animal)	...	...	...	0.1	...
Group 533. Pigments, paints, varnishes and related materials					
533.3. (3) Prepared pigments, opacifiers, enamels, glazes, lustres, etc.	...	...	...	0.05	...
Group 541. Medicinal and pharmaceutical products					
541.7. Medicaments	...	...	1.8	...	...

Table 11 (continued)

Classification	1960	1961	1962	1963	1964
Group 551. Essential oils, perfume and flavour materials					
551.1. Essential oils and resinoids	...	8.9	8.0	30.3	8.8
551.2. Synthetic perfume and flavour materials and concentrates, enfleurage greases and mixtures of alcohol and essential oils	...	...	7.0	...	...
Group 553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)					
553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)	...	3.6	46.7	128.9	41.1
Group 554. Soaps, cleansing and polishing preparations					
554.1. (1) Toilet soap	...	0.3	0.7	2.0	2.4
554.1. (2) Common soap	...	...	17.2	39.4	31.5
Group 599. Chemical materials and products, n.e.s.					
599.2. (1) Disinfectants	...	...	0.2	0.7	...
599.2. (2) Insecticides	...	0.2	5.8	0.6	0.9
599.6. (5) Wood tar, wood tar oils, etc.	...	...	...	...	...
599.9. Chemical products and preparations, n.e.s.	...	...	...	0.2	0.3

Table 12

Exports

Chemical and related products (value)

(Thousands of dollars)

Classification	1960	1961	1962	1963	1964
Group 271. Crude fertilizers					
271.4. Natural potassic salts, crude	...	0.03	0.02	...	...
Group 276. Other crude minerals					
276.3 Salt	...	13.4	2.0	0.5	...
Section 5. Chemicals					
Group 512. Organic Chemicals					
512.2. Alcohols, phenols, glycerine	...	...	...	120.2	523.7
Group 514. Other inorganic chemicals					
514.9. (9) Other inorganic compounds, n.e.s.	...	...	...	...	...
Group 521. Mineral tar and crude chemicals from coal, petroleum and natural gas					
521.1. Mineral tar	0.5	0.1	...	...	...
Group 531. Synthetic organic dyestuffs, natural indigo and colour lakes					
531. (1) Synthetic organic dyestuffs and natural indigo	...	...	0.2	...	...
Group 532. Dyeing and tanning extracts, and synthetic tanning materials					
532.1. Dyeing extracts (vegetable and animal)	...	...	...	0.6	...

Table 12 (continued)

Classification	1960	1961	1962	1963	1964
Group 533. Pigments, paints, varnishes and related materials					
533.3.(1) Prepared pigments, opacifiers, enamels, glazes, lustres, etc.	...	...	...	0.2	...
Group 541. Medicinal and pharmaceutical products					
541.7. Medicaments	...	...	1.8	...	...
Group 551. Essential oils, perfume and flavour materials					
551.1. Essential oils and resinoids	21.2	40.8	60.9	211.4	100.0
551.2. Synthetic perfume and flavour materials and concentrates, and enfleurage greases and mixtures of alcohol and essential oils	...	...	0.3	...	...
Group 553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)					
553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)	...	1.9	23.7	37.7	29.1
Group 554. Soaps, cleansing and polishing preparations					
554.1.(1) Toilet soap	...	0.4	0.4	1.7	0.8
554.1.(2) Common soap	...	...	3.9	3.5	7.6
Group 599. Chemical materials and products, n.e.s.					
599.2.(1) Disinfectants	...	...	0.1	0.2	...
599.2.(2) Insecticides	...	0.1	1.6	0.2	0.7
599.6.(5) Wood tars, wood tar oils, etc.	...	...	...	...	...
599.9. Chemical products and preparations, n.e.s.	0.2	...	...	0.2	1.4
Section 5 Total	21.9	43.3	92.9	375.9	663.3



Table 13

Imports, exports and re-exports of chemical products (value)

(In thousands of dollars)

Classification	1960			1961			1962			1963			1964		
	Imports	Exports	Re-exports	Imports	Exports	Re-exports	Imports	Exports	Re-exports	Imports	Exports	Re-exports	Imports	Exports	Re-exports
<u>Division 51. Chemical elements and compounds</u>	1292	...	0.4	1420	...	0.1	1554	...	0.1	1761	120.2	0.7	2083	524	1.2
<u>Division 52. Mineral tar and crude chemicals from coal, petroleum and natural gas</u>	122	0.5	...	102	0.1	1.1	54	...	0.2	106	...	...	15	...	...
<u>Division 53. Dyeing, tanning and colouring materials</u>	2888	...	0.9	3991	...	8.5	2781	0.2	5.8	2566	0.8	4.7	2130	...	0.9
<u>Division 54. Medicinal and pharmaceutical products</u>	6869	...	7.6	7271	...	32.2	7293	1.8	23.0	8420	...	1.2	5660	...	1.1
<u>Division 55. Essential oils and perfume materials, toilet, polishing and cleansing preparations</u>	9146	21.2	6.0	10185	43.1	78.6	10667	89.2	130.9	6208	254.3	44.9	4735	137	250
<u>Division 56. Manufactured fertilizers</u>	59	...	...	134	...	...	327	...	...	252	...	...	177	...	0.2

Table 13 (continued)

Classification	1960			1961			1962			1963			1964		
	Imports	Exports	Re-exports	Imports	Exports	Re-exports	Imports	Exports	Re-exports	Imports	Exports	Re-exports	Imports	Exports	Re-exports
<u>Division 57.</u> Explosives and pyrotechnic products	2297	...	...	2916	...	4.2	1896	...	0.2	1760	...	4.8	1487	...	...
<u>Division 58.</u> Plastic materials, regenerated cellu- lose and artificial resins	176	...	...	114	...	...	137	...	0.3	579	...	...	758	...	...
<u>Division 59.</u> Chemical materials and products, n.e.s.	3825	0.2	5.8	3024	0.1	7.1	2399	1.7	13.0	5172	0.6	4.6	3930	2	4.0
Total	26674	22	21	28357	43	132	27108	93	173	26824	376	61	20975	663	32

Table 14

Chemical products as a component of Ghana's foreign trade

Value in thousands of dollars

Year	Imports (c.i.f.)		Exports (f.o.b.)		Re-exports (f.o.b.)	
	Total	Chemical products	Total	Chemical products	Total	Chemical products
1960	363,073	26,674	320,473	22	4406	21
	100%	7.3%	100%	0.007%	100%	0.5%
1961	400,084	28,357	317,014	43	5493	132
	100%	7.1%	100%	0.014%	100%	2.4%
1962	333,619	27,108	312,821	93	9406	173
	100%	8.1%	100%	0.03 %	100%	1.8%
1963	365,308	26,824	299,317	376	5613	61
	100%	7.3%	100%	0.13 %	100%	1.1%
1964	340,594	20,975	317,045	663	4073	32
	100%	6.2%	100%	0.21 %	100%	0.8%

## VI. PLANNING THE CHEMICAL INDUSTRY IN GHANA

On the basis of the preceding tables it is possible to estimate:

- (1) The relative level of present demand for chemicals;
- (2) The trend of the market.

In the case of certain groups of products, registered tonnage or value figures for 1960 and 1961 were extremely small, so that the growth rate is unusually high. Hence correctives have to be applied so as to arrive at more reasonable estimates.

### VI.1 Medicinal and pharmaceutical products

If we leave aside the year 1964, when a regression was registered, the annual growth rate varies from 7 to 7.5 per cent by value and 29 per cent by weight. Unfortunately, these figures cannot be used for planning purposes. The existing industry manufactures only medicinal herbs and medicines produced locally, and so far has had little influence on the volume of imports. It should be pointed out that the value of this production is on the decrease (\$3,790,000 in 1962, \$2,622,000 in 1963 and \$2,312,000 in 1964). That being so, it would be wise to apply corrected rates comparable to those adopted for the other countries. This gives the following estimates:

	1963	Annual rate	1965	1970	1975	1980
Quantity (tons)	5,831	Adjusted 6%	6,550	8,750	11,700	15,700
Value (\$1000)	8,420	Adjusted 8%	9,800	14,400	21,200	31,100

If we compare expenditure on pharmaceutical products per head of population, namely:

1963	\$1.15	1975	\$2.04
1970	\$1.60	1980	\$2.56

it is clear that the estimates for Ghana, the most highly developed country in West Africa, are not high.

There is a Hungarian project for the manufacture in Ghana of 1 million ampoules and 100 million tablets a year of different kinds of special pharmaceutical products. This would be located at Kwabenya, near Accra. Total investments would amount to \$295,000.

## VI.2 Soap

Imports are decreasing as a result of the activities of local enterprises. In assessing the local market we have therefore to take account of exports and local production as shown below:

Year	Imports	Local production	Exports	Consumption (tons)
1960	23,862	-	-	23,862
1961	28,092	-	0.3	28,092
1962	31,459	406*	17.9	31,847
1963	12,412	12,101*	41.4	24,472
1964	8,245	23,000	33.9	31,211
Annual rate				7%

\* Estimated

Year	Imports	Local production	Exports	Consumption (\$1000)
1960	6,079	-	-	6,079
1961	6,800	-	0.4	6,800
1962	7,834	184	4.3	8,014
1963	3,293	5,482	5.2	8,770
1964	2,191	10,419	8.4	12,602
Annual rate				20%

Taking the more realistic growth rate, an average estimate would give the following results

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	31,211	4%	32,400	39,500	48,000	58,000
Value (\$1000)	12,602	Adjusted 3%	13,000	15,000	17,400	20,200

The market is expanding and is sufficiently large to justify the installation of new soap factories.

### VI.3 Surface-acting agents and washing preparations

Since 1960, annual growth rates for imports of surface-acting agents and washing preparations appear to be respectively 22 per cent by weight and 6 per cent by value. Assuming the more realistic figures, forecasts show the following tonnages and values:

	1964	Annual rate	1965	1970	1975	1980
Tonnage	2,548	Adjusted 13%	2,880	5,300	9,800	18,000
Value (\$1000)	782	Adjusted 13%	880	1,630	3,000	5,500

The market is sufficiently large to warrant considering local production.

### VI.4 Perfumes and cosmetics

Imports are showing a downward trend, probably as a result of the activities of local enterprises. To obtain the rate of growth of demand, local production and exports should also be taken into account:

Year	Imports	Local production	Exports	Consumption (\$1000)
1962	673	471	23.7	1,120
1963	631	571	37.7	1,164
1964	290	228	29.1	489
Annual rate				Minus

If we leave the year 1964 out of account as being in regression, it would be wise to adopt corrected rates comparable to those adopted for the other countries. This would give the following estimates:

	1964	Annual rate	1965	1970	1975	1980
Value (\$1000)	1,200*	Adjusted 5%	1,260	1,600	2,050	2,600

\* Estimated

The domestic market would appear to be sufficiently large to justify the installation of new undertakings. The existing undertakings could also be enlarged as requirements indicate.

# VI.5 Disinfectants, insecticides, fungicides

Consumption of disinfectants, insecticides and fungicides in Ghana is one of the highest in any of the countries in West Africa. According to the competent Ghanaian authorities, it is intended that the use of insecticides for agricultural purposes shall be encouraged by every possible means. Hence it is to be expected that in the future there will be a considerable increase in consumption, bearing in mind that under the seven-year Plan 1963-1969 production of the various products is scheduled to increase as follows:

	<u>1963</u>	<u>1969</u>
Cocoa	420,000 tons	600,000 tons
Natural rubber	17,000 acres	35,000 acres
Sugar cane	-	1 million tons
Tobacco	1,200 tons	3,000 tons
Bananas	3,500 tons	7,000 tons
Cotton	100 tons	200 tons
Pineapples	22,000 tons	30,000 tons

The increase in consumption over the last few years is as follows:

	1962	1963	1964	Annual rate
		Tonnage		
Imports	1,705	2,319	1,967	
Production	665*	1,204*	1,270	
Total	2,370	3,523	3,237	17%
		Value (\$1000)		
Imports	1,026	1,522	1,031	
Production	1,217	2,203	2,329	
Total	2,243	3,725	3,360	22%

\* Estimated

The annual rates as thus calculated (17 per cent by weight and 22 per cent by value) would appear to be on the high side. Unit value of local production is also unusually high. The application of more sober growth rates would give the following figures:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	3,237	Adjusted 12%	3,625	6,387	11,260	19,830
Value (\$1000)	3,360	Adjusted 10%	3,696	5,953	9,587	15,440
including:						
Tons of DDT (50%)	300*		400	900	2,000	3,000
Tons of BHC (25%)	1,000*		1,200	2,100	4,000	6,000

\* Estimated

The market is expanding and is sufficiently large to justify the development of local production. Manufacture of basic products calls for consideration at the level of the sub-region as a whole.

#### VI.6 Pigments, paints and varnishes

The activity of local enterprise explains the trend in this sector, where imports are on the decrease. Schemes are under consideration which will make it possible to cover the needs of the local market to the extent of approximately 80 per cent. Certain special types of paint are likely to continue to be imported. The trend in this sector can be estimated as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	5,446	Adjusted 9%	5,930	9,200	14,000	21,600
Value (\$1000)	2,791	Adjusted 9%	3,040	4,680	7,200	11,100

#### VI.7 Caustic soda

Caustic soda has been linked hitherto with the manufacture of soap. Starting out from very low consumption figures in 1960-1962, we find a sharp rise in 1963 and 1964 as a result of the development of local soap production. The exceptionally high annual growth rates (98 per cent by weight and 80 per cent by value) are thus explained by the low figures recorded in 1960-1962. If we take into consideration only the demand for caustic soda in soap-making, consumption projections show the following picture:



	1964	1965	1970	1975	1980
Quantity (tons)	2,300	2,500	3,950	4,800	5,800
Value (\$1000)	252	274	430	530	640

At the present time there is no industry in Ghana for processing bauxite to produce alumina, though such an industry could potentially be the main consumer of caustic soda in the country. Account must be taken of the project to set up an alumina plant, since this would mean an annual rise of approximately 10,000 - 12,000 tons in demand for caustic soda. The seven-year Plan makes provision for the installation of a caustic soda and chlorine plant which would produce sufficient caustic soda for the treatment of bauxite, for other local needs, and for export. Its capacity would be 100,000 tons of caustic soda and 90,000 tons of chlorine. It is proposed to set up the plant at Cape Coast, and the total investment figure would be \$2 million. This is a project to be examined jointly for the sub-region as a whole.

#### VI.8 Calcium carbide

Calcium carbide is used for the production of acetylene for autogenous welding. The consumption of carbide has increased steadily, with an annual growth rate of 23 per cent by weight and 14 per cent by value. A growth rate of 7 per cent for projections would seem reasonable, in which case the following table can be drawn up:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	1,360	Adjusted 7%	1,455	2,000	2,800	4,000
Value (\$1000)	170	Adjusted 7%	180	250	350	500

Thus the market opens up possibilities for the future. With regard to later years, the problem should be considered within the framework of the sub-region.

#### VI.9 Explosives

Consumption of explosives is bound up essentially with large-scale public works and the activities of mining enterprises. The main consumers of explosives in Ghana during 1963 were gold mining (some 2,000 tons), public works (about 560 tons), stone quarries (about 220 tons), bauxite (about 170 tons) and manganese (about 50 tons).

Under the seven-year Plan it is estimated that mineral production will increase as follows:

Gold	from 921 to 1100-1200 thousand ounces
Manganese	from 401 to 700 thousand tons
Bauxite	from 309 to 400 thousand tons
Limestone	from 100 to 500 thousand tons

Demand for explosives is likely to increase also as a result of the exploitation of ferro-minerals, columbo-tantalite and limestone. In the light of this trend, it would seem reasonable to apply a 5 per cent growth rate:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	2,482	Adjusted 5%	2,600	3,350	4,300	5,500
Value (\$1000)	1,350	Adjusted 5%	1,420	1,800	2,300	2,950

There is a scheme under way in Ghana for manufacturing some 3,000 tons of explosives a year on the basis of nitroglycerine. Investments are estimated at \$2,870,000, and manufacturing costs at approximately \$380 per ton.

#### VI.10 Plastics

Plastics deserve very special attention owing to the extremely high annual growth rate (92 per cent by tonnage and 44 per cent by value). However, these figures relate only to small quantities and hence they have no specific significance for the future. If we take the more realistic figures of 35 per cent as of the present time, 20 per cent after 1970 and 15 per cent after 1975, estimated demand for plastic materials in Ghana would give the following quantities and values:

	1964	1965	1970	1975	1980
Quantity (tons)	1,314	1,780	7,900	19,700	39,700
Value (\$1000)	758	1,023	4,580	11,400	22,930

It should be pointed out that the tonnages in question include materials other than plastics proper. According to some estimates, the consumption of basic products such as polyvinylchloride and polyethylene could be stated as follows (in tons):

	1964	1965	1970	1975	1980
Polyvinylchloride (PVC)	80	300	2,000	5,000	10,000
Polyethylene	25	100	1,000	4,000	10,000

In spite of the fact that the market is expanding rapidly, turnover figures are too low to justify economic manufacture of the basic materials at the level of Ghana alone in the near future. On the other hand, extruders and spinning units could be developed. At the present moment there are two undertakings - Bayakly Plastics Company at Kumsi and Metalloplastica (Ghana) Ltd. at Accra - producing a variety of plastic articles. Under the seven-year Plan, a plastics factory (Ghana Plastic Products Corp.) is due to be set up at Tema and should produce about 200,000 m of tubing and 84,000 m<sup>2</sup> of flooring a year. Investment is estimated at \$280,000.

Consideration must also be given to the development possibilities for plastic resins, which have the highest growth rates of all plastic materials (283 per cent by weight and 233 per cent by value). The proposed refinery at Tema offers interesting prospects for this development.

#### VI.11 Fertilizers

If we calculate growth rates according to the customs statistics, the over-all trend of fertilizer consumption in Ghana presents the following picture:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	3,500	42%	4,970	28,710	165,600	957,200
Value (\$1000)	177	31%	232	895	3,450	13,340

These figures need to be broken down by types of fertilizer (nitrogenous, phosphatic and potassic) and an attempt made to produce more accurate estimates using other sources of information as well. The results are summarized in the following table, which gives the appropriate references:

(Tons of fertilizers)

Source of estimate	N		P <sub>2</sub> O <sub>5</sub>		K <sub>2</sub> O	
	1963	1970	1963	1970	1963	1970
JCJ (1)	550	6,600				
FAO (2)	700	-				
F.W. Hauck (3)	-	10,000				
ECA Survey (4)	-	2,000*				
ECA Survey (5)	-	2,000*				

(1) JCJ Ghana: A Basic Chemicals Survey, 1964

(2) FAO, Production Yearbook, vol.17. (1963)

(3) F.W. Hauck: Soil Fertility and Fertilizers in West Africa (E/CN.14/INR/70)

(4) Report of the West Africa Industrial Co-ordination Mission (E/CN.14/246)

(5) Basic Chemicals Fertilizers (E/CN.14/INR/73)

\* These figures are based on a Survey by the Société sénégalaise d'engrais et de produits chimiques (SSEPC). The estimates correspond to the figures given in the report of the West Africa Industrial Co-ordination Mission. The SSPSC Survey is also used for reference in the ECA reports.

The figures based on the SSEPC Survey seem rather pessimistic. Those given by JCJ would appear to be more realistic. If we apply these tonnages to the year 1970, we obtain rates which would seem reasonable:

	Tons				
	1964	1965	1970	1975	1980
N	800	1,000	6,600	13,000	25,000
P <sub>2</sub> O <sub>5</sub>	500	700	8,700	16,000	30,000
K <sub>2</sub> O	900	1,100	6,700	13,000	25,000

The above estimates can be used as a basis for the study of a scheme for setting up a fertilizer plant in Ghana. The seven-year Plan includes a project for a nitrogenous fertilizer plant at Cape Coast which would have a capacity of 50,000 tons a year based on an investment of \$11.2 million.

## VI.12 Salt

Imports of salt are limited because of local production, which in 1964 was about 31,000 tons (\$2,743,000); imports during the same period were approximately 2,101 tons (\$92,000).

Future consumption is estimated as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	33,100	6.5%	35,240	48,300	66,100	90,500
Value (\$1000)	2,835	3.5%	2,930	3,480	4,130	4,900

The market is expanding and is sufficiently large to justify the development of local production provided all possibilities are used of reducing operating costs.

The Ghanaian Government intends to set up a new salt works close to the coast between Accra and Sakumo Lagoon. According to a survey carried out on the subject, it should be possible to produce 250,000 tons a year. The production target is 100,000 tons of salt during the initial phase, an increase of production to 250,000 tons a year in the second phase, and a reduction in price (see II.6 above),

## VII. OTHER SCHEMES

Under the seven-year Plan for Ghana, a sum of \$578,000 (public and private investment) under the heading of industrialization has been set aside for carrying out industrial schemes. Among those not already mentioned but for which economic studies have been completed or are now in progress, the following should be mentioned:

Name of project	Capacity	Total investment (in \$1000)
1. An activated carbon and charcoal works (Yeji or Ketokrachi)	100,000 tons	5,600
2. A lime kiln	170,000 tons	2,100
3. A rubber tyre factory (Bonsaso)	126,000 tyres and 126,000 tubes	4,500
4. A paper mill (Axim)	15,000 tons	5,600
5. A paper mill (no site as yet)	25,000 tons	8,400
6. A glass factory (Farkwa)	5,000 tons (bottles, household glassware, sheet glass)	5,600
7. A shoe factory (Kumasi)	2,220,000 pairs	4,750

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## C. THE UPPER VOLTA

### I. GENERAL CHARACTERISTICS

#### I.1. Population

4,650,000 inhabitants (1963).

Annual growth rate 1958-1963; 1.87 per cent.

Population projection (thousands of inhabitants):

1965 ..... 4,782

1970 ..... 5,195

1975 ..... 5,735

1980 ..... 6,415

#### I.2. Area

274,200 km<sup>2</sup>

#### I.3. Population density

17 inhabitants per km<sup>2</sup> (1960)

#### I.4. The Upper Volta has been an independent republic since 8 December 1960.

Some 94 per cent of the population is rural. The total active population is estimated at 2.4 million persons, although the wage-earning population in 1961 was only 27,500 individuals. There would appear to be some 13,000 wage-earners in the private sector and 15,000 persons employed in the public sector. The Upper Volta has a tropical climate, with a rainy season of three months, although there are distinct variations between the north and the south of the country. The South Western region is best suited for agriculture. It is a region of wooded savannah, protected from soil erosion by the low density of population, the existence of corridor forests and the luxuriant vegetation. But because of endemic diseases (onchocercosis), the region has only about 15 per cent of the total population.

In the rest of the country acid soils predominate. It consists of wooded and grassy savannah covering more than 83 per cent of the territory and housing 85 per cent of the population. The crops cultivated are sorghum, millet, a little rice, groundnuts and cotton. Livestock rearing is the main occupation, especially in the north.

The percentage of land suitable for cultivation represents only 18 per cent of the total area of the country, and the land actually cultivated represents only 6 per cent; of the 4,870,000 hectares utilized, 3 million are actually for the time being lying fallow as a result of local agricultural conditions.

The agricultural economy of the Upper Volta derives mainly from food crops, in particular grain crops. Food crops cover nearly 50 per cent of the cultivated area, 75 per cent of this area being devoted to grain crops alone. Cash crops are practically non-existent.

Agricultural production in 1961 shows the following tonnages:

1. Food crops:

Sorghum	410,000 tons	
Millet	195,000 "	
Groundnuts in shell	110,000 "	(of these 600 tons are shelled for export)
Yams	82,000 "	
Maize	75,000 "	
Peas	74,000 "	
Niebes	40,000 "	
Sweet potatoes (batatas)	32,000 "	
Fonio	16,000 "	
Sesame	2,000 "	(including 34 tons for export)

2. Cash crops

Cotton seed	5,600 tons
-------------	------------

The food crop production is entirely consumed locally and hardly covers the needs of the population; each inhabitant has only 600 to 700 grammes of grain and 120 grammes of vegetables per day - which is hardly sufficient.

Side by side with crop cultivation, the Upper Volta has a considerable cattle-rearing industry. Livestock would appear to represent more than two-thirds of exports from the country. If exports of hides and skins are taken into account, even at the present somewhat underestimated figures, along with exports of meat, the item "cattle" represents more than three-quarters of the country's exports.



Table 1 below indicates the part played by livestock-rearing in Upper Volta's export trade:

Table 1

Exports from the Upper Volta

	Value (thousands of dollars)	Percentage
Livestock	10,128	70.6
Beef cattle	7,490	
Sheep, goats	2,334	
Poultry	264	
Unrefined gold	1,175	8.2
Hides and skins	474	3.3
Treenuts	397	2.7
Cotton	393	2.7
Shelled beans	328	2.3
Meat	300	2.0
Miscellaneous	1,179	8.2
Total	14,374	100.0

Source: Ministry of Economic Affairs, Economic Statistics and Research Authority (Customs Statistics).

It should be noted that the Upper Volta's external trade shows a decided deficit. In spite of the fact that it has a considerable population, lack of natural resources and distance from the sea have stood in the way of the country's industrial development. The only mineral resource worked at present is the gold mine at Poura. Industry plays only a minor role in the economy of the country (3.8 per cent of the gross domestic product in 1962 and slightly over 5,000 wage-earners). Average per capita income is very low, approximately \$45.

The Ministry of Economic Affairs has drawn up a scheme for a five-year plan covering the period 1963-1967. This is the first part of a long-term plan covering the period until 1975; an interim plan has been devised for the years 1963-1964. The essential features of the over-all Plan would appear to comprise the following:

Modernization of the agricultural sector, gradual changeover from a subsistence economy to a market economy, and expansion of the saleable agricultural surplus;

Laying of the foundations for expansion. This will involve prospecting for minerals, reducing consumption, increasing capital formation, and intensifying the training of administrative personnel;

Considerable improvement in the living conditions of the population between now and 1975. This will mean doubling agricultural production in fifteen years and improving the distribution of the national revenue;

Doubling of productivity rates in seventeen years;

An attempt between 1959 and 1968 to ensure that the primary sector provides 66 per cent of total production, the secondary sector approximately 14 per cent and the tertiary sector 20 per cent.

In the light of the above, the following investment programme is considered desirable:

Not less than 50 per cent for directly productive investment, with the stress on the rural sector;

About 20 per cent for the economic infrastructure;

About 10 per cent for over-all surveys likely to have repercussions on production only over the long term;

The remainder of the social sector, priority here being given to efforts at training intermediate administrative officers (secondary education level).

## II. MINERAL RESOURCES

Gold: The Poura Mining Company works an auriferous quartz vein having a gold content varying between 11 and 27 grammes per ton, with sterile material at 5 grammes per ton. The chief vein is at a depth of 200 metres. Proven resources appear to be less than 600,000 tons, with a mean gold content of 18 grammes, representing a total of approximately 10 tons of gold. Production figures are as follows:

	1961	1962	1963	1964
Kg of gold	356	1,237	1,393	1,034

The mine employs about 600 workers. Other gold occurrences are reported in the Gaoua and Dossi regions.

Copper: Copper was mined near Congondy prior to 1940. Other finds are reported in the neighbourhood of Bobo-Dioulasso.

Manganese: There is manganese in the Tombao region, with resources estimated at 10 million tons, 5 million being accounted for by the Markoye deposit alone (ore grade 51 per cent Mn), as well as 1 million tons in the Tiéré region (ore grade 40 per cent Mn).

Graphite has been discovered in the regions of Koya and Diebougou; and chromium, nickel, tin and bauxite occur in various regions.

Dolomite deposits (19 per cent MgO) are known to exist in Western Volta.

Ferro-titanium is found at Tin Edia, but it is difficult to work. Reserves are estimated at 50 million tons, containing 53 per cent Fe and 10 per cent  $TiO_2$ .

Granite is mined in the neighbourhood of Ouagadougou.

None of these ores are of direct interest for the chemical industry.

### III. ELECTRIC ENERGY, FUEL AND WATER

The electricity installations of the Upper Volta generate thermal power; they are located in the towns and are designed exclusively to meet the needs of the built-up areas concerned. There are two diesel plants, the first at Ouagadougou, the other at Bobo-Dioulasso; distribution in 1964 was 14.5 million kWh. Needs are increasing and two projects are envisaged: a dam at Beanfora on the river Camoe (12.5 million kWh) and the harnessing of the Black Volta River at Dedougou (18 million kWh).

The estimated cost of the electric power produced is approximately \$0.08 per kWh. The price of imported diesel fuel was \$30.8 per ton in 1962. This figure would appear to have risen since then and at present is probably in the neighbourhood of \$36. In the same way, the price of fuel oil is estimated at \$24, but these prices may be subject to review if special conditions such as tax reliefs are forthcoming.

The figure for water distribution in 1964 was 2.3 million  $m^3$ . The cost of water in the industrial towns of Bobo-Dioulasso and Ouagadougou is \$0.2 per  $m^3$ . The abundance and purity of the water at Bobo-Dioulasso is noteworthy. It may be worth while pointing out that the cost of the land used for the electricity and water mains is approximately \$1.20 per  $m^2$ .

#### IV. EXISTING INDUSTRY

IV.1. It should be pointed out that the industrial sector at the moment plays a very minor part in the economy of the Upper Volta. Of the forty-three undertakings under the heading of "Manufacturing industry and repair shops", only three employ more than 100 workers.

The structure of employment in 1961 gives a good idea of its nature and throws light on the role of industry as such. Total wages for the whole of the industrial sector were estimated in 1961 at \$3.38 million, or rather less than the half of the total wages for the private sector; the breakdown for the latter is as follows:

	<u>Wages paid</u> (in millions of dollars)	<u>Personnel employed</u>
1. Secondary sector		
Agricultural and food industries	0.26	460
Mines	0.43	550
Buildings and public works	2.33	3,420
Equipment industries	0.36	800
	<u>3.38</u>	<u>5,230</u>
2. Tertiary sector		
Commerce, banking, the professions	1.82	2,300
Transport	1.34	1,900
Domestic workers	0.55	1,950
	<u>3.71</u>	<u>6,150</u>
Total for the private sector (secondary and tertiary)	7.09	11,380

Numbers employed and earnings in the public sector are higher in the aggregate than those of the private sector, namely 15,000 persons and \$8.6 million.

IV.2. The main plants existing at present are;

Two cotton-ginning mills belonging to the C.F.D.T., operating at Bobo-Dioulasso (capacity 12,000 tons) and Ouagadougou (capacity 6,000 tons). Fibre production in 1961 was 1,500 tons.

A rice mill at Sisalia (Diakandape) which can handle 5,000 tons of paddy but is not operating at full capacity (1961 figure 1,060 tons) owing to supply difficulties. Its minimum economic level is 3,200 tons of paddy a year for processing or 65 per cent of its maximum capacity.

A brewery at Ouagadougou (BRAVOLTA) with a warehouse at Bobo-Dioulasso. Capacity 40,000 hl of beer. Production in 1964: beer 35,054 hl; lemonade 962 hl; soda water 13,168 hl; aerated water 3,796 hl; syrups 36,979 litres; ice 2,946 tons.

Three small establishments producing aerated beverages.

A workshop for the production of ready-to-wear apparel.

Several wood and metal processing shops.

Two brickworks at Ouagadougou, which are increasing production each year.

A factory producing cement slabs and workshops for prefabricating bricks.

A large number of artisan shops: iron-working, cabinet-making, plumbing, painting, flooring, sheeting, refrigeration, etc. One of these (A.M.B.) is equipped with modern installations and machinery and manufactures mass-produced metal and joinery components.

Among projects under consideration the following are noteworthy:

A workshop for assembling bicycles and scooters at Bobo-Dioulasso.

A cotton-spinning mill and a textile-weaving mill.

A brick works and a factory for producing cement tubes.

A second brewery.

Abattoirs and a meat-canning factory.

The development of cotton production should make it possible to expand cotton ginning and better use of the two existing mills. Also under consideration are the extension of the brickworks and meat processing plants (for dried meat or canned meat).

IV.3 The industries already existing which have some direct connexion with the chemical or para-chemical industry are the following:

The CITEC oil mill and soap factory at Bobo-Dioulasso. This is working far below its capacity of 6,000 tons - in 1960 it produced only 2,000 tons and 3,200 tons in 1961 (treenut butter, groundnut oil, oil seed and peanut butter). The

soap factory has been built up gradually since 1955. Soap production as such increased from 50 tons a year in 1955 to 600 tons in 1961. The target for 1962 was 800 tons and for 1963 1,000 tons.

Research is being undertaken with regard to the processing of treenut (shea) butter by etherification using glycerine manufactured at the soap factory.

A workshop for producing articles of plastic. Capacity is 960,000 pairs of plastic footwear a year, and production in 1964 was 317,040 pairs.

A tannery, to be used also for training apprentices.

Lime kilns at Fiero.

Schemes planned include the following:

A second oil mill and soap factory in the east of the country.

A cotton oil mill.

Improvements to the existing oil mill and soap factory.

A tannery at Ouagadougou, where a plant for the production of fertilizers from town night soil is to be installed (production target: 12,000 tons a year).

Lack of natural resources and the cost of electric energy have so far stood in the way of schemes for the establishment of a chemical industry in the Upper Volta.

The foregoing outline of the industries which already exist and the projects at present in hand brings out the two main features of the problem of industrialization in the Upper Volta:

1. Industry is for the most part based on the processing of the products of agriculture and livestock rearing;

2. The present level of industrialization is low, and the main undertakings are a long way from operating at full capacity.

It should be pointed out, incidentally, that most industrial schemes would receive a not inconsiderable degree of aid from the Government in the form of direct financing, loans, subsidies, price supports, etc.

#### V. THE PRESENT MARKET FOR CHEMICALS

The tables below are based on the customs statistics for the period 1960 - 1963; the figures for 1964 have not been published so far. Value levels are shown from approximately \$10,000 upwards, so that the headings will correspond with those of other countries. Growth rates are as a rule calculated over a period of three years, except where a figure is missing or is not significant. Table 2 shows the tonnages imported, and table 3 indicates their value in dollars. The code numbers are those of the Brussels nomenclature.

Table 2

Imports: Chemical and related products (tonnage)

(Tons)

Code	Description	1960	1961	1962	1963	Annual rate
25-01-08	Crude salt	366	2043	5165	7340	171 %
25-01-09	Other salt	576	3819	2225	3692	85 %
.....	.....	...	....	....	....	...
<u>Chapter 25</u>	Mineral products	952	5956	7442	11163	127 %
27-11	Gaseous hydrocarbons		182	188	202	5 %
<u>Chapter 27</u>	Petroleum derivatives	2	183	190	204	5 %
28-17-08	Caustic soda	67	50	171	148	30 %
28-56	Carbides	24	42	57	61	36 %
<u>Chapter 28</u>	Inorganic chemicals	93	118	268	256	40 %
<u>Chapter 29</u>	Vitamins, alcaloids, antibiotics	n	...	n	1	Negligible
30-02-01	Vaccines and sera, pharmacopocial	1	n	3	1	Variable
30-03-02	Other pharmacopocial medicaments, not put up	1	5	3	4	Variable
30-03-13	Pharmaceutical specialities put up for retail sale	74	98	181	129	20 %
30-04-01	Wadding	1	2	9	7	91 %
30-04-11	Other impregnated articles	13	20	36	38	43 %
<u>Chapter 30</u>	Pharmaceutical products	110	141	240	181	18 %
31-02	Nitrogenous fertilizers	1	10	25	25	58 %
31-03	Phosphatic fertilizers	-	27	154	153	139 %
31-04	Potassic fertilizers	n	5	1	79	Variable
<u>Chapter 31</u>	Fertilizers	6	51	180	287	137 %

Table 2 (continued)

Code	Description	1960	1961	1962	1963	Annual rate
32-09-20	Paints	30	229	170	278	110 %
32-09-30	Dyes put up for retail sale	n	5	4	49	214 %
<u>Chapter 32</u>	Paints and varnishes	30	234	174	327	121 %
36-02	Explosives	n	42	88	77	36 %
36-06	Matches	7	93	174	219	53 %
<u>Chapter 36</u>	Explosives and matches	7	135	262	296	48 %
38-11-08	Disinfectants put up (1 kg)	9	37	66	50	77 %
38-11-10	Disinfectants not put up	24	13	90	84	51 %
.....	.....	...	...	...	...	...
<u>Chapter 38</u>	Disinfectants and solvents	36	56	164	139	57 %
39-01	Condens. and polycond. products	2	2	4	7	51 %
39-02	Polym. and copolym. products	8	38	60	86	120 %
39-07-39	Other plastic articles	13	34	66	73	78 %
.....	.....	...	...	...	...	...
<u>Chapter 39</u>	Plastic materials	24	141	262	177	95 %
<u>Chapter 51</u>	Man-made fibres	25	4	4	6	Variable



Table 3

Imports: chemical and related products (value)

(Thousands of dollars)						
Code	Description	1960	1961	1962	1963	Annual rate
25-01-08	Crude salt	7	48	208	288	245%
25-01-09	Other salt	14	96	72	124	107%
.....	.....	..	...	...	...	...
<u>Chapter 25</u>	Mineral products	22	148	283	416	166%
27-11	Gaseous hydrocarbons	-	19	23	25	15%
.....	.....	..	...	...	...	...
<u>Chapter 27</u>	Petroleum derivatives	1	20	25	26	14%
28-17-08	Caustic soda	6	6	14	16	39%
28-56	Carbides	4	7	11	11	40%
.....	.....	..	...	...	...	...
<u>Chapter 28</u>	Inorganic chemicals	12	19	34	38	47%
<u>Chapter 29</u>	Vitamins, alcaloids, antibiotics	n	-	6	8	Negligible
30-02-01	Vaccine and sera pharmacopoeial	13	2	6	13	Variable
30-03-02	Other pharmacopoeial medicaments	3	24	27	32	120%
30-03-13	Pharmaceutical specialities put up for retail trade	184	284	620	368	26%
30-04-01	Wadding	2	4	18	13	87%
30-04-11	Other impregnated articles	20	45	64	88	61%
.....	.....	...	...	...	...	...
<u>Chapter 30</u>	Pharmaceutical products	261	424	770	529	26%

Table 3 (continued)

(Thousands of dollars)						
Code	Description	1960	1961	1962	1963	Annual rate
31-02	Nitrogenous fertilizers	n	1	2	2	41%
31-03	Phosphatic fertilizers	-	2	10	10	124%
31-04	Potassic fertilizers	n	n	n	8	Variable
.....	.....	...	...	...	...	...
<u>Chapter 31</u>	Fertilizers	n	4	12	22	134%
32-09-20	Paints	21	120	116	152	97%
32-09-30	Dyes put up for retail trade	n	4	5	40	216%
.....	.....	...	...	...	...	...
<u>Chapter 32</u>	Paints and varnishes	26	130	146	200	97%
36-02	Explosives	n	26	55	48	36%
36-06	Matches	9	132	212	184	18%
.....	.....	...	...	...	...	...
<u>Chapter 36</u>	Explosives and matches	9	158	267	232	21%
38-11-08	Disinfectants put up (1 kg)	7	30	41	44	85%
38-11-10	Disinfectants not put up	17	8	32	27	16%
.....	.....	...	...	...	...	...
<u>Chapter 38</u>	Disinfectants and solvents	25	41	77	74	46%
39-01	Condens. and polycond. products	3	4	7	11	54%
39-02	Polym. and copolym. products	8	35	53	80	115%
39-07-39	Other plastic articles	20	84	72	100	71%
.....	.....	...	...	...	...	...
<u>Chapter 39</u>	Plastic materials	33	152	156	213	86%
<u>Chapter 51</u>	Man-made fibres	7	11	8	12	20%

## VI. PLANNING THE CHEMICAL INDUSTRY IN THE UPPER VOLTA

The above tables refer to imports only, since the volume of exports in the chemical industries sector is negligible. Most sectors show extremely high growth rates owing to the fact that the tonnage and value figures recorded in 1960 are very low and in some cases virtually nil. As in previous instances, correctives must be applied on the same lines as those adopted for the other countries.

VI.1 Pharmaceutical products

The annual growth rates obtained according to the statistics (18 per cent by quantity and 26 per cent by value) seem likely to prove rather too high in the future. It might be wiser to take the figure of 12 per cent based on the estimates for other countries. This gives the following projection:

	1963	Annual rate	1965	1970	1975	1980
Quantity (tons)	182	Adjusted 12%	220	400	700	1,200
Value (\$1000)	537	Adjusted 12%	660	1,200	2,000	3,500

As in other developing countries, a pharmaceutical industry could start out as a simple processing industry based on bulk imports of pharmaceutical products supplied by the major world industries, presented in tablet form and put up in local works.

VI.2 Soap

Consumption at present is low, but the extent to which needs are covered by local industry is increasing in percentage every year. To compare the per capita consumption of the Upper Volta today with that of other West African countries, it might be wise to apply a corrective of 10 per cent - somewhat higher than for the other countries - which would give the following:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	2,700*	Adjusted 10%	3,000	4,800	7,800	12,400
Value (\$1000)	1,000*	Adjusted 10%	1,100	1,800	2,850	4,600

\* Estimated

The market is expanding, and is sufficiently large to justify the development of local production. As has already been pointed out, there is a scheme for a second oil mill and soap factory in the Eastern region of the country. Furthermore, there are plans for improvements to the existing soap works at Bobo-Dioulasso.

#### VI.3 Surface-active agents and washing preparations

In view of the general trend of the market for these products, which is likely to expand enormously over the next few years, the following consumption levels can be envisaged for Upper Volta:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	200*	Adjusted 17.5%	235	530	1,200	2,600
Value (\$1000)	100*	Adjusted 17.5%	118	260	600	1,300

\* Estimated

The domestic market ought to be sufficient to justify putting up the products locally.

#### VI.4 Perfumes and cosmetics

Present consumption would appear to be in the neighbourhood of \$300,000 a year, a very low figure. It is estimated that over-all requirements will increase on the following scale:

	1964	Annual rate	1965	1970	1975	1980
Value (\$1000)	300*	Adjusted 7%	320	450	630	900

\* Estimated

The market would allow of making up and packaging locally to cater for 60 to 80 per cent of the requirements.

#### VI.5 Pigments, paints and varnishes

Here again, the period 1960 to 1963 is not representative. The very high figures of 121 per cent by weight and 97 per cent by value drop to 18 and 24 per cent respectively for the period 1961 to 1963, when a restricted market was getting under way.

If we round off the figures and apply an adjusted and more realistic growth rate comparable to those adopted for the other countries, a sober estimate would give the following picture:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	400	Adjusted 11%	440	700	1,200	2,000
Value (\$1000)	240	Adjusted 11%	270	450	760	1,300

Thus the market offers prospects for the future, and if advantage is taken of these, it should be possible to supply about 60 to 80 per cent of the local market.

#### VI.6 Disinfectants and solvents

The annual growth rates recorded in the customs statistics are 57 per cent by weight and 46 per cent by value. These appear to be higher than the prospects would warrant. Future consumption, comparable with that of the other countries, should be as shown in the following table:

	1964	1965	1970	1975	1980
Quantity (tons)	160	250	600	1,200	2,400
Value (\$1000), including:	77	120	290	580	1,100
Tonnage of DDT (50 per cent)	5	10	30	90	200
Tonnage of BHC (25 per cent)	30	60	180	400	800

Sales outlets are insufficient to justify a scheme for local manufacture. This is a problem that affects the whole of the sub-region.

#### VI.7 Explosives

The use of explosives is too limited to warrant attaching any importance to the growth rates worked out, namely 36 per cent by weight and by value over the period 1961 - 1963. As in the case of other countries, consumption of explosives is casual, since the mining industry is only small. Estimated future consumption of explosives is as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	77	Adjusted 7%	82	120	160	230

The turnover is too low to warrant local production.

## VI.8 Plastics

The growth rate for plastic materials is fairly high - 95 per cent by weight and 86 per cent by value. In the light of the general trend of the market for these products, a rate of 25 per cent would seem reasonable or:

	1964	1965	1970	1975	1980
Quantity (tons), including:	200	250	760	2,330	7,100
PVC (tons)	60*	80	240	720	2,200
Polyethylene (tons)	40*	60	200	650	2,200

\* Estimated

A footwear factory already exists (Manufacture des plastiques de la Haute-Volta : MPHV). This company plans to extend its activities to cover moulded footwear, but the market is too small to justify local manufacture of the basic articles.

## VI.9 Caustic soda

Caustic soda is closely linked with the manufacture of soap. The market is steadily growing (annual growth rate 30 per cent by weight and 39 per cent by value). Future requirements of caustic soda for soap production may be estimated as follows:

	1964	1965	1970	1975	1980
Tonnage	120	150	480	780	1,240

The market is small, and the production problem is a matter of concern to the sub-region as a whole.

## VI.10 Calcium carbide

Consumption of carbides has risen steadily, though it is still small in quantity (61 tons in 1963). Estimated consumption of this product can be stated as follows:

	1964	Annual rate	1965	1970	1975	1980
Tonnage	70	Adjusted 7%	75	100	150	210

This problem should be studied in the framework of the sub-region.

## VI.11 Fertilizers

The use of fertilizers is booming, and growth rates are high (137 per cent by weight and 134 per cent by value). Moreover, tremendous efforts are being made at present by the Government to develop both food crops and industrial crops. The target is to double the value of rural food production in fifteen years by exploiting new areas and increasing the yield.

Consumption of fertilizers is shown below, classified by recommended sources and main types of fertilizer: single superphosphate (SS), ammonium sulphate (SA), dicalcium phosphate (Dc):

Year	Source of estimate	Over-all tonnage	Tons of N	Tons of $P_2O_5$	Tons of $K_2O$
1967	S.E.D.I.A. (1)	5,000 (SA)	1,050	-	-
	ditto	+ 10,000 (SS)	-	1,800	-
1970	J. Kellermann (2)	-	250	250	-
	F.W. Hauck (3)	-	500	500	500
	S.E.D.I.A. (1)	12,000 (SA)	2,500	-	-
	ditto	+ 25,000 (SS)	-	4,500	-
1971	J. Kellermann (2)	5,700 (SA)	1,200	-	-
	ditto	+ 78,000 (Dc)	-	29,600	-
	ditto	+ 8,500 (SS)	-	1,275	-

- (1) SEDIA Survey: Industrialisation de la Haute-Volta, June 1962
- (2) J. Kellermann: La consommation des engrais en Côte-d'Ivoire, February 1963. The 1970 figures are taken from the SSPEC Survey, and the 1975 figures from the Agricultural Development Programme.
- (3) F.W. Hauck: Soil Fertility and Fertilizers in West Africa (E/CN.14/INR/70)

Estimates depend of course on the various assumptions adopted by the authors in question, but it is impossible to reach any conclusion on figures which are so variable. In the light of the development expected by 1975 in regard to industrial crops (cotton: 70,000 hectares, groundnuts: 120,000 hectares) which consume mainly  $P_2O_5$ , requirements by that date can be estimated at 3,500 tons of this fertilizer.

If we take F.W. Hauck's projections as valid for the year 1970, future needs can be estimated as follows:

Tonnage	1964	1965	1970	1975	1980
N	100	160	500	1,500	3,000
$P_2O_5$	100	160	500	1,500	3,000
$K_2O$	100	160	500	1,500	3,000

The market is expanding, but tonnages are as yet far too low to justify any scheme for local manufacture by a single country. This is a problem which can only be solved at the level of the sub-region.

#### VI.12 Salt

The type with which the Upper Volta is concerned is essentially crude salt; it has to be imported because the country is not a salt producer. Most of this crude salt comes from within the sub-region, while Senegal is the main supplier of "other salt".

If we bear in mind the demand for salt in the other countries, it would seem justifiable to assume an annual growth rate of 7 per cent, which would give the following projection:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	11,800	Adjusted 7%	12,600	17,700	24,800	34,800
Value (\$1000)	440	Adjusted 7%	470	660	930	1,300

The market is expanding and is fairly large. This problem will be taken up in due course in respect of the sub-region as a whole.



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D. MALI

1. GENERAL CHARACTERISTICS

I. 1. Population

4,394,000 inhabitants (1963)

Annual growth rate 1958-1963: 2.5 per 100.

Population projection (in thousands):

1965: 4,580

1975: 5,680

1970: 5,060

1980: 6,485

2. Area: 1,201,000 km<sup>2</sup>

I. 3. Population density: 4 inhabitants per km<sup>2</sup> (1963)

I. 4. Mali is one of the largest countries of West Africa and has been independent since 20 August 1960. It has no coastal frontier and the distance to Dakar, as the crow flies, is 550 km. The country may be divided from north to south into three climatic areas: Saharian (200,000 sq.km.), Sahelian (400,000 sq.km.) and Sudanian (400,000 sq.km.); the pluviometry varying from a few millimetres in the Saharian zone to 1,500 mm. south of Sikasso. Crops without irrigation do not extend beyond the centre of the Sahelian zone. About half the area is cultivable, though not very fertile. The agricultural production is adequate for Mali's domestic needs and permits exportation to neighbouring countries.

The main agricultural products (1964) are:

Products	Area	Production
Millet and sorghum	1,300,000 hectares	750,000 tons
Rice	200,000 "	165,000 "
Maize	90,000 "	70,000 "
Peanut	50,000 "	20,000 "
Wheat	2,500 "	2,000 "
Cassava (manioc), sweet potatoes and yams	32,000 "	270,000 "
Niebes	13,000 "	5,000 "
Groundnuts in shell	260,000 "	130,000 "
Cotton	78,372 "	31,373 "
Sisal (sisal)	-	200,000 "

Source: Eléments du bilan économique 1964, Bamako Chamber of Commerce, Agriculture and Industry.

Livestock rearing is important. Livestock is one of the country's essential resources.

The estimated livestock in 1964 was:

Cattle	4,262,420 head
Sheep and goats	9,694,770 "
Horses	123,250 "
Camels	168,100 "
Asses	340,580 "
Pigs	17,130 "
Poultry	10,545,200 "

Source: Eléments du bilan économique 1964, Bamako Chamber of Commerce, Agriculture and Industry.

Fish is also one of Mali's main sources of wealth.

Table 1 shows the proportion represented by agricultural, livestock and fishery products in the country's exports.

Table 1.

Exports from Mali (1964)

(Quantities in thousands of tons, values in thousands of dollars)

	Quantity	Value
I. <u>Recorded exports</u>		
Groundnuts	43,500	7,758
Cotton	7,700	4,521
Cotton-seed	4,000	255
Oil-cake	1,700	138
Rice	10,820	1,284
Millet	1,700	146
Hides and skins	...	304
Meat	...	304
Various other products (modern sector)	...	608
Cattle	...	4,051
Fish	...	4,051
Fruit and vegetables	...	202
Various other products (traditional sector)	...	685
Total		24,307
II. Non-recorded exports	...	8,516 *)
Total exports	...	32,813

\*) The non-recorded exports of cattle and fish are estimated to amount to a value of some \$6,000.

Source: Eléments du bilan économique 1964, Bamako Chamber of Commerce, Agriculture and Industry.

The main source of exports is agricultural and livestock production.

Information as to Mali's mineral resources is poor and they are only exploited as artisan or small-scale type industries (rock-salt at Taoudeni, gold in various parts). Phosphate and various non-ferrous metal industries are known to exist.

At present industry is directed to food products: fruit preserving, factories for making ice, syrups and mineral waters, rice-mills, etc.

In 1962 the average annual per capita income was estimated to be in the region of \$68.

On account of its remoteness from the sea and the absence of power and raw materials, conditions in Mali at present are not favourable to industrial development. Consequently, the country's industrial, and therefore economic, future is dependent upon a great effort being made to prospect for power and mineral resources.

On 22 September 1960, the Extraordinary Congress of the Sudanese Union defined the fundamental objectives of the Five-Year Plan (1961-1965) as follows:

To develop agricultural and livestock production along socialist lines in order to make Mali more independent with regard to food supplies and to increase exports;

To lay the foundations of a diversified planned economy by systematic prospection of the mineral and petroleum resources of the country's subsoil, by studying the water-power possibilities and by turning the main products to account through transformation;

To make infrastructure investments in the realm of transport, administration, health, education, etc., in order to facilitate a further expansion of production in subsequent plans;

To develop the national conscience, to form managerial staff and to mobilize the masses.

The plan provided for a rate of increase in gross internal production (excluding services) of 8 per cent per annum.

In order to achieve that increase, and making allowance for a marginal coefficient of about 2.2, an initial sum of \$260 million will have to be invested for a \$117 million increase in the gross national production. Priority in development is given to agriculture industrialization following later when a solid infrastructure has been established.

## II. MINERAL RESOURCES

Rock salt: Mining in the Taoudeni region represents an annual production of about 10,000 tons. The plan provides for modernisation of the Taoudeni mines.

Gold: Only a few gold deposits, exploited by isolated gold-washers, particularly in the Kaiboro area. Production is reported to be not more than a few kilogrammes per year.

Phosphates: The Tilemsi valley reserves are estimated at 2.5 million tons of ore containing 26 to 28 per cent of  $P_2 O_5$ . They would appear to be insufficient for economic exploitation.

Manganese: A deposit exists at Ansongo, said to contain 1.3 million tons with over 40 per cent Mn content and 2 million tons of less rich ore. Calcination is reported to give 48 per cent of Mn.

Bauxite: There are many occurrences in the country. Reserves estimated at 150 million tons with a 46 per cent aluminium content are said to have been discovered in the region of Kenieba. But the distance is too great for export by sea to be profitable.

Copper: Occurrences are known to exist (round Tesalit and in the Adrar of the Iforas).

Iron (magnetite): A few occurrences have been reported in the Niaro-Kayes-Bafoulabé area, but no large deposit.

Other metals: Lead, zinc, tungsten and molybdenum are also to be found in various places, and near Bougouni there is lithium - 10,000 tons of metal in an ore containing 7 per cent of  $LiO_2$  (spodumene).

Various: The existence of gypsum is reported in the Adrar of the Iforas. Kaolin is said to exist near the frontier with Guinea. Prospections for gold and tin are being made in the Kenieba area, and for diamonds in the Kenicha area and petroleum on the Gao-Timbuktu axis. Apart from rock salt, the resources are of little interest to the chemical industry.

### III. ELECTRIC ENERGY, FUEL AND WATER

At present the electric energy resources are limited. Electricity production is reported to have developed as follows:

Table 2: Production of electric energy

	1960	1961	1962	1963	1964
Bamako	12,082	13,233	16,085	18,486	22,141
Kayes	1,189	1,012	984	950	957
Segou	716	686	697	750	908
Gao	609	543	531	575	671
Mopti	258	312	386	452	500
Bougani	90	106	118	78	74
Sikasso	-	-	-	p	211
	14,944	15,892	18,801	21,291	25,462

Source: Eléments du bilan économique 1964 Bamako Chamber of Commerce, Agriculture and Industry.

Directly connected with the development of industrialization is the problem of increasing the water-power resources, and this constitutes one of the major objectives of the development plan.

The Sotuba hydroelectric plant is under construction. It consists of a diversion dam, a catchment basin, adduction channels, a "sheltered" - type plant, a spillway channel and a 30 kV transport line to connect the plant with the Bamako diesel power station, to supply power to the town. The plant is to be equipped with 2 alternators of 3,400 kW (with average water inflow). Its production capacity, in present conditions, is estimated to be 35 kilowatt/hours in an average year. The total cost of the work will amount to about \$160,000. The plant should be in operation by the middle of 1966.

The project for a dam on the Senegal River at Gouina, which alone would represent three-quarters of Mali's water reserves, is being studied. If this dam were built, Mali's energy potential would increase very rapidly, as the dam's power reserves are calculated to be between 1,500 and 2,000 million RWa.

Lastly, hydrological research is being carried out on the project for installation of a 1,000 kw turbine at Marlala. Mali's basic energy is almost all imported in the form of petroleum products. The problem is linked up with that of the installation of refineries and the distribution of gaseous hydrocarbons. Only the discovery of petroleum in the Timbuktu-Gao area for instance (which is now being prospected), would make it possible to consider the question of local refining to supply the countries of the interior.

The average price per ton of diesel fuel was \$35 in 1962 and it has probably now increased to about \$40. The price of fuel oil is quoted at about \$27 per ton. These prices need to be checked and may be reduced if special conditions are applied (tax relief).

Water production has increased as follows (in thousands of tons):

	1961	1962	1963	1964
Bamako	2,391	3,374	3,921	4,144
Bougouni	54	54	52	49
Gao	271	237	179	280
Kayes	568	604	583	539
	3,824	4,269	4,735	5,012

Source: Eléments du bilan économique 1964, Bamako Chamber of Commerce, Agriculture and Industry.

Work on the installation of a water supply for Sikasso is in progress; it is scheduled to be put into service in 1967. The supplying of water depends upon the possible future location of industrial installations.

#### IV. EXISTING INDUSTRY

IV. 2. The inquiry into industrial and commercial establishments produced the following information as at 31 December 1964:

Branch of activity	Turnover (\$1000)	No. of wage earners	Wages paid (\$1000)	Taxes (\$1000)	Overheads (\$1000)
A. <u>Trade</u>					
Private capital	31,006	1,122	1,677	3,622	1,718
B. <u>Industry</u>					
1. Public works					
Private capital and State	10,221	3,466	2,730	1,284	474
2. Industries					
Private capital	6,850	2,401	1,839	498	1,082
	17,071	5,867	4,569	1,782	1,556
C. <u>Transport</u>					
1. Transport					
Private capital and State	7,000	1,238	1,422	336	608
2. Transit					
Private capital	1,190	278	408	226	384
	8,190	1,516	1,830	562	992

Branch of activity	Turnover (\$1000)	No. of wage earners	Wages paid (\$1000)	Taxes (\$1000)	Overheads (\$1000)
D. Insurance	871	16	40	304	49
E. Hotel industry	944	194	122	61	166
F. Cinema	701	144	65	304	187
Totals	58,783	8,827	8,803	6,635	4,668

Source: Eléments du bilan économique 1964, Bamako Chamber of Commerce, Agriculture and Industry.

It is clear that the industrial sector, properly speaking, plays only a very small part in the country's activity.

One of the characteristics of the Mali economy was the almost total absence of industries. It was during 1964 that the practical stage of industrialization in Mali really began.

The main installations set up during the year were:

The Baguineda fruit-canning works,

The experimental sugar mills,

The Koulikoro oil mill,

The chain of industrial abattoirs,

The granite block factory,

The Sotuba hydroelectric plant, etc.

#### IV. 2. The main existing industries may be grouped as follows:

The main food industries consist of 9 rice-mills, 4 of which belong to the Niger Office (unitary capacity of 10,000 to 12,000 tons annually), 3 to the Government and 2 to private enterprise.

There is also one fruit-canning works, five sodawater and lemonade factories, one beer-bottling factory, two ice factories, and cold-storage abattoirs at Bamako, Gao and Segou.

The Baguineda fruit-canning factory, which was opened in 1964, has begun to produce tomato and mango juice and concentrates.

The industries for the transformation of agricultural products comprise 5 small cotton-ginning works, one cotton-seed oil factory and one oil and soap works.

Another oil mill at Koulikoro was opened on 1 December 1964. It consists of a pressing installation, with preparatory presses, feeders and all the necessary machinery for treating 30,000 tons of unshelled groundnuts per year (250 working days). The unrefined oil thus produced (production capacity 8,000 tons annually) is then transformed



at an oil refinery into edible or table oil. The by-products from the refining process and part of the unrefined oil are treated in the new soap factory, which can produce 3,000 tons of common or toilet soap per year.

The equipment at the oil mill is also designed for transforming certain quantities of shea(karité)nuts into edible fats (capacity: 5 tons of shea butter per day). Some of the by-products from the refining of shea butter are used for soap-making.

The metal construction industries are represented by three undertakings which make equipment (metal scaffolding) and finished products (furniture).

The building industry comprises three brickworks, at Magnambougou, Kayes and Segou. A factory for making granite from marble waste was opened at Befoulabé in 1964. Its production is to be doubled by the addition of another press. A complete marble works, for which the material is now on its way to Mali, is soon to be added on to the installation also.

The building of various other industrial installations has either been started or is about to start:

- A carpet factory at Sotuba;

- A ceramic factory at Yanfolila (capacity 400-500 tons annually);

- A sugar-mill at Dougadougou (capacity: 4,000 tons of refined products from the sugar-cane plantations in the Nioro area).

On 10 April 1964 an experimental sugar-mill was opened, comprising two presses, a furnace utilizing the waste from the pressed canes and seven boilers with a capacity for treating 15 tons of cane daily. Three shifts, of 17 workers each, operate this factory on a 24-hour basis in the season. This is the first stage in the sugar production plan.

- A match factory with a production capacity of 45 million boxes per year;

- A cigarette factory which should meet practically all Mali's needs;

- A rice-mill at Diafarabé with a capacity of 1000 tons annually;

- A cement works with a capacity of 50,000 tons annually;

- A textile complex (weaving, spinning, dyeing) at Segou, with a capacity of 2,500 tons;

- A cotton-ginning works;

- An oxygen and acetylene manufacturing plant.

#### IV. 3. Existing industries having some direct relationship with the chemical or para-chemical industry

With the exception of the oil and soap factories and the oxygen and acetylene plant, the existing industries and those under construction have little connexion with chemistry.

## V. PRESENT MARKET FOR CHEMICAL PRODUCTS

The information in the following tables is taken from the customs statistics for the period 1961-1963. Before that time, in 1960, these statistics were grouped together with those of Senegal and Mauritania and it is not possible to separate them.

Furthermore, the statistics for 1964 are not yet published. The values are generally recorded on a basis of \$10,000 in order to conform to the statistics of the other countries. The rate of increase is calculated at a two year interval, except where a figure is not available or does not seem significant. Table 3 indicates tonnage imported. Table 4 indicates its value in dollars. The codes are those of the Brussels Nomenclature.

Table 3

Imports: chemical products and fertilizers (tonnage)					(Tons)
Code	Description	1961	1962	1963	Annual rate
25-01-08	Crude salt	3298	1060	215	Minus
25-01-09	Other salt	4839	14188	17147	88%
...	...	...	...	...	...
<u>Chapter 25</u>	Mineral products	8178	15253	17366	45%
27-11	Gaseous hydrocarbons	195	197	186	Minus
...	...	...	...	...	...
<u>Chapter 27</u>	Petroleum derivatives	197	201	187	Minus
28-17-08	Caustic soda	1056	502	490	Minus
28-56	Carbides	74	35	61	Minus
...	...	...	...	...	...
<u>Chapter 28</u>	Inorganic chemicals	1152	576	604	Minus
<u>Chapter 29</u>	Vitamins, alkaloids, antibiotics	n	1	4	300%
30-02	Sera, vaccines, toxins	1	4	1	Variable
30-03-01	Medicaments, pharmacopeial, not put up	2	17	11	Variable
30-03-03	Non-pharmacop. medicaments not put up	7	5	15	Variable
30-03-13	Pharmaceutical specialities put up for retail sale	226	269	223	Variable

Code	Description	1961	1962	1963	Annual rate
30-04-01	Wadding	26	51	26	Variable
30-04-11	Other impregnated articles	7	1	14	Variable
...	.....	...	...	...	.....
<u>Chapter 30</u>	Pharmaceutical products	275	521	294	Variable
31-02	Nitrogenous fertilizers	392	289	2168	135%
31-03	Phosphatic fertilizers	110	500	1397	255%
31-04	Potassium fertilizers	2	21	n	Variable
<u>Chapter 31</u>	Fertilizers	505	812	3565	166%
36-02	Explosives	7	11	1	Minus
36-06	Matches	156	234	149	Variable
...	.....	...	...	...	.....
<u>Chapter 36</u>	Explosives and matches	163	245	150	Variable
38-11-08	Disinfectants, put up (1kg)	52	120	60	Variable
38-11-10	Disinfectants, not put up	305	285	267	Minus
...	.....	...	...	...	.....
<u>Chapter 38</u>	Disinfectants and solvents	364	311	338	Minus
39-01	Condens. and poly-condens. products	4	7	9	50%
39-07-39	Other plastic articles	22	24	22	-
...	.....	...	...	...	.....
<u>Chapter 39</u>	Plastic materials	48	56	37	Variable
51-04-18	Fabrics containing 85% and over of man-made fibres	3	46	5	Variable
51-04-19	Fabrics containing less than 85% of man-made fibres	4	3	3	Negative
...	.....	...	...	...	.....
<u>Chapter 51</u>	Man-made fibres	15	50	9	Variable

Code	Description	1961	1962	1963	Annual rate
32-09-20	Paints	168	166	253	23%
32-09-30	Dyes, put up for retail sale	29	18	15	Negative
...	.....	...	...	...	.....
<u>Chapter 32</u>	Paints and varnishes	202	193	271	16%

Table 4

Imports • chemical products and fertilizers (value)      Thousands of dollars)

Code	Commodity	1961	1962	1963	Annual rate
25-01-08	Common salt	192	40	14	Minus
25-01-09	Other salt	160	428	408	6%
...	.....	...	...	...	.....
<u>Chapter 25</u>	Mineral products	355	479	423	9%
27-11	Gaseous hydrocarbons	29	27	24	Minus
...	.....	...	...	...	.....
<u>Chapter 27</u>	Petroleum derivatives	31	28	25	Minus
28-17-08	Caustic soda	92	40	44	Minus
28-56	Carbides	13	5	8	Minus
...	.....	...	...	...	...
<u>Chapter 28</u>	Inorganic chemicals	113	52	61	Minus
<u>Chapter 29</u>	Vitamins, alkaloids, antibiotics	5	8	20	100%
30-02	Sera, vaccines, toxins	4	10	26	155%
30-03-01	Medicaments, pharmacopeial, not put up for retail sale	14	54	88	151%
30-03-03	Non-pharmacop. medicaments, not put up	17	21	72	106%
30-03-13	Pharmaceutical specialities put up for retail sale	680	676	680	-
30-04-11	Other impregnated articles	16	4	36	Variable
30-04-01	Wadding	52	108	64	Variable
...	.....	...	...	...	.....
<u>Chapter 30</u>	Pharmaceutical products	823	885	997	11%

Code	Description	1961	1962	1963	Annual leave
31-02	Nitrogenous fertilizers	37	30	88	54%
31-03	Phosphatic fertilizers	28	76	126	112%
31-04	Potassic fertilizers	n	2	N	Variable
...	.....	...	...	...	.....
<u>Chapter 31</u>	Fertilizers	65	109	214	82%
32-09-20	Paints	100	96	144	20%
32-09-30	Dyes, put up for retail sale	31	29	13	Minus
...	.....	...	...	...	.....
<u>Chapter 32</u>	Paints and varnishes	136	137	161	9%
36-02	Explosives	3	5	n	Minus
36-06	Matches	92	180	96	Variable
...	.....	...	...	...	.....
<u>Chapter 36</u>	Explosives and matches	96	186	96	Variable
38-11-08	Disinfectants, put up (1kg)	44	72	28	Variable
38-11-10	Disinfectants, not put up	236	232	164	Minus
...	.....	...	...	...	.....
<u>Chapter 38</u>	Disinfectants and solvents	284	308	199	Minus
39-01	Condens. and poly-condens. products	7	13	13	36%
39-07-39	Other plastic articles	40	44	38	-
...	.....	...	...	...	.....
<u>Chapter 39</u>	Plastics	78	83	56	Variable
51-04-18	Fabrics containing 35% and over of man-made fibres	30	72	27	Variable
51-04-19	Fabrics containing less than 35% of man-made fibres	28	21	34	Variable
...	.....	...	...	...	.....
<u>Chapter 51</u>	Man-made textiles	82	96	67	Variable

## VI. PLANNING THE CHEMICAL INDUSTRY IN MALI

The preceding tables relate only to imports, the volume of exports in the chemical industry being negligible. In most instances the short period of reference makes it impossible to perceive any clear trend in the market and the rates of increase calculated should be regarded with caution. It seemed likely that more accurate figures would be obtained by applying the rates adjusted in the light of experience acquired in other countries.

### VI. 1. Pharmaceutical products

On account of the diversity of the products, the quantities recorded do not provide figures that can be used for forecasting. The 11 per cent rate calculated for the average values is fairly close to that accepted for the other countries. Application of a 10 per cent rate for quantities and values gives the following results:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	350	Adjusted 10%	400	640	1030	1660
Value (\$1000)	1330	Adjusted 10%	1460	2360	3800	6100

The pharmaceutical industry in Mali could start as a simple processing industry. Local production of cattle vaccine should also be developed.

It should be noted that a laboratory for vaccine production was built in 1963 and in 1964 the following products were sent out:

Vaccines against cattle plague (rinderpest)	1,757,356
Peripneumonia vaccines	667,490
Symptomatic anthrax vaccines	66,526
Bacterial anthrax vaccines	34,780
Pasteurella vaccines	791,000
Poultry disease vaccines	3,220
Total	3,320,372

Source: Eléments du bilan économique 1964, Bamako Chamber of Commerce, Agriculture and Industry.

### VI. 2. Soap

The total consumption for 1964 is estimated to be 3,480 tons. Local soap production is already considerably affecting the import figure (681 tons in 1963).

It is envisaged that the total requirements will increase as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	3480	Adjusted 9%	3800	5800	9000	13,800
Value (\$1000)	900*	Adjusted 9%	980	1500	2300	3,570

\* Estimated

The market is expanding and is large enough to justify the development of local production.

#### VI. 3. Surface-active agents and washing compounds

Present consumption is very low. Comparison between the total per capita consumption of these products in Mali and in other West African countries shows that of the Mali to be the lowest.

In the light of the general development of the market in these products it seems wise to adopt the 20 per cent rate, i.e.:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	100	Adjusted 20%	120	300	740	1850
Value (\$1000)	45	Adjusted 20%	54	130	330	380

#### VI. 4. Perfumes and cosmetics

The value of present consumption appears to be about 120,000 dollars per year, which is a very low figure. Forecasts indicate that total needs are likely to increase as follows:

	1964	Annual rate	1965	1970	1975	1980
Value (\$1000)	120*	Adjusted 10%	130	210	340	550

\* Estimated

The market offers possibilities of putting up and packing locally to an extent that would satisfy 60 to 80 per cent of the local requirements.

# VI. 5. Pigments, paints, varnishes

The annual rates calculated (16 per cent) by weight and 9 per cent by value) seem fairly normal.

Using rounded figures and allowing for an adjusted rate of increase comparable to those adopted for the other countries, we arrive at the following estimates for future consumption:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	300	Adjusted 12%	340	600	1100	1800
Value (\$1000)	180	Adjusted 12%	200	350	630	1100

The market offers prospects for the future. If putting up is done locally, it should be possible to supply about 60 to 80 per cent of local needs.

# VI. 6. Disinfectants and solvents

It must be borne in mind that this sector includes the import of pesticides, for Mali's five-year programme provides for the use of insecticides for cotton (\$704,000 worth, financed by EDF) and fungicides for groundnuts and rice (financed by the Government).

It should be noted that the 1963-1964 cotton campaign was marked by very great progress in insecticide treatments, as the following figures show:

	<u>1962-1963</u>	<u>1963-1964</u>
1st treatment	2,114	5,818
2nd "	1,877	6,228
3rd "	1,189	1,804
4th "	258	861

Future consumption may be estimated as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	350	500	1000	1000	4000
Value (\$1000)	200	285	570	1140	2280
including					
Tonnage of DDT (50%)	40	50	100	200	400
Tonnage of BHC (25%)	120	200	400	800	1600



In spite of this notable contribution to the pesticide industry, the problem of possible manufacture can only be considered in terms of the sub-region as a whole.

#### VI. 7. Explosives

The limited extent of mining in the country explains the low import figures for explosives, these being mainly used for large-scale operations.

The following are the estimated figures for future consumption:

	1964	1965	1970	1975	1980
Quantity (tons)	6	6	15	30	60

The problem is one to be considered on the basis of the sub-region as a whole.

#### VI. 8. Plastics

The period 1961-1963 is too short for any clear trend to be discerned.

Taking into account the present **very** low consumption on the one hand and the market trend on the other, it seems prudent to adopt a 35 per cent rate at present, and 30 per cent after 1970, which gives the following figures:

	1964	1965	1970	1975	1980
Quantity (tons)	80	108	490	1800	6800
including					
Tonnage of PVC	30	40	160	600	2100
Tonnage of polyethylene	20	25	130	500	2000

The market is too limited to justify making a study with a view to setting up a factory for basic products. The development plan provides for a shoe factory.

#### VI. 9. Caustic soda

Imports of caustic soda decreased during the period 1961-1963, so that it is not possible to make forecasts for the future. The only estimates that can be given are for future needs in caustic soda for soap production, as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	300	300	580	900	1380

The problem of production concerns the sub-region as a whole.

#### VI. 10. Calcium carbide

Consumption is very limited. Future needs may be estimated as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	70	75	100	150	210

The problem is one for the sub-region as a whole.

#### VI. 11. Fertilizers

Except for potassium, the consumption of fertilizers has started well in Mali, with annual increase rates of 135 per cent and 54 per cent for nitrogen (quantity and value), and 255 per cent and 112 per cent for  $P_2O_5$ . It should be noted that credits from the European Development Fund, amounting to \$4,190 million, have been earmarked for the improvement of Mali's agriculture in the period 1963-1968.

These credits are divided as follows: 64.4 per cent for cotton, 27.3 per cent for groundnuts and 8.3 per cent for rice. The sum to be spent on fertilizers is \$400,000, \$388,000 and \$276,000 respectively for each of these crops, i.e. a total of \$1,064 million, over a period of five years (\$213,000 per year).

If we compare these sums with the customs statistics we note that the 1963 imports correspond exactly to the amount of the EDF credit; that being so, we may ask what will happen in 1969, when those credits cease! The promoters' answer is that the profits made with this assistance will enable agricultural undertakings to continue buying fertilizers to maintain crop output.

In any case, present figures have already far exceeded the consumption figures adopted by ECA according to the survey carried out by the S.S.E.P.C. (Société sénégalaise d'engrais et de produits chimiques).<sup>1/</sup> Its estimate for 1970 was only 1190 tons of supertriple (100 tons of  $P_2O_5$ ). The estimates for the future must therefore be revised; if we assume that present consumption corresponds to the amount of ammonium sulphate and supersimple, this represents 460 tons of nitrogen and 250 tons of  $P_2O_5$  in 1963.

Taking 1963 as a basis and taking into account the present development in this field in Mali, we obtain the following estimates for the future consumption of fertilizing agents:

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<sup>1/</sup> E/CN.14/246 and E/CN.14/INR/73

	1963	1964	1965	1970	1975	1980
Tonnage of N	460	500	600	1500	3000	6000
Tonnage of $P_2O_5$	250	300	400	1200	2400	6000
Tonnage of $K_2O$	negligible		200	800	1600	4000

The 1970 figures do not correspond exactly to those indicated by F.W. Hauck, who estimated 1000 tons of each substance<sup>1/</sup>.

The market is expanding but the quantities are still very low to justify studying the possibility of local manufacture by a single country. The problem is one for the sub-region as a whole.

#### VI. 12. Salt

The figures for crude salt show a distinct decrease, probably because of the exploitation of the Taoudeni mine, which also supplies neighbouring countries, Upper Volta and Nigeria. But the sector as a whole is expanding on account of the imports of other salts, which tends to indicate that the mining conditions are not adequate to withstand foreign competition (Senegal in particular).

Taking into account the demand for salt in other countries, it seems appropriate to adopt an increase rate of 6 per cent per year, which gives the following estimates:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	18450	Adjusted 6%	19540	26200	35000	46800
Value (\$1000)	447	Adjusted 6%	470	630	850	1140

The market is expanding and is large enough to justify studying every possibility for developing local production.

<sup>1/</sup> E/CN.14/INR/70

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## E. THE IVORY COAST

### I. GENERAL CHARACTERISTICS

#### I. 1. Population

3,665,000 inhabitants (1963)

Annual growth rate 1958-1963:

2.5 per cent

Population projection (in thousands):

1965: 3,834

1975: 4,740

1970: 4,235

1980: 5,385

#### I. 2. Area: 322,500 km<sup>2</sup>.

#### I. 3. Population density: 11 inhabitants per sq. km. (1963)

I. 4. The Ivory Coast has been an independent State since 7 August 1960. In spite of the rise of its industry, the country's economy is still essentially agricultural, and still largely based on the export of its four main products: coffee, cocoa, bananas, timber. But it is capable of great diversification, for, especially in the south, climatic conditions are favourable to most of the rich tropical products.

The territory of the Republic may be divided into several main regions.

First, the west, comprises two distinct regions:

Between the edge of the savannah and of the forest and north of a line Dabou-Toulepleu, there is an area of industrial crops, cocoa and, especially, coffee. The soils are rich in places (Oumé-Divo), on a base of dolerites and amphiboles, but of only medium quality everywhere else. The climatology is good but the effects of deforestation are clearly felt, at Gagnoa for example. The food crop is rice.

The balance between forest and crops is sometimes threatened, as at Gagnoa. In any case its precarious nature leaves no free scope anywhere for extensive prospects. So efforts must be directed towards increasing the output of perennial crops by improving growing methods, maintaining food crops on fixed sites, using manure, and therefore developing livestock-rearing and also preparing flooded ricefields.

The southern part of this region is very sparsely populated, almost unexplored. There are vast forest reserves to exploit, but they have hardly been touched because of lack of facilities for transporting the timber. According to a pedological study made by ORSTOM, the soils, and even more so the climate, are favourable to the growing of coffee, hevea and oil palms.

There are vast swampy areas that could be prepared for growing rice under water. So this southern part of the western zone would seem to be the great region of the future in the Ivory Coast, if it is provided with an adequate infrastructure soon.

The centre is characterized by its high population density. The soils are of medium quality. Only the south and the wooded part of the east in the Bouaké circle are suitable for industrial crops. The rest is covered with savannah and is much less favourable. This is the northern limit of the coffee belt, which means that the problem of income for the rural population arises, as the classic factor for raising the standard of living - coffee or cocoa growing - can scarcely be counted upon.

The growing of yams, a traditional crop in the Baoulé country, which gives excellent results and has a nutritive value akin to that of the potato, could be developed. But it is rice and maize, foods that keep well and whose yield could easily be much increased, that seem to be the crops of the future, and could make this region the granary of the Ivory Coast and its capital. Cotton and tobacco could be grown alongside as industrial crops, but it seems probable that they would remain of secondary importance.

The north is regarded as poor, particularly on account of its unsatisfactory climate. Cotton, tobacco and rice could be grown there, but the potential wealth, at present insufficiently exploited, is livestock-breeding.

The east is the region where industrial crops have been grown for the longest time, and it is there also that the balance between forest and crop land is most seriously threatened. The question of how to maintain the fertility and the climate is a very urgent one. But the population is increasing at such a rate that the problem of looking for new land will soon arise. Movement towards the unexploited west could be the solution, hence the task of preparing the latter region becomes of primary importance.

Table 1 shows the place occupied by agricultural products in Ivory Coast exports:

Table 1  
Exports from the Ivory Coast  
(Value in millions of dollars)

Commodity (in thousands of tons)	1962		1963		1964		1965 (11 months)	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Green coffee	142.6	76.7	182.1	99.1	204.3	128.5	168.4	94.1
Tropical woods	915.1	37.6	1154.9	50.4	1526.1	72.3	1402.9	66.7
Cocoa beans	101.1	42.8	99.7	45.7	124.3	58.9	96.9	36.1
Fresh bananas	125.3	11.7	133.4	14.1	125.9	12.6	117.3	10.2
Preserved pine- apple (without alcohol)	5.5	1.6	7.8	2.3	10.7	3.2	12.3	3.5
Pineapples	2.4	0.4	2.9	0.5	4.2	0.8	3.6	0.6
Kola nuts	19.8	3.4	9.3	1.5	17.3	2.7	21.5	3.6
Fruit juices	4.2	1.0	5.9	1.3	7.3	1.5	7.4	1.4
Palm and palmetto nuts	10.7	1.1	10.4	1.2	12.8	1.4	14.1	2.0
Raw skins	0.4	0.1	0.3	0.1	0.3	0.1	0.5	0.1
Beer	0.3	0.4	0.9	0.1	3.1	0.3	0.1	0.02
Shea (karité) nuts	-	-	0.8	0.05	5.3	0.3	-	-
Cotton seeds	1.3	0.08	6.1	0.2	4.3	0.2	4.9	0.2
Palm oil	1.1	0.3	0.4	0.1	0.9	0.2	1.1	0.3
Ginned cotton	0.2	0.4	1.1	0.2	1.1	0.2	1.5	0.5
Manganese	97.6	2.2	105.3	1.8	116.4	2.0	121.9	2.1
Diamonds (in thousands of carats)	415.9	2.2	213.5	1.6	236.0	1.8	181.1	1.6
Natural rubber	-	-	0.4	0.2	1.6	0.7	2.5	1.6
Other products	36.0	11.19	31.9	9.8	47.1	14.1	73.3	20.5
Total in thousands of tons)	1,463.6	193.2	1,753.6	230.2	2,213.0	301.8	2,050.2	244.7

Source: Directorate of Statistics of Economic and Demographic Studies.  
Monthly Statistical Bulletin, December 1964, 1965.

Although still very inadequate, the industrialization of the Ivory Coast is nevertheless the result of half a century of work: the first sawmill dates from 1915, the first textile factory from 1922 and the first oil and soap factory from 1938. Industrial production in the country is very diversified and the number of different industrial sectors is a sign that the country's industrial development is progressing steadily. The rise in industry is contributing more and more to the stabilization of the trade balance by reducing imports of consumer goods and equipment, even though it is increasing the inflow of raw materials. It is giving greater importance to the export of finished or semi-finished goods, and mining products. The food industries, based largely on the transformation of agricultural and fishery products, form the most important sector. Most of the recently created industries have been set up and financed by foreign enterprise with government encouragement.

The economic situation of the country is well illustrated by the principal aggregates shown below:

Table 2  
Principal aggregates 1960-1964  
(Value in millions of dollars)

Item	1960	1961	1962	1963	1964
1. Gross domestic production at market prices:	547.7	597.9	655.9 <sup>x/</sup>	746.6	878.7
of which					
Agriculture	289.3	...	295.3	323.7	365.7
Industries	68.0	...	103.3	117.9	141.0
Services	190.4	...	246.7	305.0	372.0
2. Administration (salaries) and domestic services	41.3	50.6	56.7	68.9	73.3
3. Gross domestic product at market prices	589.0	648.5	712.6	815.5	952.2
4. Net factor income from abroad	-24.3	-25.1	-28.4	-32.4	-36.5
5. Gross national product at market prices	564.7	623.4	684.2	783.1	915.5
6. Indirect taxes (net of subsidies)	78.2	86.7	108.6	135.3	178.6
7. Gross national product at factor cost	486.5	536.7	575.6	647.8	736.9
8. Depreciation	21.9	24.7	30.4	28.4	30.4
9. National income	464.6	512.0	545.2	619.4	706.5

Source: United Nations, Economic Commission for Africa, Statistical Bulletin for Africa, November 1965

<sup>x/</sup> The constituent items do not add up to the total shown, owing to the exclusion of value added in the production of water and of wood consumed on farm.



At present there is no "Plan" for the Ivory Coast. "Ten-year Prospects" are all that have been drawn up and they are not yet of an official nature. Their main purpose is to consolidate the country's economic and political independence. They lay down two main guiding principles:

(a) More balanced economic expansion

(b) Increase in production.

The primary sector is to be the main foundation for development, but a radical change is planned in the relative importance of the three main sectors - primary, secondary and tertiary. The development of production will be based on diversification of the economy, which implies a slowing down of production in the traditional primary sector supplying the export trade; at the same time, the plan provides for intensification of production, the introduction of new crops (palm kernels, hevea, cotton, sugar cane) for local consumption, the cultivation of virgin land, which is to be distributed by the State, increased industrial production and the development of mining prospection.

During the ten years covered by the plans, it is estimated that the three main sectors will be developed as follows (percentages):

	<u>1960</u>	<u>1970</u>
<u>Primary sector</u>	<u>52.9</u>	<u>38.3</u>
consisting of:		
Food crops and cattle	30.6	23.5
Marketable crops and industrial crops	18.8	11.4
Fisheries and forestry	3.5	3.4
	<u>1960</u>	<u>1970</u>
<u>Secondary sector</u>	<u>12.4</u>	<u>25.8</u>
consisting of:		
Extractive industries, Processing industries, Energy, and small-scale industries	8.4	21.3
Building and public works	4.0	4.5
<u>Tertiary sector</u>	<u>34.7</u>	<u>35.9</u>

The investments required during the ten-year period will amount to \$1.4 thousand million, half of which is to be provided out of public funds. During most of the period, private financing will come mainly from abroad, but internal financing will gradually increase.

According to certain fragmentary indications received, gross domestic production is expected to increase by 6.8 per cent between 1960 and 1970, industrial production by 15 to 20 per cent and per capita consumption by 4 per cent.

## II. MINERAL RESOURCES

The two main mining resources of the Ivory Coast are diamonds and manganese, and there is also some columbo-tantalite. The recorded production figures are:

	1960	1961	1962	1963	1964	1965 (11 months)
Diamonds (carats)	199,120	549,339	283,911	179,659	200,271	181,190
Manganese (tons)	61,600	124,740	106,963	139,063	136,564	155,069
Columbo-tantalite (kg)	2,600	3,800	2,618	1,000	1,500	...

Source: Directorate of Statistics of Economic and Demographic Studies, Monthly Statistical Bulletin, December 1963, 1964, 1965.

This production represents a total value of about \$6.2 million in 1964 as compared with \$5.8 million in 1963.

II. 1. Diamonds

The diamond deposits are in the west of the country, especially in the Seguela district. The mining is done by two large companies: SAREMCI (Société anonyme de recherches et d'exploitation minière de la Côte-d'Ivoire), and SODIAMCI (Société diamantifère de la Côte-d'Ivoire), a few villages grouped together as co-operatives and a certain number of clandestine workers. SAREMCI has been mining the Tortiya deposit in the area just mentioned, since 1948. Since 1960 SODIAMCI has been operating a few deposits for which it holds permits in the Seguela region, but its means are rather limited as yet. However, it is investing considerable sums in enlarging and modernizing its installations.

The planning services envisage that if new deposits are not discovered before 1970, local diamond production will not appreciably increase, owing to the decrease in diamond content in the deposits prospected.

A new company, Haston, is being formed to prospect and mine the underground diamond deposits in the Ivory Coast. It has obtained priority permission and intends to start surface and depth mining in the Seguela deposit, in collaboration with SODEMI (Société pour le développement minier de la Côte-d'Ivoire).

## II. 2. Manganese

Manganese is mined by the Mokta Company. The manganese deposit, which is situated about 60 km northwest of Grand-Lakou, in very rugged forest country, has been mined since 1960. The deposit consists of a chain of small veins of ore of a unitary tonnage of about 100,000, along a strip of land about 10 km long and 1 km wide following the line of the Birrimian terrain.

The Grand-Lakou ore contains 46 per cent of manganese.

A second deposit has been discovered at Odienné, but transport of the ore presents difficulties. It would first have to be taken to the railhead by road, then sent by rail, which would add heavily to the cost price.

## II. 3. Columbo-tantalite

At the end of 1957 SAREMCI started mining a small deposit of columbo-tantalite close to Bouaké. The first occurrences of the substance were discovered in 1952 and subsequent prospection gave very promising indications, showing it to be abundant and present over an area of several hundred km<sup>2</sup>. But detailed prospection, prematurely suspended because of the fall in the price of the ore, has only led to the discovery of small deposits, now being worked at a slow rate.

Thus the question is by no means closed. If prospecting were resumed, with the aid of certain important observations made recently during working operations, this might lead to a rise in the price of the ore.

## II. 4. Other mineral occurrences

Prospecting has revealed other occurrences in the Ivory Coast:

Gold: in the region of Ily, Mount Flotouo and River Labo;

Iron: in the region of Odienné;

Titanium: in the Grand-Lakou area;

Bauxite: in the regions of Divo-Lakota, Oumé-Toumoudi and Bondoukou;

Lithium and beryl: in the region of Adropé and Agboville;

Chrome, nickel and cobalt: in the region of Tiassalé;

Red Clay: near Grand-Bassam;

White clay: near Abidjan.

These substances are not of interest to the chemical industry as raw materials. Their treatment calls for mechanical procedures, and the consumption of chemical products is negligible.

### III. ELECTRIC ENERGY, FUEL AND WATER

The industrial development of a country cannot be envisaged without at least a brief examination of its potential energy. The two main sources of energy in the Ivory Coast are electricity and petroleum products.

#### III. 1. Electric energy

In the domain of electrification, enormous progress has been made since the end of the Second World war. At that time, the Ivory Coast only possessed two limited distribution systems, for the towns of Abidjan and Grand-Bassam. The entire installations (station producing poor quality gas at Abidjan and diesel station at Grand-Bassam) represented 850 kW of power.

Since 1950, measures for developing the production and distribution of electricity have been instituted and have given very remarkable results: in the Abidjan district alone the total power installed has risen to 33,800 kW, and this is complemented by the 2,000 kW of the Bouaké station and 3,000 kW from small plants set up at secondary centres.

In 1961 there was only one hydroelectric power station in the Ivory Coast - Ayamé I (installed capacity 19,200 kW; it began operation in 1959 and at the end of that year took over from the Abidjan thermic installations, which at that time consisted of five diesel units of 2,000 kW and three steam power units of 4,000 kW).

In 1965 a second hydroelectric power station, Ayamé II, is to start working and will produce 150 million kWh (installed capacity 30,000 kW).

In the coming years these two units will probably be supplemented by a third, to be installed on the White Bandama, south of Béomi, which would give a production of 600 million kWh (installed capacity 70,000 kW) and supply not only Bouaké but all the central region as well: Daloa, Dimbokro and the southern part of the country (Abidjan, Gagnoa, Agboville, etc.)

The country's electricity production from 1960 to 1965 (11 months) is shown in the following table (in thousands of kWh):

	1960	1961	1962	1963	1964	1965 (11 months)
Hydroelectric	58,922	73,400	90,014	106,944	96,012	123,751
of which Abidjan produced:	58,922	73,400	90,014	106,944	96,012	123,751
Thermal	8,034	19,402	30,138	47,616	86,736	73,829
of which Abidjan produced:	2,479	10,157	16,381	32,271	66,607	50,911
Total production	67,226	92,802	120,152	154,560	182,748	197,580
Total consumption	57,170	79,231	101,587	130,720	157,975	170,977

Source: Directorate of Statistics of Economic and Demographic Studies, Monthly Statistical Bulletin, December 1963, 1964, 1965.

It is estimated that in 1970 the Abidjan district will require 350 million kWh, 210 in high tension and 140 in low tension.

The price per kWh varies from 0.0146 to \$0.0286 according to the installed capacity and the monthly consumption. With the proposed new installations this price may decrease.

### III. 2. Fuels

The Ivory Coast uses neither coal nor coke. There are no coal deposits on its territory and practically no coal is imported. Petroleum products, on the other hand, are consumed in large quantities. At present they are imported, but when it starts working, the refinery near Abidjan, which is to have a capacity of over 700,000 tons, will gradually be able to cater for the country's needs, except for a few special products which the local installations are not equipped to produce. The refinery is to treat a mixture of crude oils imported from Hassi-Messaoud (Algeria), the Gabon and possibly Nigeria. It is expected to sell most of its products within the country: butane, high-grade petrol (gasoline) (98), ordinary petrol (87), kerosene, gas oil for engines, diesel oil and fuel oil. Part of the production will serve for the refuelling of ships and the surplus will be exported, in particular to the Upper Volta and Mali. The naphtha might possibly be used as material for a chemical industry. The refinery could also send hydrogen to the margarine factory.

The refinery is equipped to treat about 700,000 tons of crude oil per year. The investments are estimated to amount to 16 million dollars.

Production by the Abidjan refinery (Ivory Refining Company) should bring the price of fuel oil down by almost half for the large priority consumers, i.e. to \$16 per ton instead of \$28.

### III. 3. Water

It is obvious that water is not only necessary for quenching the thirst of the population. It is also a valuable aid to agriculture and livestock breeding. Lastly, it is one of the essential conditions of any industrial development, for there are very few industries in which water does not play an important part. The problem of the supply of fresh water is likely to arise wherever sites are chosen for future installations in the Ivory Coast, but it should be considered in conjunction with any new projects at the time of planning.

The water supply of Abidjan is fairly satisfactory for the time being, but with the rapid development of the town, the present supply possibilities may become inadequate. At present the capital uses 32,000 cubic metres of water per day at peak periods. With the demographic expansion and industry's increasing fresh water requirements, plans must be made to increase the distribution capacity.

It is proposed to use the Banco water. The suggested installations would allow for a daily consumption of about 66,000 m<sup>3</sup>, which would bring the distribution capacity of the Abidjan district up to nearly 100,000 m<sup>3</sup> per day.

At present there is no regular water distribution system at Bouaké and the local industrial firms each cater for their own needs by individual boring operations. In view of the size and development of the town, it was necessary to provide a normal drinking water supply without delay.

The project under construction consists in damming the course of a local stream, the Kan, and thus constituting (after a certain time, for the Kan has very little water in the dry season) a reserve that could supply Bouaké with about 6,500 m<sup>3</sup> of water per day. The project is not entirely satisfactory, as Bouaké is liable to develop industrially and the reserves provided by the Kan dam will soon be inadequate.

Furthermore, it would seem that the Kan dam should only be regarded as a provisional solution of the problem of fresh water for Bouaké, the definitive solution being the construction of a much larger dam across the Bandama, 100 km north of the town. This would serve both to constitute a very large reserve water supply and to produce the electric current necessary for the whole town.

Hydraulic works are at present in progress at Divo, Yamoussoukro, Boundiali, Adzopé, Bouna, Agnibilekrou, Toumodi, etc. All of these are solely to provide water for human consumption and the supplies would be inadequate if a large industrial enterprise considered setting up in these parts.

#### IV. EXISTING INDUSTRY

It is not possible within the scope of this report to give precise information on all the existing enterprises. The gross production value and the added value per sector of activity is given (see Table 3) and a few further details concerning these sectors.

Table 3

Development of domestic production by sector of activity, 1960 - 1964.

(millions of dollars)

Sector of Activity	1960		1963		1964	
	Gross production	Added value	Gross production	Value added	Gross production	Value added
1. Agriculture and livestock	291.3	270.5	314.1	288.2	347.6	318.0
2. Forestry	26.7	14.8	49.9	29.9	68.9	41.3
3. Fishing	6.1	4.1	8.3	5.5	9.7	6.4
4. Mining and quarrying	5.9	5.0	5.6	4.1	6.5	4.7
5. Energy, water	13.6	12.1	21.1	17.9	22.4	17.8
6. Food manufacturing	14.1	7.1	33.2	15.4	39.3	17.8
7. Building materials	1.3	1.0	3.2	3.0	2.1	2.0
8. Wood industry	7.9	3.5	18.3	14.6	9.6	8.0
9. Textiles and leather industries	9.3	4.7	20.7	8.8	27.2	11.0
10. Mechanical and electric industries	15.7	7.1	28.8	16.9	34.8	17.7
11. Oils and Fats	13.1	4.3	17.9	5.8	19.8	6.2
12. Rubber and plastic materials	0.7	0.2	1.7	0.7	1.8	0.9
13. Chemical products	0.6	0.4	3.5	2.1	4.9	3.0
14. Miscellaneous manufacturing	1.2	0.8	3.0	2.2	3.8	2.6
15. Building and construction	59.6	22.2	72.3	34.2	107.5	47.7
16. Transport and communications	39.6	23.6	59.6	35.4	72.0	42.6
17. Rent	9.1	8.5	19.3	18.0	24.9	22.7
18. Other services	15.4	12.2	21.1	16.5	24.7	19.2
19. Commerce	132.6	97.3	288.3	227.0	355.5	288.6
20. Taxes on imports	48.7	48.7	-	-	-	-
Total	712.5	548.1	989.9	746.2	1183.0	878.2

Source: United Nations, Economic Commission for Africa, Statistical Bulletin for Africa, November 1965.

#### IV.1. Food industries, tobacco and cigarettes

The main industries are:

Pineapple canning: S.A.L.C.I. at Ono

S.A.F.C.O. at Tiassalé

C.O.L.F.R.A. near Abidjan

The three canning factories at present working treat 16,000 - 16,500 tons of fruit annually (SALCI 12,500 tons, SAFCO 2,500 - 3,000 and COFRA about 1,000).

Without any appreciable transformations, these canneries could deal with a total of 22,000 to 25,000 tons a year.

Tunnyfish (canning and freezing): SCODI at Abidjan

SOIP at Abidjan

SOGIP at Abidjan

SCODI can deal with 50 tons per day and has a factory for by-products (fish meal, fish sausage, oil, etc.).

SOGIP is a sister company of SOIP. At present it deals with the freezing and storage of fish dried by SOIP or other companies. It makes ice and can sell it when production exceeds its own requirements. At present it can take in and place under refrigeration 120 tons of fish per day and store 800 to 900 tons at 18° below zero. Its storage capacity is soon to be increased to 1,700 - 1,800 tons.

The "Abidjanaise" company, whose premises are at Kilometre 6 on the road to Dabou, specializes mainly in freezing tunnyfish and selling it in frozen form.

#### Breweries, carbonated drinks

Beer is produced locally by two breweries: BRACODI and SOLIBRA.

BRACODI set up in Abidjan in 1949. Its production capacity is about 250,000 hectolitres. Its annual production varies from 150,000 to 200,000 hectolitres. It has a bottling plant at Bouaké which receives beer from Abidjan in tanks. The Bouaké depot can bottle 3,000 bottles an hour.

SOLIBRA was set up at Abidjan in 1954 and at first dealt only with carbonated drinks. It was transformed in 1958 and in 1960 very modern brewery equipment was installed, with which it can reach a production figure of 50,000 hectolitres of beer. The plan provides for the installation of a new brewery with a capacity of 50,000 hectolitres at Bouaké.



The local breweries make soft drinks and various carbonated beverages as well as beer. In addition to BRACODI and SOLIBRA which together produce more than 140,000 hectolitres of carbonated drinks (water, colourless lemonades or various kinds of soda water), there are a certain number of individual producers making small quantities of flavoured drinks.

SOBODI, at Abidjan, makes about 500,000 bottles of coca-cola per month.

#### Production of ice

Total production is estimated to be 15 - 160 tons per day. At present it is produced mainly for commercial needs, by BRACODI-Abidjan (100 tons per day), SOLIBRA (40 tons per day) and BRACODI-Bouaké (15 tons per day). Some firms have their own freezers, and sometimes sell their surplus production; SOGIP, for instance, does this.

The production of ice will considerably increase when the permanent refrigerating plant planned for the fishing port, with a total capacity of 160 tons per day, comes into operation.

Soluble coffee: Capral, the very modern factory built by Nestlé in the industrial district of Abidjan, began working in 1962. Full capacity: 5,000 tons of green coffee per year.

Flour: The "Grands Moulins d'Abidjan", a flour mill started in 1963, represents a total investment of over 6 million dollars. The mill will supply the whole country and will be able to export to the States of the customs union.

Tobacco and cigarettes: There is only one tobacco factory in the country - the MTCI (Manufacture des Tabacs de Côte-d'Ivoire), at Bouaké. It is supplied partly by local and partly by imported tobacco.

It produces various makes of cigarette. It does not make up pipe tobacco, chewing tobacco or snuff.

Its present production capacity is 7,000 cases of 1,000 packets each (i.e. 140 tons) per month.

#### IV.2. Wood industries

Timber is one of the great natural riches of the Ivory Coast. In 1960 654,000 tons of crude timber were exported (in 1964, 1,526,000 tons) and during the same period the local industry used only 130,000 tons. This disproportion is regrettable. It would be to the country's advantage to transform as much timber as possible locally, not only cutting it into planks, which is after all an elementary operation, but using it to manufacture many articles for a variety of uses: furnishing, packing, building, etc.

The Ivory Coast possesses some forty working sawmills, the most important ones being SCAF at Grand-Bassam, CFI at Abidjan, Jacob at Oumé and SEPC at Abidjan, and the new Schlosser mill at Tiassalé. Among other sawmills dealing with several thousands of cubic metres of wood per year are Chandor at Gagnoa, Beuglot at Dim/Kotobi, Lalane at Lakota, SMAG at N'aida, CIF at Gagnoa, CAFACI at Akoupé, Voisin at Issia, Chardonnet at Tiassalé, etc.

The activity of the Ivory Coast sawmills is based on the cutting up of logs and is at present not very diversified. Some mills do however strip wood, cut it into planks and make plywood and various types of cases and packing material, and also do joinery work.

For several years SCAF has even been making prefabricated panels for the building industry. At present it is the only company making cases or boxes in stripped wood. EGM (Entreprise générale de menuiserie) at Abidjan specializes in making ordinary furniture and hulls for ships. SEPC and CFI have workshops where ordinary furniture for the local market is made.

Some firms work for shipping, using the wood for making hulls or interior fittings for small ships. Outboard motor-boats and small wooden yachts are also made at Abidjan.

The Jacob sawmill at Oumé makes excellent plywood with stripped redwood. Several sawmills, in particular CFI, SEPC and the Bandama mills, make wooden packing cases.

It may be estimated that, in 1961, taking local production as a whole, percentages represented were as follows:

Log-cutting .....	70%
Joinery and furniture .....	14.5%
Manufacture of plywood .....	7%
"        " cases of sawn wood .....	5.5%
"        " stripped wood .....	2.5%
"        " wooden planks .....	0.5%

#### IV.3. Paper and cartons

There now exists at Abidjan a firm specializing in the manufacture and printing of wrapping paper and cartons, for the export of local produce such as fruit juices, bananas, avocado pears, ground coffee or articles manufactured at Abidjan, such as footwear, shirts, hosiery, etc.

At the present time there are six printing works of varying importance at Abidjan.

#### IV.4. Textile and ready-made clothing industries

Cotton occupies by far the largest place in the country's textile market and shows the most marked development.

##### Textile factory

The Etablissements Gonfreville were established at Bouaké in 1922. In 1962 they produced 2,422 tons of spun cotton, 1,770 tons of dyed spun cotton, and 841 tons of woven material. 52 per cent of the production is exported. A rival business, ICODI, is now being installed. The factory will treat cotton textiles (bleaching, dyeing, printing, finishing). It expects to print 2,500,000 metres of material annually.

##### Ready-made clothing and hosiery goods

The two main ready-made clothing firms at present in operation are SAFRIC and MACODI. SAFRIC started mass production of clothing articles in 1960. It has undertaken to produce a large quantity of men's clothing and hosiery goods annually (about 200,000 articles per month in 1963). It produces a very wide range of goods - 250 different types of article - from men's bathing costumes to suits for town wear. SAFRIC also makes large quantities of shorts, trousers, undervests and sports shirts. MACODI is a ready-made clothing firm. It specializes in luxury goods. At present it manufactures trousers and shirts. In 1965 it made about 170,000 articles, mainly trousers.

There are two hosiery firms at Abidjan: "Devanlay et Recoing-Afrique" and the "Société abidjanaise de Bonneterie". The former has specialized in hosiery goods for both sexes and all ages, specializing mainly in jersey fabric underwear and knitwear.

Present annual production may be estimated at 3 million articles of underwear and 600,000 articles other than underwear, utilizing a total of 250 tons of cotton. The "Société abidjanaise de Bonneterie" which is just starting, intends to manufacture underwear and other garments, of woven as opposed to jersey, material.

#### Rope and string

The material used in this branch of industry in the Ivory Coast is sisal. The Bouaké rope and string factory, founded in 1922, uses sisal for almost all its manufactures. At present it is making about 700 tons of various products annually, mainly sisal thread, string, cord, and medium and thick rope. The firm also sells sacks and repairs worn sacks.

#### IV.5. Leather and footwear

Local production of leather goods is very small. It consists mainly of a few articles in crocodile skin and snakeskin, usually for tourists. MIPA produces plastic footwear. In 1962 it manufactured 80,000 pairs per month. It has extended its range to buckets, bowls and various household utensils. Another very recently established firm is making preformed plastic footwear and does the riveting on the spot.

#### IV.6. Metal industries, motor cars and cycles, other mechanical and electrical products

##### Metal constructions

There are several firms in the Ivory Coast which specialize in metallic construction. The most important seem to be SAMELA, SIFERCOM and the Etablissements BOUET. SAMELA produces about 130 tons per month of metal scaffolding and 20 tons per month of small metal work. SIFERCOM produces about 60 tons of metal scaffolding per month and BOUET from 30 to 40 tons of metal.

##### Metal work, boiler-making, metal furniture

Firms making metal scaffolding also usually make window frames and door jambs. This is the case with SAMELA and SIFERCOM. Another firm, AMB, also makes small metalwork articles, but seems to specialize in artistic metalwork. The firm of MISCHLER specializes in roll-up shutters and makes all kinds of metal shutters and a small quantity of metal window and door frames.

There are two well-established boiler-making firms at Abidjan - SIFERCOM and CARENA. SIFERCOM makes 25 to 30 tons of boiler parts per month, and does the ferruling and welding of round-bottomed boilers for oil tankers. It also makes tanks for the transport of water and fuel on lorries and trailers, vertical reservoirs for the storage of petroleum products, water-tower cisterns, and all the metalwork for railway cars. CARENA specializes more in naval construction, but also makes silos and various kinds of tanks.

There are three or four firms making or equipped to make metal beds. The most important is the Société Tranquet, which makes between 18,000 and 20,000 beds or bedsteads annually.

About a year ago, a local firm Tubafabric, began to specialize in the manufacture of tubular furniture, especially chairs. In a year it has made 4,000 chairs, 1,500 garden armchairs, 600 school tables and a few other less important articles.

#### Other metal articles

There are plans for setting up two factories for making up metal sheeting, received flat or in rolls, either into corrugated sheets or bins. The galvanizing will be done by a company now being established. Abidjan already has a factory for the transformation of unfinished aluminium sheeting.

Metal packing materials are made by SIFEM, and very recently another company, SADEM, better known under the name of Mecanembal, has been started. In 1962 SIFEM made over 1,000 tons of cans. It has three production lines that can put out 500,000 cans in 8 to 10 hours. Mecanembal has three production lines, capable of manufacturing 30,000 cans per day.

Since 1958, ALUCI has been making aluminium kitchen utensils. It is still working well below its capacity, and could produce 350 tons of articles per year without new installations.

#### Boat-building and repair

CARENA is mainly engaged in naval construction work. It does careening, and repairs hulls and metal plates. It also repairs machines and overhauls engines. CARENA builds boats, such as tugs and 6-to 45-metre motorboats in wood or metal. Another enterprise, SICOMA, is to be established at Abidjan, and will build fishing boats for the CAPI. There is also a dredging firm (Société des dragages), which makes marine or other boilers in its workshops and does mechanical repairs.

Motor cars and cycles

SAFAR makes commercial vehicles and has a production rate of 120 vehicles per month - 35 commercial vehicles of 1,000 to 1,400 kg, 25 2.5 kg lorries and 60 R-4s, including 10 light lorries. Its annual production capacity is 4,500 vehicles.

SERIA builds trailers for transport, mainly single- or double-axle trailers for heavy loads.

MAC makes several models of bicycles. Surplus production (as much as 25,000 cycles per year) is exported to neighbouring countries.

A second firm, FORMONS, is preparing to assemble bicycles locally. Its estimated capacity is 10,000 per year.

MAC has obtained the contract for making Peugeot power-cycles under licence.

Other mechanical and electrical products

SOREPEL repairs all kinds of engines, from small (half-horsepower) motors, to 120 h.p. engines, overhauling and repairing about 2,000 per year.

SAR is engaged in the mass production of transistors. It is capable of supplying the whole Ivory Coast market and also producing a surplus for export (3,000 to 4,000 transistors annually). It can turn out one transistor every three minutes. SAR is about to start manufacturing television sets, planning to produce 2,000 sets a year at the outset.

A.B.J. manufactures a few essential machines, in particular those required for local agriculture. One of its chief products is a coffee hulling machine.

IV.7. Mining and quarrying See II

IV.8. Chemical and paracheimical industries See V

## V CHEMICAL AND PARACHEMICAL INDUSTRIES

This sector is expanding considerably. Among the existing enterprises concerned with the chemical industry, are the following:

### Treatment of oil-producing substances

There are at present four factories producing unrefined palm oil:

The oil works at the Mé experimental station,

The I.R.H.O. works at Dabou,

The I.R.H.O. works at Grand-Drewin (Sassandra),

The Acabo-Dabou oil works.

Total production of unrefined palm oil was 7,000 tons in 1960. It is planned to install an oil-extraction plant with a capacity of 8,000 to 10,000 tons as part of the plantation scheme in the Cosrou area. The Blohorn oil factory treats part of the Ivory Coast palm kernel yield; as by-products, it makes oil-cake (1,500 tons annually), margarine (capacity about 80 tons per month), soap, sodium silicate (for soap) and it has recently set up a detergent factory.

### Oxygen and acetylene

The Air Liquide Company, which has existed since 1947, produces about 400,000 m<sup>3</sup> of dissolved acetylene annually. A yearly increase of 10 per cent is envisaged after 1970.

### Soap

The soap industry in the Ivory Coast is represented by a remarkably well organized and growing enterprise - the Blohorn Huilerie et savonnerie des lagunes. It has two Mazzaroni installations and at the present time can manufacture 25,000 tons of common or toilet soap annually. Its factory makes a 72 per cent and an 80 per cent common soap, and a toilet soap of excellent quality. Palm, copra and palm kernel oils are used. After extension, the factory, which produced about 12,000 tons in 1960, 14,000 in 1962 and about 15,000 in 1963, is expected to reach a production of 28,000 tons in 1970.

The development of soap production provides an ideal outlet for the country's oil-yielding trees, since every kilogramme of soap requires 700 grammes of fats, most of which can be supplied by the local plantations of oil palms and coconut trees, though tallow will still have to be imported for a long time yet. The Blohorn works produce large quantities of glycerine, which for the time being is all exported to France (212 tons in 1961, about 400 tons in 1970).

#### Washing compounds

Blohorn makes up Helios washing materials based on products imported from France. The annual capacity is 12,000 tons a year.

An installation comprising an atomizing tower has been set up, which produces washing compounds locally at the rate of 500 kg. an hour. Manufacture covers both products containing soap and other types of washing compounds in local demand.

It is interesting to note that overseas, as in Europe, soapless washing compounds are in much greater demand than those containing soap, for which the rate of increase in demand is relatively slow.

#### Bleach (Eau de Javel or hypochlorite)

This product, widely used in France for bleaching household washing, is manufactured locally by three firms - Blohorn, SOLIBRA and BRACODI. The Ivory Coast market consumes from 50,000 to 60,000 litres per month. Part of the local production is exported to the neighbouring countries (especially Upper Volta and Guinea).

#### Sodium silicates

This product is imported in the form of vitreous silicate and then treated by a company of the Blohorn group, the Société des silicates de Côte-d'Ivoire. This firm's production is intended to meet not only the requirements of the soap factory but also those of the paperboard factory and a certain number of new local industries, such as the paint industry, mining (ore flotation) or even public works contractors (stabilisation of earths).

#### Perfumery

SIMOPA, a small undertaking, was set up at Abidjan at the beginning of 1962. Its manufacturing programme is fairly wide in range and is to be put into operation by stages. At present it uses imported products, making them up into a range of popular goods, such as perfumed talcs, toilet waters with various perfumes much in demand, pommades coloured differently according to where they are to be sold, nail varnish, lipstick, etc.

According to the different products, the operations performed within the country are either in the nature of actual manufacture from certain basic substances or are merely blending or dissolving processes.

The 1965 estimate of perfumery products manufactured in the country is 300 tons and the expected figure for 1970 is 500 tons.

#### Pharmaceutical products

This sector has been in full expansion for several years. Pharmacy in Africa, as in Europe, has evolved. Retorts, alembics, mortars and pestles have been consigned



to the junk room. The XXth century apothecary, at Abidjan as in Europe, no longer makes juleps - he sells patented products or "specialities". Specialities represent 80 to 90 per cent of the imports of pharmaceutical products into the Ivory Coast. Most of the remaining 20 or 10 per cent consist of cotton wool, gauze and dressings.

There is a project for setting up a pharmaceutical industry on the Ivory Coast. The Laboratoires pharmaceutiques africains (LPA) propose to manufacture 200 of the specialities in greatest demand in Africa. Agreements have already been concluded with the most important French laboratories - SPECIA, RHONE-POULENC, ROUSSEL, etc.

Some fifty specialities were already made up in the Ivory Coast by a small pharmaceutical firm. The LPA is to take over these manufactures.

The site chosen is alongside the road to Bingerville; its area is three hectares, one third of which will be occupied by buildings.

The material is very up-to-date and will comprise mixers, grinders, apparatus for making pastilles, for distilling and for preparing absorbent cotton. There will also be assembly lines for packing and bottling.

At the outset the LPA is to employ about a hundred workers.

The laboratories will probably also make up and pack certain pesticides. Agreements to this effect are said to have been made with Péchiney-Progyl.

#### Paints

Up to the past few years, all paints used in the Ivory Coast were imported. A few whitewashes made of lime, and sometimes size, were prepared locally.

Even at Abidjan, the Africans are still sometimes satisfied with a 50 per cent linewash (without size) adding disinfectant in some cases. Some paint firms (which do painting work) also used to make a few simple preparations based on imported pigments, but no paint worthy of the name was of local origin.

The development of the paint market in the country is connected primarily with the development of building. Indeed it may be said that three-quarters of the paints used are for building (exterior or interior painting). The second main use is for the prevention of corrosion by protecting metal surfaces. Requirements in this line will certainly increase with the development of the trading and fishing port (marine paints) and the metal buildings which are part of the industrial expansion plan.

Two firms are capable of meeting almost all the needs apart from certain very special paints which it would be difficult to manufacture locally). The first of these firms, SIPEC, was set up only recently; it began work in 1961. It plans to manufacture paints, colours, varnishes, resins and various maintenance products, at Abidjan.

As far as paints are concerned, it expects to produce locally almost all the paints in local demand, from the most standard and usual kinds to the most up-to-date. It has already put most of them on the local market. The demand for size paint, used mainly for ceilings (as it stays on better and does not peel) is fairly limited. SIPEC produces what is required. SIPEC also manufactures household oil paints, although the number of customers interested in this type of paint is tending to decrease. The main disadvantage of these paints is that they do not dry well and light turns them yellow. Stand-oil paints are more durable and stand washing better.

SIPEC mainly concentrates on the manufacture of modern paints (vinyl and glycerol phthalate), which are increasingly successful because they are practical, lasting and look well. Special paints are also being, or to be manufactured, (marine paints, anti-rust paint, rubber paint, etc.) SIPEC's production capacity is about 150 tons a month (200 tons when large series are made). This represents an annual supply of 1,800 to 2,400 tons. SIPEC employs about 50 workers.

A second paint firm, SAEC, is just starting, and manufactures Astral-Celluco products under licence. It makes all the paints that are in normal demand, except fired lacquer paints, which are to be included in the second stage of its programme. Its main production, therefore, will be paints for the building trade (oil, vinyl, glycerol phthalate) and a few special paints (marine, anti-rust, rubber).

It is said that SAEC's initial production will be 120 tons a month. It is to employ forty workers.

#### Pesticides

Imported pesticides are either for agriculture (75 per cent) or for domestic, industrial and sanitary purposes, etc. (25 per cent).

The development of agriculture, improved crop-growing methods, the intensified campaign against cocoa, coffee, cotton and banana parasites, etc., changing habits and better hygiene will lead to an increased demand for various pesticides.

There are at present two companies in the Ivory Coast engaged in making up and packing pesticides (Shell, and SOFACO, a subsidiary of Blohorn).

#### Manufacture of plastics

Plastics have already been mentioned in relation to footwear (see Chapter IV.5). As already mentioned, MIPA makes plastic buckets and basins, at the rate of 700-750 a day. Another firm, Polyplast, specializes in household utensils. Its range of

articles is limited so far, but will undoubtedly be extended (6- 10- and 14-litre buckets, two types of chamber pot, two types of basin, two types of beakers, one salad bowl, etc.)

It has modern machines and its rate of production is relatively fast: one small basin every 15 seconds or one bucket every 50 seconds. In 1962 (nine months of work), with two machines, it produced 100 tons of various articles. In 1963, with four machines, production exceeded 200 tons. The machine-shed could be greatly enlarged if there were export possibilities. Polyplast also works with polyethylene. As an experiment, it has made about 100,000 red plastic cups for collecting latex in the hevea plantations.

Plastic is also used extensively for packing material by Cobafruit, which takes delivery of high-pressure low-density polyethylene compound and carries out the extrusion process at its own works. The plastic is distributed in rolls to members of the Cobafruit organization (500-600 tons a year).

Another firm, Aflex-Plastiques, which welds plastic bags by hand, is seen to be equipped with an automatic welding machine enabling it to weld from 30,000 to 35,000 bags daily, a medium-capacity extruder, and a printing frame (serigraphy). Later on the firm intends to introduce flexographic material for printing in several colours. Aflex's production might be of interest to agriculture or certain industries (such as the local ready-made clothing industry) which pack their goods in polyethylene bags.

Bonsacoh, a business with headquarters in Zone 4 C, imports plastic sheeting and makes up a range of utility or fancy articles of good quality: suitcases, briefcases, portfolios, toilet bags, etc. The articles are assembled by sewing. The firm employs about 80 workers and produces an average of 5,000 articles per working day.

Lastly, MIS uses polystyrene, receiving expandible polystyrene compound and making up expanded polystyrene sheeting (Styropor) under licence. It is a product intended mainly for thermic isolation, but it can only be employed as sheathing or casing for the protection of pipes or apparatus which do not reach high temperatures, as its fusion point is below 100°. It is remarkable, however, for everything connected with cold storage or phonic insulation. The Styropor produced by MIS is used for making ice-chests for camping. Its incomparable lightness also means that it is in demand by the marine fishing trade for floats. MIS employs 15 permanent workers and makes about 150 m<sup>3</sup> of expanded polystyrene a month. In 1962 the local production

capacity in plastic articles, excluding footwear, was estimated to be about 1,000 tons a year.

#### Tyre retreading

At present, there is only one firm making tyre retreads. It has been working since the beginning of 1962, and employs some 50 workers. It retreads a few of the most usual types of tyre (for lorries, vans and private cars). The worn tyre is scraped almost down to the canvas on special machines and then covered with solution. When this is dry, a band of crude rubber is placed on and firmly pressed down. The tyre is then put through a kind of firing process which makes the new band fuse with the casing and take on the tread markings essential to make it roadworthy.

MRP reconditions about 35 to 40 tyres of all kinds per day by this process (25 private car tyres and 10 to 12 heavy lorry tyres). Its production is liable to increase.

#### Matches

SOTROPAL has installed a very modern factory in the industrial district of Abidjan, where the whole process of making matches is done mechanically and automatically. All the work is done in its own factory. It takes delivery of local wood in log form and strips the logs. The wood is cut into layers of different thicknesses according as they are to be used for the stalks or the boxes. The dip, made in the firm's laboratories from various chemical elements, is a composition specially designed to give best results in a humid tropical atmosphere.

In 1962 SOTROPAL made 4,300 cases of matches, that is to say, about 26,000 16-kg. cartons. In addition, in the same year, it exported 8,000 cartons to Mali, 5,500 to the Upper Volta and 1,500 to various other countries. Information indicates that SOTROPAL supplies a very large part of the local requirements (at least 80 per cent of the market).

The Plan forecasts that in the next few years SOTROPAL is expected to reach a production of 12,000 cases and that the figure would rise to 20,000 in 1970. The firm employs over 200 workers.

## VI. THE PRESENT MARKET FOR CHEMICAL PRODUCTS

The following tables have been drawn up from figures relating to chemical products, taken as a basis for reference from the customs statistics for 1960-1964.<sup>1/</sup> In order to simplify presentation, as a rule only imports of over \$40,000 in 1964 (10 million Frs. CFA) have been listed. The corresponding exports have been deducted in order to show only domestic consumption.

To get an idea of the tonnages and values of other products not mentioned, one has only to calculate the difference between the figures given and the total for each sector. The difference is small and is made up of the figures for numerous products which it seemed unnecessary to enumerate. It must be pointed out that the total for each sector does not necessarily correspond to the total indicated in the customs statistics, for some chemical or related products are listed in other sectors (artificial textiles, plastics, etc.)

Lastly, in order to facilitate the estimation of future needs (See VII) the average annual variation rate has been calculated on the basis of this period (except where a figure was lacking or was insignificant).

Table 4 shows the tonnages consumed. Table 5 gives their value in dollars. The code numbers correspond to those of the Brussels Nomenclature.

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<sup>1/</sup> The figures were taken from the multicopied lists of the Institut national de la statistique et des études économiques (I.N.S.E.E.), Paris.

Table 4

Domestic consumption: chemical and related products

(tonnage)

Code	Commodity	1960	1961	1962	1963	1964	Annual rate
25.01.08	Crude salt .....	13,917	16,753	5,541	16,935	22,897	13%
...	...	...	...	...	...	...	..
<u>Chapter 25</u>	Mineral products .....	16,132	17,785	5,726	22,889	23,014	9%
27.11	Gaseous hydrocarbons .....	1,151	1,276	1,568	1,936	1,807	12%
...	...	...	...	...	...	...	..
<u>Chapter 27</u>	Petroleum derivatives ....	1,223	1,350	1,712	2,084	1,968	13%
28.17.08	Caustic soda .....	1,169	1,433	1,267	1,402	1,706	10%
28.56	Carbides .....	489	474	487	420	517	1%
...	...	...	...	...	...	...	..
<u>Chapter 28</u>	Inorganic chemicals .....	2,024	2,151	2,197	1,999	2,449	5%
<u>Chapter 29</u>	Vitamins, alkaloids, antibiotics .....	19	18	17	3	16	negative
30.02.01	Vaccines and sera, pharmacopoeial .....	2	2	5	5	9	73%
30.03.02	Other pharmacop. preparations not put up.	n	32	324	123	255	variable
30.03.13	Pharmaceutical specialities put up for retail sale..	556	606	533	504	676	5%
30.04.01	Wadding .....	22	70	48	28	67	32%
30.04.11	Other impregnated products.	38	53	30	31	46	5%
...	...	...	...	...	...	...	..
<u>Chapter 30</u>	Pharmaceutical products	624	780	70	715	1,075	14%

Table 4 (cont'd.)

Code	Commodity	1960	1961	1962	1963	1964	Annual rate
31.02	Nitrogenous fertilizers ...	4,019	4,641	4,250	2,233	3,625	negative
31.03	Phosphatic fertilizers.....	1,099	2,120	2,681	2,188	2,961	27%
31.04.08	Simple potassic fertilizers	3,740	7,451	6,473	6,192	8,925	24%
31.04.11	Mixed potassic fertilizers	1,426	352	361	1,699	3,637	26%
31.05.08	Fertilizers other than nitrogenous, phosphatic or potassic .....	425	42	1,129	215	569	7%
31.05.11	Fertilizers in tablet form	858	2,206	909	559	2,135	25%
<u>Chapter 31</u>	Fertilizers .....	11,824	16,828	15,818	13,086	21,426	16%
32.09.10	Varnishes .....	43	55	71	55	92	21%
32.09.20	Paints .....	885	918	785	1,057	1,237	9%
32.09.30	Dyes .....	83	82	36	112	128	12%
...	...	...	...	...	...	...	..
<u>Chapter 32</u>	Paints and varnishes .....	1,011	1,055	892	1,224	1,457	10%
36.02	Explosives .....	66	46	105	38	54	negative
36.06	Matches .....	20	92	37	27	26	7%
...	...	...	...	...	...	...	..
<u>Chapter 36</u>	Explosives and matches ....	86	138	142	65	80	negative
38.11.08	Disinfectant, put up (1 kg)	93	200	257	276	301	35%
38.11.10	Disinfectant, not put up ..	1,605	1,574	1,458	1,592	1,168	negative
38.18	Solvents and diluents for varnishes .....	33	94	74	54	225	7%
...	...	...	...	...	...	...	..
<u>Chapter 38</u>	Disinfectants and solvents	1,731	1,868	1,789	1,922	1,694	negative

Table 4 (cont'd.)

Code	Commodity	1960	1961	1962	1963	1964	Annual rate
39.01	Condensed and poly-condensed products .....	218	144	207	346	329	11%
39.02	Polym. and copol. products..	190	369	670	1,353	3,375	105%
39.07.31	Other moulded plastic articles .....	22	30	27	38	38	14%
39.07.32	Non-strat. plastic articles	5	8	28	30	70	93%
39.07.39	Other plastic articles .....	639	215	275	272	417	negative
...	...	...	...	...	...	...	..
<u>Chapter 39</u>	Plastics	1,074	765	1,207	2,039	4,229	41%
51.01.09	Man-made fibres cont. NC ...	4	15	9	9	24	57%
51.04.18	Textiles containing over 85% of man-made fibres ...	3	8	8	17	32	81%
51.04.19	Fabrics containing less than 85% man-made fibres..	6	19	5	18	26	44%
...	...	...	...	...	...	...	...
<u>Chapter 51</u>	Man-made fibres	19	47	29	55	91	48%



Table 5

Domestic consumption: chemical and related products

(Thousands of dollars)

Code	Commodity	1960	1961	1962	1963	1964	Annual rate
25.01 08	Crude salt .....	316	412	152	480	690	22%
....	.....	...	...	...	...	...	...
<u>Sector 25</u>	Mineral products...	384	460	170	648	709	17%
27.11	Gaseous hydrocarbons	136	144	188	229	208	11%
....	.....	...	...	...	...	...	...
<u>Sector 27</u>	Petroleum derivatives	148	164	220	261	245	13%
28.17.08	Caustic soda ....	128	120	88	95	153	4%
28.56	Carbides.....	76	88	72	62	76	-
<u>Sector 28</u>	Inorganic chemicals	281	276	235	227	300	1%
<u>Sector 29</u>	Vitamins, alkaloids, antibiotics....	17	22	10	6	10	negative
30.02.01	Vaccines and sera pharmacopoeal	16	42	68	140	276	103%
30.03.02	Other pharmacop medicinal prepara- tions, not put up	1	176	1296	412	880	variable
30.03.13	Pharmaceutical specialities put up for retail sale	1368	1552	1920	1884	2334	14%
30.04.01	Wadding.....	52	132	96	56	128	25%
30.04.11	Other impregnated products....	84	124	80	80	116	8%
....	.....	...	...	...	...	...	...
<u>Sector 30</u>	Pharmaceutical products ...	1563	2085	3528	2655	3852	25%
31.02	Nitrogenous fertilizers...	389	425	296	130	227	negative
31.03	Phosphatic fertilizers...	46	82	108	118	147	34%

Table 5 (contd.)

Code	Commodity	1960	1961	1962	1963	1964	Annual rate
31.07.03	Simple potassic fertilizers	236	428	396	371	585	25%
31.04.11	Mixed potassic fertilizers	120	32	28	144	288	24%
31.05.03	Fertilizers without nitrogen or phosphate...	34	8	92	17	48	9%
31.05.11	Fertilizers in tablet form...	72	192	76	48	180	26%
....	.....	...	...	...	...	...	...
Chapter 31	Fertilizers...	916	1170	998	823	1477	13%
32.09.10	Varnishes.....	29	40	52	44	68	21%
32.09.20	Paints.....	504	512	484	696	800	12%
32.09.30	Resins	96	128	48	180	236	25%
....	.....	...	...	...	...	...	...
Chapter 32	Paints and varnishes...	629	680	584	920	1104	15%
33.02	Explosives....	49	35	76	29	39	negative
33.06	Matches...	15	72	29	19	19	6%
....	.....	...	...	...	...	...	...
Chapter 33	Explosives and matches...	64	107	105	48	58	negative
38.11.08	Disinfectants put up(1 kg)...	92	188	224	216	232	26%
38.11.10	Disinfectant, not put up...	660	636	500	324	268	negative
38.18	Solvents and diluents for varnishes...	17	48	29	27	104	57%
....	.....	...	...	...	...	...	...
Chapter 38	Disinfectants and solvents	769	872	753	567	604	negative
39.01	Condens. and poly-condens. products	100	76	96	152	156	12%
39.02	Polymer and copolymer. products	216	342	504	996	1748	69%
39.07.31	Other moulded plastic articles	44	48	44	52	68	12%
39.07.42	Non-Strat. plastic articles	13	20	32	64	124	75%

Table 5 (contd.)

Code	Commodity	1960	1961	1962	1963	1964	Annual rate
39.07.39	Other plastic articles...	732	416	484	564	788	2%
...	.....	...	...	...	...	...	...
<u>Chapter 39</u>	Plastics....	1105	902	1160	1828	2884	27%
51.01.09	Man-made fibres....	18	60	35	39	112	58%
52.04.18	Fabrics containing over 85% of man-made fibres...	16	72	72	136	276	104%
51.04.19	Fabrics containing less than 85% of man-made fibres	52	128	46	120	204	41%
...	.....	...	...	...	...	...	...
<u>Chapter 51</u>	Fabrics of man-made fibres	110	284	180	334	624	54%

## VII. PLANNING THE CHEMICAL INDUSTRY IN THE IVORY COAST

From an examination of the preceding tables we can estimate:

- (a) The relative value of present needs in chemical products,
- (b) The trend of market development.

VII. 1. Pharmaceutical products

This sector takes the lead in exports of foreign currency for the year 1964, showing a fairly regular increase in tonnages (annual rate 14 per cent) and in values (25 per cent).

In an existing project for setting up a pharmaceutical industry in the Ivory Coast, provisionally classified as a priority measure, the annual rate is taken as varying between 12 and 8 per cent.

If we apply the 8 per cent rate, which seems more realistic for estimates, we get the following figures:

	1964	Annual rate	1965	1970	1975	1980
Quantity, (tons)	1,091	Adjusted 8%	1,180	1,700	2,500	3,700
Value (\$1000)	3,862	Adjusted 8%	4,170	6,100	9,000	13,200

The Laboratoires pharmaceutiques africains (LPA) would be financed in the proportion of 40 per cent by the Government, 40 per cent by European companies and 20 per cent by local firms. Production would be limited to certain products made up into syrups, tablets or pommades or put into glass ampoules: anti-moebic, anti-parasitic, antibiotics, sulfamides, anti-malaria, lactic ferments, yeasts, etc.

For the most part the basic products would continue to be imported, which would represent a value of \$272,000, including \$104,000 worth of packing. Local purchases would amount to \$32,000.

The estimated turnover is as follows:

Year	1st	2nd	3rd	4th	5th
\$ 1,000	720	720	840	960	980

If the first year is 1965, deducting the indispensable imports mentioned above, the saving in foreign currency would be about 12 per cent.

According to certain estimates, the initial investment would amount to about \$112,000 with an increase of \$40,000-\$60,000 in 1970 and \$100,000 in 1975. Other estimates speak of a total of \$600,000.

## VII.2. Soap

The rate of increase in the consumption of soap in the Ivory Coast is greater than the rate of increase of soap imports. The percentage required to cover local industry needs increases year by year.

Admitting an increase rate of 4 per cent, the figures for the rise in soap consumption would be:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	14,000	Adjusted 4%	14,600	17,700	21,500	26,000

The market is expanding and large enough to justify the development of local production.

## VII.3. Surface-acting agents and washing compounds

As already indicated, there is a much greater demand for soapless washing preparations than for those with soap, for which the increase coefficient is relatively poor. Taking into account the general market trend for these products, which is likely to rise in the coming years, it seems wise to adopt the 12 per cent rate, which gives:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	1300	Adjusted 12%	1,450	2,560	4,500	8,000
Value (\$1,000)	770	Adjusted 12%	860	1,500	2,700	4,700

The market is expanding and it will soon be possible to make use of existing capacities.

## VII.4. Perfumes and cosmetics

Local production of perfumes and beauty products is already considerably affecting the import figures.

It is estimated that total requirements are likely to increase as follows:

	1964	Annual rate	1965	1970	1975	1980
Value (\$1,000)	1,500*	Adjusted 4%	1,560	1,900	2,300	2,800

\* Estimated

Nearly all the most common perfumery products, particularly those in the category of hygiene, such as scented waters and toilet waters, products for the skin and hair, and dentifrices, will be either made up or packed locally. Only luxury perfumes and well-known makes of goods will be imported to satisfy well-to-do customers.

#### VI.5. Pigments, paints, varnishes.

The rate of increase recorded in the customs statistics is 10 per cent per year for weight and 15 per cent for value.

On a basis of the most cautious increase rate estimate, 8 per cent per year, future consumption would be:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	2,700*	Adjusted 8%	2,920	4,300	6,300	9,300
Value (\$ 1000)	1,520*	Adjusted 8%	1,640	2,400	3,540	5,200

\* Estimated

The progress achieved in this sector has already make it possible to meet local demand.

#### VII.6. Disinfectants and solvents

This group includes the pesticides, which are already being made up and packed locally.

Forecasts for total consumption of DDT, BHC, Dieldrine, copper oxychloride, Endrine, Landane, Coumafene, parathion, etc. are as follows:

	1964	1965	1970	1975	1980
Quantities (tons)	1,694	2,838	4,500	5,900	10,000
Value (\$1000)	604	1,609	3,360	4,700	7,700
including					
- Tonnage of DDT (50%)	75*	152	640	1,100	1,600
- Tonnage of BHC (25%)	745*	1,383	1,720	2,200	3,500

\* Estimated

The average DDT content was calculated for the sake of equivalence. In fact, 75% DDT is used for cotton plants, 50% for coffee plants and 25% for palms and coconut palms.

Most of the other products are listed in cubic metres but they have been reckoned in tons for the total.

Other forecasts gave the following figures:

4,000 to 4,500 tons in 1965,

9,000 to 10,000 tons in 1970,

but they seem too optimistic. Projects have been submitted for the manufacture of an additional 2,000 tons of products with an investment of \$200,000 (\$60,000 being for buildings). A \$400,000 extension would be envisaged for 1975, designed to cover 80 per cent of the national needs. All the constituent elements are imported.

The question of the possible manufacture of basic products is linked with that of the electrolysis of sodium chloride, which is a matter that concerns the sub-region as a whole.

#### VII.7. Explosives

The main explosives utilized are organic derivatives, representing a value of \$17,200 (1964 figure). Consumption is declining, as in the whole of this sector. It depends mainly on large-scale works, for the country's mining industry is of minor importance.

Forecasts for total consumption may be estimated as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	54	Adjusted 7%	58	80	110	160

The market prospects are insufficient to justify the consideration of manufacturing locally. The problem must be examined at the level of the sub-region as a whole.

#### VII.8. Plastics

These rank second in the customs statistics for 1964 values. The rate of increase is 41 per cent per year for weight and 27 per cent for value. Future prospects would be as follows (rounded figures):

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	4,229	41%	6,000	33,000	185,000	1,030,000
Value (\$1000)	2,884	27%	3,700	12,000	40,000	132,000

Allowing for the more realistic rates of 25 per cent now, 20 per cent in 1965, 15 per cent after 1968 and 10 per cent after 1970, calculated in respect of local undertakings, the forecasts would work out as follows:

	1964	1965	1968	1970	1975	1980
Quantity (tons)	4,229	5,250	9,000	12,000	19,000	30,600
including:						
- Tonnage of PCV	1,700*	2,200	3,300	4,000	6,000	9,000
- Tonnage of polyethylene	1,700*	200	2,600	3,000	5,000	8,000

\* Estimated

These estimates represent capacities too small to justify local manufacture of basic products. In fact the minimum capacity to ensure profitability in this type of enterprise is recognized to be 15,000 tons for PVC and 10,000 tons for polystyrene. The problem is one for the sub-region as a whole. It is possible, however, on the other hand, to develop the injection and extrusion processes already in use. It is estimated that an extension of the existing installations would suffice to meet the needs of the Ivory Coast market, a importation does not seem possible.

The Ivory Coast lacks raw materials for the manufacture of plastic resins, but the establishment of the Abidjan refinery raises new possibilities.

#### VII.9. Caustic soda

Caustic soda is connected with soap production, for which an increase rate of 4 per cent has been indicated. The requirements in caustic soda for the production of soap may be estimated as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	1,500	1,500	1,770	2,150	2,600

For the time being the market is relatively limited. It will increase significantly as new industries are set up or existing ones expanded (oil and petroleum refineries, textile industries, manufacture of detergents, paper pulp, etc.). But in spite of this appreciable addition to the demand for caustic soda, the question of its possible manufacture is one for the sub-region as a whole.



VII.10. Calcium carbide

It is used in the production of acetylene for autogenous welding. With the development of electric welding, its rate of consumption is likely to rise more slowly, and the statistics confirm this. Its other uses (manufacture of plastics) can only be for large-scale production and hydrocarbons are now used as raw material. Increased demand, therefore, depends upon the possible manufacture of polyvinylchloride.

If we adopt the cautious rate of 7 per cent, taken for the other countries, the forecasts would be:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	520	Adjusted 7%	560	780	1100	1500

The production of calcium carbide must therefore be considered at the level of the sub-region as a whole.

### VII.11 Fertilizers

This sector comes third in the imports for 1964. According to the customs statistics, the total increase would be as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	21,426	16%	24,700	52,000	110,000	231,000
Value (\$1000)	1,477	13%	1,670	3,100	5,700	10,500

These figures could be broken down into various types of fertilizer, (nitrogenous, phosphatic or potassic), but an anomaly at once appears in the consumption of nitrogenous fertilizers, which seems to be decreasing. We therefore have to look for more exact estimates from other sources of information. These are summarized in the following table (in rounded figures) with indication of the source:

Year	Estimate	Total tonnage	N (tons)	P <sub>2</sub> O <sub>5</sub> (tons)	K <sub>2</sub> O (tons)
1965	Agricultural prospects <sup>1/</sup>	36,300	4,100	2,100	7,800
	10-year prospects <sup>2/</sup>	47,000	5,600	3,600	10,900
1970	F.W. Hauck <sup>2/</sup>	?	5,000	5,000	5,000
"	S.S.E.P.C. Survey	26,000(SA)	-	5,500	Not indicated
"	reissued by ECA <sup>2/</sup>	+30,600(SS) or 11,700(ST)			
"	Agricultural prospects	72,600	7,600	5,700	13,500
"	Kellerman Report <sup>4/</sup>	72,200	8,460	6,750	14,950
"	Other estimate	+ 20% per year	10,700	4,700	21,500
"	10-year prospects <sup>1/</sup>	99,500	11,600	10,300	21,700
1975	Agricultural prospects <sup>1/</sup>	123,800	13,000	12,000	27,000
"	Kellerman Report <sup>4/</sup>	126,500	13,700	12,600	28,200

<sup>1/</sup> Various studies made for the Ivory Coast Government and based on the surfaces cultivated.

<sup>2/</sup> E/CN.14/INR/70 - F.W. Hauck: Soil Fertility and Fertilizers in West Africa.

<sup>3/</sup> E/CN.14/246 and E/CN.14/INR/73

(SA) Ammonium sulphate

(SS) Supersimple

(ST) Supertriple

<sup>4/</sup> J. Kellerman - The Consumption of Fertilizers in the Ivory Coast - Feb. 1963.

According to the method used for calculating fertilizer requirements, estimates may vary in the proportion of one to two. The study made by the Société sénégalaise d'engrais et de produits chimiques used as reference in the ECA reports seems pessimistic.

If the tonnages indicated in 1965 are taken as references, the forecasts for the consumption of fertilizers are as follows:

	1964	1965	1970	1975	1980
Tonnage of N	2,500	5,000	9,000	17,000	33,000
Tonnage of $P_2O_5$	1,400	1,800	7,000	13,000	25,000
Tonnage of $K_2O$	5,300	7,000	13,000	23,000	43,000

The estimates given in the Kellerman report have served in the drafting of various projects for fertilizer factories. One of these projects was to utilize the by-products (gas or naphtha) of the Abidjan refinery to make ammonia, at a rate of 50 tons a day, producing 13,500 tons a year. The factory would also produce sulphuric acid by oxydizing the sulphydric acid ( $H_2S$ ) recuperated from the refinery and adding imported sulphur to make up the required amount. Part of the ammonia would be transformed into nitric acid, at the rate of 85 tons per day, giving an annual production of 24,200 tons a year. By adding potash to the sulfonitric mixture, fertilizers could be manufactured, with an average formula of 10.10.22, at the rate of 365 tons per day, giving a production of 107,000 tons a year. The installed energy of the factory would be 5,000 kw and it would consume 1,650  $m^3/h$  of cooling water and 75  $m^3/h$  of demineralized water.

Investment required for the first stage would be about \$8 million. With a further investment of \$4 million for the second stage, production capacity would be brought up to 150,000 tons a year. Surplus production would be exported to Mali.

Another project was to manufacture a variety of products (20,000 tons of ammonium sulphate, 12,000 tons of simple superphosphate and 30,000 tons of complex 9-9-18 fertilizers), importing the raw materials: phosphate, sulphur and ammonium nitrate. It had been planned to start production in 1967/68 at the rate of 50,000 tons a year, increasing to 60,000 tons in 1970. \$4.2 million were to be invested. The ammonia was to be imported. Work has not yet been begun on the project.

It should also be mentioned that since 1963 the factory for treating domestic waste, which was installed at Abidjan by the Omnium d'assainissement, processes 50 tons of waste a day for making compost. This is used on the plantations, and is an organic manure rich in humus.

#### VII.12 Salt

Cooking salt is an imported product in the Ivory Coast. It is true that the country has many kilometres of coast-line, but the attempts to set up salt works at Sassandra or Grand-Drevin did not meet with success.

Salt consumption is increasing at the rate of 13 per cent for quantity and 22 per cent for value. Taking into consideration the fact that the per capita consumption in the Ivory Coast is already very high, it is wiser to adopt the 5 per cent rate, which gives us the following forecasts:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	22,900	Adjusted 5%	24,000	30,700	39,200	50,000
Value (\$1000)	690	Adjusted 5%	720	930	1,180	1,500

The question will be reconsidered at the level of the sub-region as a whole.

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Also, data compiled by the author during the Mission to the Ivory Coast.

## F. GUINEA

### I. GENERAL CHARACTERISTICS

#### I.1. Population:

3,360,000 inhabitants (1963);

Annual growth rate 1958-1963: 3%

Population projection (in thousands):

1965: 3,400

1975: 4,325

1970: 3,800

1980: 5,030

#### I.2. Area:

245,857 km<sup>2</sup>

#### I.3. Population density:

14 inhabitants per km<sup>2</sup> (1963)

I.4. The Republic of Guinea has chosen planning as its way of development. Determined to put an end to the consequences of foreign domination, it has given priority to industrialization as a development factor. To make the transition from the economy of an agricultural country, and moreover a country in which the agriculture is very largely a subsistence agriculture, to the economy of an industrial country, is far from easy. Such a transition, which has to be the result of an evolution costly both in money and time, cannot be accomplished in a hurry.

To industrialize an under-developed country means starting from scratch. The factors which influence and make possible the existence of industries, small, medium or large, in the developed countries (labour, intermediate and higher grade staff, means of transport, exploitation of thermal and hydroelectric sources of energy, investment capital, institutions providing theoretical and practical education) are lacking and have to be created, often over long initial periods, before a developing country can develop an industry of any importance. Moreover, the industrialization of a developing country can only be achieved by stages, and some stages can only be begun several years after the beginning of the first stage of the plan.

Guinea's industrial development demands very great effort. Its purpose will be to industrialize and turn to account the country's large resources in mining, agriculture, animal husbandry and fisheries, in order to achieve a reduction in the imports of consumer goods and a rapid increase in the exports of mining products, either in the form of raw minerals or transferred by future transformation industries.

Guinea possesses exceptionally good prospects for a balanced and rapid economic development: as far as industry is concerned, it has vast reserves of high content bauxite, and its no less important reserves of hydroelectric energy provide good prospects for a prosperous aluminium industry. There are very large iron ore reserves in Mount Simabou and Mount Nimba, with a high iron content - up to 35 per cent, and more in places. A new technical process facilitates the rational exploitation of the Kaloum reserves. There are deposits of good quality diamonds. All these resources are concentrated within a reasonable area. But the prosperous future augured by this remarkable industrial potential must be based on a prosperous agriculture. In this realm also Guinea has a remarkable potential: vast possibilities for the growing of rice, bananas, cotton, sugar cane, pineapple, fruits and vegetables.

Its agriculture can be developed so as to provide it with a most varied range of crops of fruit, cereals and vegetables, exceeding in volume the requirements of a population ten times larger than its present one.

One whole part of the country's forest zone contains the most sought-after species of tropical woods. The Foutah, and the Belya, Kankan, Siguiiri and Boké districts could be used to make livestock rearing one of the country's main sources of revenue.

Guinea's territorial waters, along the whole length of its coast-line, are known to be very rich in fish and already attract fishermen from every continent. In addition, industrial fishing in general and tunny-fishing in particular, are regarded as immediate means of developing Guinea's economy.

Balanced economic development should link the various economic sectors together especially the industrial and agricultural sectors. As part of this new approach, the food industries are called upon to play an important part in the economic development process.

## II. MINERAL RESOURCES

### II.1. Bauxite

There are a number of deposits and the total reserves are reported to exceed 1000 million tons. Total production estimates (in round figures) are as follows:

	(thousands of tons)
1955-1959 (average) .....	392
1960 .....	1,378
1961 .....	1,767
1962 .....	1,450
1963 .....	1,664
1964 .....	1,678

Estimates for 1965 and 1966/67 (in tons)

Deposits	Estimates		
	1965 1st half-year	1965 2nd half-year	for 1966/67
Kassa .	104,067	150,000	About 150,000 tons per year if possible, in view of exhaustion of deposit.
Fria ..	710,000	710,000	About 1.8 million tons per year, to supply the aluminium works after extension.

Quantities and values of exports of bauxite:

Year	Quantity (in tons)	Value (in millions of Fr. G)	Percentage of total exports
1960	704,835	1,128	8.85%
1961	341,578	608	4.01%
1962	13,064	23	0.20%

The bauxite is exported mainly to Canada and the German Federal Republic.

II.1.1. The Fria Plateau deposit

This deposit is mined by the Compagnie internationale pour la production de l'alumine, situated 150 km from Conakry. The Kimbo reserves are estimated to amount to 140 million tons, with a 42-44 per cent alumina and 25 per cent iron content. It is an open-cast mine, with a production capacity of 1.5 million tons a year (started in 1960).

The Kimbo aluminium works at present produce 480,000 tons a year. 10 per cent of the production is exported to Cameroon, to be treated at the Edea works, the rest of the aluminium production being exported to Europe. Investments amount to \$140 million.



The following table shows the growing influence of bauxite processing on the country's foreign trade balance.

Quantities and values of alumina exports:

Year	Quantity (in tons)	Values (in millions of Fr. G)	Percentage of total exports
1960	171,376	2,622.9	20.58%
1961	462,901	7,146.9	47.10%
1962	441,124	6,631.2	59.82%

Two plans have been put forward to triple the capacity of the aluminium works and bring it up to 1,400,000 tons a year, in successive amounts of 240,000 annually; to build a dam on the Konkouré (\$160 million of investments); and to set up an aluminium plant (an additional \$140 million).

#### II.1.2 The Kassa deposits

These deposits are situated in the Los Islands, near Conakry, and up to November 1962 were mined by the Société des bauxites du Midi. The reserves are over 10 million tons, containing 53 per cent alumina and 11 per cent iron. Mining began in 1952, with an investment of 12 million dollars and a production capacity of 400,000 to 550,000 tons a year. The entire production is intended for export.

#### II.1.3. The Boké deposit

The deposit is situated 300 km north of Conakry. An agreement was signed in 1957 between the Société des bauxites du Midi and the Government of Guinea for the exploitation of the reserves, estimated at 400 million tons, and containing 45-50 per cent of aluminium and a small amount of silica. The contract provided for the extraction of 1.5 million tons per year and a plant to treat 220,000 tons of alumina per year. The estimated investment required was \$80 million and up to 1961 20 millions had been spent. But the estimates were too low and \$150 million more were needed to carry out the programme. Work was suspended for lack of capital.

The Government decided to nationalize the Kassa and Boké plants and to expropriate the Société des bauxites du Midi, which led to the stoppage of work at Kassa in 1962.

Since October 1963 the concession has been taken up by a new company (Harvey Aluminium Co.) with government participation. With the new investments (\$50 million) it should be possible to attain production of one million tons a year, with 5,000 workers. A calcination plant is also to be installed to treat 200,000 tons a year. The Government is making every effort to have it working by 1967.

#### II.1.4. Other deposits

The following must also be mentioned:

the Dabola Fongué area, 450 km from Conakry, where there are reserves said to consist of several hundred million tons, with a 40 per cent alumina content;

the Kindia area, 140 km from Conakry, near Conakry-Niger; these reserves are estimated to amount to 100 million tons, with a 40 per cent alumina content;

occurrences have been discovered near the Portuguese Guinea frontier.

#### II.2. Iron

The total production for 1963-65 and the production estimates are as follows (in tons):

	1963	1964	1965 (1st half-year)	Estimates	
				1965 (2nd half-year)	1966/67
<u>Compagnie Minière</u>	750,000	728,596	546,295	600,000	About 1,200,000 tons per year

The entire production is intended for export.

##### II.2.1. The Kaloun mines

These are situated close to Conakry and have been operated since 1953 by the Compagnie Minière de Conakry (CMC). The reserves are estimated to be from 500 to 3,000 million tons of lateritic type ore, containing 52 per cent of iron and 9 per cent of alumina in the case of type A and 55 per cent iron in the case of type C (type B is of little importance).

The estimate for initial investment was \$5 million; by 1963 it exceeded \$9 millions and it is now \$11 millions.

Annual production at present is 1.2 million tons per year, at 56 per cent, and it could easily reach 12,000 tons a day if a market were found for it.

#### II.2.2. The Mount Nimba and Mount Simonou deposits

These are situated 800 and 1,000 km from Conakry, near the frontiers with Liberia and the Ivory Coast. The reserves are estimated at 200 and 700 million tons respectively and the average iron content is 63 per cent.

In August 1961 an agreement was signed between the Government and the Consortium européen pour le développement des réserves de l'Afrique (CONSAFRIQUE) for simultaneous mining of the two deposits. Estimated investment would be \$100 million for the first stage (\$200 millions in all) with Japanese participation. Estimated production: 5-6 million tons when the mine is working fully. The Government hopes that it may start before 1969.

#### II.2.3. Other deposits

There is a third promising deposit at Konbokoly, but so far only preliminary studies have been made there.

#### II.3. Diamonds

Unofficial production was 500,000 carats in 1960, 600,000 coming from the Siguiro area, and 670 km from Conakry. It was only 350,000 carats in 1962 after the nationalization of the mines.

Official production figures for 1963-65 and estimated figures for 1966-67 are:

1963 .....	52,069 carats	- 250,108,000 frs. G
1964 .....	41,860 "	- 251,160,000 frs. G.
1965 (1st half-year)	25,992 "	

Estimated:

1965 (2nd half-year)	25,000 carats
1966/67	about 50,000 carats per year.

The Government's target, under the Seven-Year Plan, is to bring the annual production of diamonds up to 500,000 carats. The geological prospects are favourable. Several deposits, representing 800,000 carats, have been discovered.

#### II.4. Gold

There are from 10,000 to 15,000 professional gold-washers and a considerable number of casual prospectors looking for gold in Guinea, mainly in the Siguiri area, north of Kackan. The deposits are poor: 1 to 2 g per m<sup>3</sup>, or sometimes 5 g. Production is very variable and never recorded. Near the Bonova vein there is said to be a plant with a capacity for floating 100 tons a day.

#### II.5. Occurrences of other metals

Prospecting carried out in 1962-63 located the following:

Limestone in the Siguiri area, 670 km from Conakry. The reserves are estimated to be 50 million tons;

Granitic marble, black, pink, green and red, near Kindia. The Morifonyé pink granite deposit, estimated at 70,000 F. per m<sup>3</sup>, is situated right on the coast;

Manganese, 225 km. north west of Conakry;

Leucite. This is a silicate of aluminium and potassium, of volcanic origin, corresponding to the theoretical formula  $4 \text{SiO}_2 \text{Al}_2\text{O}_3 \text{K}_2\text{O}$ .

Analysis of the nephelinitic syenites in the Los Islands gives the following results:

	$\text{SiO}_2$	$\text{Al}_2\text{O}_3$	$\text{K}_2\text{O}$	$\text{Na}_2\text{O}$
Sample 1606	55.38	22.74	4.5	11.29
Sample 1	57.80	17.50	7.0	6.00

These syenites also contain iron ( $\text{Fe}_2\text{O}_3$ ),  $\text{FeO}$ ,  $\text{CaO}$  from 7 to 12 %. This leucite is enriched on the site by electromagnetic separation, until the  $\text{K}_2\text{O}$  content is 17 - 18 %; the resulting concentrate then contains about 85 % of leucite, the rest being basalt. The iron content is 2 - 3 % of  $\text{Fe}_2\text{O}_3$ . The concentrate still contains too much silica (53 - 55 %) to be economically suitable for the calcination process, but it lends itself well to treatment by  $\text{HCl}$  or  $\text{HNO}_3$  at a temperature of 70 - 80 °C. These processes have been studied at length in the test installations of the Electrochimica Company at Bussi in Italy. Pechiney et Ugine have also worked on these products.

The Italiana Potassa Company has yet another process, utilizing hydrochloric acid.

After crushing, the leucite is loaded into containers for HCl treatment. As a result of the exothermic reactions, the temperature remains at 80°. The final solution obtained is free of silica and retains the aluminium and potassium chlorides. By cooling, the solution leaves a deposit of KCl, which is used directly as a fertilizer. The aluminium chloride gives  $\text{AlCl}_3 \cdot 3\text{H}_2\text{O}$  which is decomposed by heat treatment into  $\text{Al}(\text{OH})_3$  and HCl which is put back again. The process is difficult on account of the aggressivity of the HCl gas in contact with the material used.

The process is the same with  $\text{HNO}_3$ . The nitrates are separated by fractioned crystallization and after taking out the  $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ , which crystallizes first, the potassium nitrate is crystallized by addition of concentrated  $\text{HNO}_3$ . Information concerning the processes carried out in Italy might help towards finding a method for enriching the Los Islands syenites.

The Guinean subsoil also contains chrome, nickel, kaolin and rare soils.

It is clear from the foregoing that none of the mineral resources at present known in Guinea seems suitable for the development of a chemical industry. As pointed out by the Battelle Institute<sup>1/</sup>, the distance from Conakry (670 km) makes the transport of the Siguiri limestone too costly for economic exploitation and the utilization of the nephelinic syenites from the Los Islands depends upon long-term research. The situation might improve if the Konkouré dam is built, its waters being used to supply an electrochemical works. Unfortunately, as things are at present, raw materials have to be imported.

### III. ELECTRIC ENERGY, FUEL AND WATER

#### III.1. Electric energy

III.1.1. Like most of the developing countries, Guinea lacks the electric power necessary for its economic development. At some time or another this lack of energy is liable to delay the installation and even the planning of new industries. The present installed electric energy can produce up to 57,000 kVA, divided into small units, as the following table shows:

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<sup>1/</sup> See E/CN.14/INR/73.

Installed electric energy

Thermal:

Conakry	5,800 kVA	
Namou	260 "	
Lobé	185 "	
Boké	185 "	
Kankan	375 "	
Macenta	200 "	
Fria	37,500 "	
	<hr/> 44,505 kVA	44,505 kVA

Hydroelectric:

The great waterfalls	12,500 kVA	
Lobé	150 "	
	<hr/> 12,650 kVA	12,650 kVA

Total installed 57,155 kVA

As part of the 1960-63 three-year plan additional electric power stations are being installed, to provide a total source of energy of 18,200 kVA:

Thermal:

Conakry	4,200 kVA
5 regional towns.      Total power	1,500 "

Hydroelectric:

The great waterfalls	12,500 "
	<hr/> 18,200 kVA

In order to meet the country's most pressing needs, the Directorate of Energy, which is part of the Ministry of Economic Development, is negotiating with the Tudor Engineering Company of Washington D.C., a project for setting up a number of small electric power stations. The project covers only the immediate needs of 19 regional towns at present lacking electric energy for the population, the agriculture and some small industrial workshops.

The national consumption of electrical energy has risen from 18.8 million kWh in 1958 to 151 millions in 1964, i.e. an increase of 700 %. Production for the same period has risen from 21 million to 168 million kWh. These figures are higher than those for consumption, the difference being represented by the losses due to the transport of the energy.

III.1.2. The following are the tariffs in force at Conakry:

From 6 h. to 13 h. and from 14.30 h. to 18 h.	0.40 frs. G kWh
From 13 h. to 14.30 h. and from 22 h. to 6 h.	5.60 "
From 18 h. to 22 h.	14.10 "

On the basis of these figures, the average rate per day comes to:

\$ US 0.035 per kWh

In addition, to the running expenses there is a fixed rate of \$ US 26.00 per kW per month on the installation work. The tariffs have not been changed since 1957, although application of the economic index would mean an increase of 40 per cent. Being anxious to promote an investment policy, the Government preferred to reduce the profit margin rather than increase the price per kW.

III.1.3. Guinea's hydroelectric potential is very favourable to industrialization. The potential is estimated to be 63.2 thousand million kWh, and in 1958 productibility was estimated to be 13.6 thousand million kWh, as the following table shows:

Watershed	Potential of watershed 10 <sup>9</sup> kWh	Total Productibility 10 <sup>9</sup> kWh	Utilization coefficient
Konkouré	12.0	6.0	0.50
Fatala	2.0	0.7	0.38
Hogon	2.0	0.2	0.10
Holenté	2.5	0.2	0.08
Tominé	6.5	2.0	0.32
Gambie	4.5	0.5	0.11
Bofing	10.0	3.0	0.30
Upper Niger	23.7	1.0	0.04
Totals	63.2	13.6	0.21

So far no plans have been made to harness these hydroelectric resources for use. According to information received in Guinea, the French authorities had begun a series of fairly intensive operations to measure the flow from the watersheds listed in the above table, but had not completed the work, which generally takes ten years or more. The purpose of the work had been to permit final selection of the waterfall or watershed on which a full preliminary study should be completed. The Konkuré watershed was the one on which the most advanced studies had been made, but the results are only partially known.

Setting up small electricity plants to reinforce a local electricity system does not involve long and detailed preparation nor take a very long time, but the installation of large hydroelectric power stations requires a long period of preparation and planning.

In some cases it may take as long as ten years to measure the flow of a water source, and the planning of a hydroelectric power plant may mean having experts at work over a period of three to five years.

Generally speaking, the placing of orders for large hydroelectric plants, then building and installing them, requires at least five years, during which time the civil engineering work at the site of the waterfall is being done.

So it must be reckoned that for a major project to make use of a waterfall, it will take 18 to 20 years from the time the surveys for measuring the flow are begun until the hydroelectric plant starts to work.

Consequently, it is obvious that the period of preparation for a major hydroelectric project is so long that it cannot but affect the country's entire industrialization planning. That being so, Guinea, with its considerable mining resources, which will need electric power much greater than the present potential if they are to be exploited industrially, must give absolute priority to the planning of its future electricity supply system.

### III.2. Fuel

So far no petroleum deposits have been found in Guinea; hypotheses as to the existence of any important oil-fields are pessimistic. However, no serious research has been done to justify the affirmation that there are none.

Plans have been drafted for the establishment of a petroleum-gasoline-aviation spirit-diesel oil-tar refinery. It is estimated that 750,000 tons would be needed annually to produce 50 per cent of the heavy products essential for the calcinated bauxite and aluminium industries and for operating transport and agricultural machinery, etc. The site selected is Kaparo, on the coast. The project is being studied; a 12-year credit has been granted and the work is scheduled as part of the Seven-Year Plan.



### III.3. Water

At the time of nationalization (1961), the installations supplied only 13,000 m<sup>3</sup> of water a day, whereas the minimum requirements were about 19,000 m<sup>3</sup>. Of these 13,000 m<sup>3</sup>, 9,000 m<sup>3</sup> were obtained from wells at Kakimbon, Aviation, Belle-Vue, UCDA and Stade, and 4,000 m<sup>3</sup> from water taken from the Lamicouré, Samocouré, Fecouré and Kitema rivers on the slopes of Mount Kakoulina; two pipelines, one of 300 mm and the other of 500 mm bring the water from these various sources respectively to the Belle-Vue reservoirs, which have a capacity of 2,700 m<sup>3</sup> and to Chateau d'Eau, which has a capacity of 2,750 m<sup>3</sup>.

On 30 July 1964 the contract for carrying out the water adduction project for the town of Conakry, in connexion with the Kalé dam project, was signed between the Government of the Republic of Guinea and the German group of companies Stahl Union-Phoenix-Rhein-Rohr. The installations were put into operation on 11 February 1964.

The new pipeline, 82 km. long, is in welded steel, in two parts:

- (1) From the great waterfalls to Yessoulou (44 km long and 800 mm in diameter),
- (2) From Yessoulou to Conakry-Aviation, (35 km long, 700 mm in diameter).

The former pipeline was in cast iron, 30 km long and only 300 mm in diameter.

The new filtration works have 7 filter-beds with a total filtering surface of 350 m<sup>2</sup>, as compared with 12 m<sup>2</sup> at the old works. The new pipeline leads to a 10,000 m<sup>3</sup> reservoir near the airport, joined to the town water supply system by a steel pipe feeding the secondary reservoir at Belle-Vue. The capacity of the former reservoirs was only 2,750 m<sup>3</sup>. The 40,000 m<sup>3</sup> of water made available to the Conakry region by the new pipeline provides an abundant regular supply for the population, whose needs are estimated to be 25,000 m<sup>3</sup> a day as compared with 19,000 m<sup>3</sup> in 1958.

The increased need for water resulting from the rate of expansion scheduled in the national development programme will necessitate using the present installations at maximum capacity, i.e. 500,000 m<sup>3</sup> per day. This will be made possible by improving the Conakry distribution system. It is foreseen that the reservoirs and filtration plant will make it possible to bring the total capacity of the installations as a whole to 80,000 m<sup>3</sup> per day, with only a modest investment of funds.

In addition to the Conakry supply, the Seven-Year Plan provides for water supplies for all the regional capitals. Studies concerning 12 towns have been completed and tenders for contracts examined. The studies concerning the remaining towns will soon be finished and the work is scheduled as part of the Seven-Year Plan.

#### IV. EXISTING INDUSTRY

Apart from mining, industry in Guinea is not yet very diversified. Lack of capital has led to the postponement of many important projects which the Government is trying to negotiate with foreign enterprises. Except for the remarkable FRIA factory (480,000 tons of alumina annually), Guinea does not at present possess any real industry, only workshops and small industries which partially meet the needs of the population.

IV.1 Among the existing industries, the following are worthy of note:

IV.1.1 The Kobaya ceramic brick-works, 25 km from Conakry, completed in 1963. Initially the Kobaya works were to produce 16 million units per year, 9 million to be bricks of varying dimensions and 7 million flat tiles. But the increasing needs of the building industry have already brought the production of bricks up to 12 million a year. The bricks are mainly functional in type, used for supporting walls or for filling in, and for ground or facade surfacing or flooring.

IV.1.2 N'Zerekore sawmill and plywood factory, which started work in 1964 with a production capacity of 50,000 m<sup>3</sup> of rough timber, 2,400 m<sup>3</sup> of veneer and 6,000 m<sup>3</sup> of plywood. At the present rate of cutting, the rich forests of Dické, Koulé, Lené and Gama can supply the sawmill for a hundred years, with over a hundred different species of timber.

IV.1.3. The Sonfonia furniture factory, opened in 1964. Annual production capacity: 33,000 ordinary chairs, 4,200 armchairs, 10,200 school benches, 600 wardrobes, 600 blackboards, 2,700 office desks, 2,300 cupboards of various kinds, 1,200 beds, 13,700 various joinery articles, 30,000 packing cases. The raw material comes from the N'Zerekore sawmill. A few finishing materials and accessories are imported. The factory also makes packing cases, doors and windows, with or without shutters. It can do any other special joinery work to order. Its production capacity is 100,000 articles; plans have already been made to extend the works.

IV.1.4. The Wassawassa cigarette and match factory, near Conakry, completed in 1964. Annual production capacity: 24 million packets of cigarettes and 48 million boxes of matches. It will be supplied with imported tobacco and imported stripped wood.

IV.1.5. The Mamou food products industrial complex, situated south of Fouta-Djalon, opened in 1964. It consists of a canning factory and an abattoir with cold storage.

(a) The canning factory comprises:

A section which prepares and cans the goods (total capacity: 5 million cans a year).

A section which makes the cans (60,000-70,000 cans per 8-hour shift),

A cold storage unit with a capacity of 50 tons.

(b) The abattoir, with butchery, and porkmeat and sausage-making section unit attached, and cold storage facilities, can deal with 50 cattle, 600 sheep, and 20 pigs a day, the cold storage unit being able to stock 100 tons of finished products.

The installed annual production capacities for a one-shift day, with a normal rate of supply, is as follows:

Tomatoes	3,000 tons
Various vegetables	600 "
Fruit	300 "
Meat	780 "

During this first year, production covered the factory's capacity for making the prepared substances ready for canning, (purée etc.) up to the following amounts:

Tomatoes	20%
Various vegetables	20%
Fruit	30%
Meat	3%

These relatively low figures are the result of the difficulty of organizing and educating the rural populations of Middle Guinea, who have the task of supplying this complex. Constant in its desire to make the enterprise a complete success, the Government has fixed a special price of 25 frs. per kg of tomatoes delivered at the factory and, for the next campaign, has organized tomato and vegetable production on a hundred hectares of land at a farm at Linson, in order to ensure that the factory will receive at least half its required supply.

Meat production during the past year was on a trial basis, the refrigerated abattoir only having been put into use on 8 May 1965. It is equipped for diversified production, which will play a decisive part in achieving a profitable exploitation of Middle Guinea's numerous livestock. Butcher's meat can be produced there and the town of Conakry supplied at less cost, the meat being transported in lorries, under refrigeration. The automatic skinning and industrial treatment of hides in Conakry's modern abattoir will make it possible to send supplies under the best possible conditions (1000 tons of skins annually) to the Conakry tannery and shoe factory which is being quickly built at the present time.

By inducing considerable increases in agricultural and animal production in the whole of Middle Guinea, the Mamou factory will be successfully fulfilling its function as a stimulator of economic development in Middle Guinea. Its task will be facilitated by the general infrastructure now being built up, which will make Mamou the main meeting point of the roadways linking up Conakry via Kindia with Kissidougou, via Faronah with Kankan, and via Dabola with Kouroussa.

The Kinkon dam, to be inaugurated in 1966 will increase the supply of electric energy in the region by means of a 30 kg high tension cable passing alongside the Pita-Dalaba-Mamou axis and ending north of Labé.

The factory extensions to be completed shortly will provide a new automatic production line for orange juice, essences and concentrates, which will process 5 tons of citrus fruits per hour and so turn to account the 20,000 tons of these fruits at present wasted annually in these regions.

IV.1.6. The Atlantide brewery and lemonade factory at Matom. This is a private company and the total investment required to start it was about 35 million frs G. It had a production capacity of 8,000 to 10,000 bottles a day in 1960, which has risen to 2,000 to 3,000 since 1962. Production consists of aerated drinks, syrups, bleaching liquid (eau de Javel) and vinegar. It is all absorbed by the local market.

IV.1.7.. COPROA (Comptoir des Produits Africains) is a limited company entirely run by private capital. It has a factory in the Madina district of Conakry and its main activity is the production of pineapple slices, pineapple juice, and orange and grapefruit crush. It owns a 966-hectare plantation which supplies the factory with its raw material, the capacity being 30,000 tons per year. It should be noted that Guinea is a specially suitable country for pineapples. The investment needed to start the enterprise was about 99,068,350 frs. G; it has modern installations and can process seven and a half tons per hour. In 1963 effective production was 1,088 tons of pineapple. About one-third of this was taken by the domestic market, two-thirds being for export.

IV.1.8. "Fruitaguinée" has a factory at km 4 on the road to the airport at Conakry, with a capacity of 4,500 33-centilitre bottles per day of aerated fruit drinks. It is planned to increase the factory's production capacity and also produce bleach (eau de javel), washing compounds and vinegar.

IV.1.9. La Société des brasseries de Guinée (SOBRAGUI) has a brewery with a production capacity of 6,000 bottles an hour, and a second production line for aerated waters with a capacity of 6,000 bottles an hour. The production capacity in syrups of all flavours is 10,000 0.66 litre bottles per month. 15 tons of ice-cream per day are produced, in brine tanks, with three 600,000-frigorie compressors. Manufacture of carbonic gas. Manufacture of vinegar and oil: Bottling of vinegar after treatment: 300,000 litres per year. Edible oil in labelled bottles. Eau de javel and MIR liquid soap are also produced.

IV.1.10. "Torrefaction guinéenne" is one of the few factories producing consumer goods which uses local raw materials almost exclusively. It is situated at Dabondy, km 11 on the road to the airport. At present three qualities of soluble coffee (Turkish coffee) and express coffee are produced. Filter coffee alone represents about 60 per cent of the total production. With the present installations, one ton per day can be produced. The factory plans to increase its production.

IV.1.11. Dubreka oil factory: a small pilot unit producing palm oil. Dubreka administrative district possess 12,000 hectares of wild palm trees of average density. Calculations showed that 24,000 tons per year could be used. With these available reserves, 40 small hydraulic presses could be set up which could treat 4 tons of palm kernels per day. One hydraulic press is already in operation and another is being installed.

IV.1.12. The Factory for plastic articles makes mainly sandals, raincoats and packing materials, all from PCV, for which the raw material is imported. The factory fulfils an important function in supplying almost all the footwear and an appreciable proportion of the raincoats for the population of Guinea and a fairly high proportion of the material for packing fruit.

IV.1.13. A small paint and lacquer factory, supplying only a small part of the paint products needed in the country.

IV.1.14. A quinine factory. This factory was closed for over a year but has now resumed production.

IV.1.15. A company producing oxygen and acetylene working at 25 or 30 per cent of its capacity (16,000 m<sup>3</sup> of oxygen per month).

IV.1.16. A workshop for making steel constructions, which produces a number of standard constructions for shops and small workshops, based on interchangeable parts, composed of soldered sections. It supplies only a small part of the country's needs and could serve as the example for similar workshops which might be set up, not only at Conakry but also in some regional towns.

IV.1.17. The "Patrice Lumumba" printing works. This is a large printing works with very up-to-date equipment and a potential far exceeding the country's present needs. It lacks the experienced hands and supervisory staff needed for operating the extensive machinery installed there. It would be useful to bring in from abroad a small number of specialists, managers and workers who would be able to find supplementary uses for the equipment, at present not fully used, and to train Guinean workmen and managers.

IV.2. New factories where trial production has already begun.

IV.2.1. The Sanoya textile complex, 38 km. from Conakry, on the road to Kindia. It is an imposing group of buildings, comprising three factories:

Spinning factory

Weaving factory

Finishing factory.

Capacity: 22 million metres of cotton cloth, unbleached, white or printed.

Equipment: 22,000 spindles; 700 looms

Cost: 2.5 thousand million frs. G.

The building of the complex began in May 1964 and was finished in June 1965. The raw material consists of 4,000 tons of cotton a year, at present imported. In the near future this intake capacity should easily be covered by local production. The trial production amounts to 40,000 metres of unbleached cotton cloth. The labour force required is 1,200 of which one-third would be women.

IV.2.2. The prefabricated housing factory, at km 17 on the Conakry-Kindia road. The investment cost, to be amortized in 20 years, is 178,000,000 frs.G. The annual production capacity is 300 houses of 90 m<sup>2</sup>. A house can be put up in less than four days, with a team of six to eight unskilled workers. The parts are cast in moulds, glazed and dried at the factory, then transported to the site. The parts are made of reinforced concrete with an addition of 350 kg per m<sup>3</sup> of cement; they are slabs measuring 1.10 by 3.10 m and weighing 380 kg.

IV.2.3. The floor-tiles factory, situated on the south side of the Conakry-Kindia road, at km 17 is a section of the "Société industrielle d'exploitation de Granit Guinéen" (SIGRAG). Building of the factory began in April 1964 and was completed in October 1964. The investment cost is estimated to be 78,000,000 frs.G. and is amortizable in 20 years.

As at May 1 1965, the factory was producing 25,000 m<sup>2</sup> a year and had 20 workers and two managers. In the near future production will rise to 250,000 m<sup>2</sup> per year and there will be 80 workers.

With a production worth 375,000,000 frs.G., in the near future this factory will make it possible to cease importing floor tiles entirely. It should be noted that before it came into operation, Guinea imported tiles to a value of 225 million frs.G.

IV.2.4. Granite crushing: 80,000 m<sup>2</sup> per year of crushed granite for road-surfacing ballast and building work.

IV.2.5. A lorry-assembling plant (Conakry) for 700 vehicles of six different types. The plant is equipped for assembling various makes of light vehicles, and agricultural tractors. The capital will gradually be increased, by Guinea and its American partner (Mack Trucks) \$US 2 million. So far sixty lorries have been assembled and delivered to customers.

IV.3. Factories being built and schedules for starting work at the end of 1965:

IV.3.1. The Army's industrial complex (Camp Alpha Yaya)

Tannery, treating 1,000 tons of skins per year

Shoe factory: 500 pairs per day

Clothing factory

Machine workshop

IV.3.2. A sugar refinery with a sugar-cane plantation (Madina Oula). An annual production of 30,000 tons of refined sugar is planned. So far 40 hectares have been planted with sugar-cane at Medina Oula, near Kindia; 400 are to be planted in 1966 and 4,000 in 1967.

IV.3.3. A factory producing aluminium goods (Conakry). Later this factory will be supplied from the production of the proposed aluminium works. Building is nearly finished and in the first year it is to produce 1,000 tons of utensils and 1,000 tons of building material (corrugated sheeting). Estimated capacity during the first stage is 2,500 tons of aluminium.

IV.3.4. Composition-board panels factory at Seredou, to make 12,000 m<sup>3</sup> per year or 40 tons per day. It is to use cinchona bark from the quinine factory and various waste products from the Seredou timber works. Hydro electric plant of 800 kW.

IV.3.5. The Foulayah complex (near Kindia). Estimated investment 87 million frs.G. The initial project provided for a total production capacity of:

6,000 bottles per hour or 14 million per year of health drinks made of local products;

5,000 bottles per hour or 12 million per year of chocolate milk, made from the DITINN dairy farm.

IV.3.6. The Conakry biscuit works (private enterprise)

300 tons of biscuits annually

3,000 tons of bread (single team of workers)



#### IV.4. The chemical industry in Guinea

At present Guinea has no chemical industry. Factories existing or now being built consist of only the following:

A plastic articles factory (see IV.1.12)

A small paint and lacquer factory (see IV.1.13)

A quinine factory (see IV.1.14)

An oxygen and acetylene factory (see IV.1.15).

The lack of chemical factories properly speaking, does not mean that the Government is not interested in setting up a chemical industry. Introduction of this branch of industry is envisaged in the Seven-Year Plan.

#### V. THE PRESENT MARKET FOR CHEMICALS

Guinea does not yet possess a Central Statistical Service, and partial statistics only are available in the various Ministries. Moreover, as there are no experienced statisticians, the information obtained is not generally adequate for producing over-all statistics.

The following tables concern the trade statistics for 1960-1962 (the statistics for 1963 and 1964 are not yet published). They also show the place occupied by imported chemical products in the total import figures.

Table 1

Imports: chemical and related products (tonnage)

Classification	1960	1961	1962	Annual rate
53 Dyes, varnishes and paints ...	258	235	254	
54 Pharmaceutical products .....	157	344	1,097	165 %
553 Perfumery .....	78	54	65	Minus
554 Common soap, toilet soap and other soaps .....	2,134	403	2,826	15 %
56 Fertilizers .....	7,325	5,295	13,372	35%
59 Industrial parachemical products .....	2,396	1,710	3,198	15 %

Table 2

Imports: chemical and related products (value) (Thousands of dollars)

Classification	1960	1961	1962	Annual rate
53 Dyes, varnishes and paints ...	131	122	151	7 %
54 Pharmaceutical products .....	487	1,484	1,970	101 %
553 Perfumery .....	103	108	73	Minus
554 Ordinary soap, toilet soap and other soaps .....	438	126	600	17 %
56 Fertilizers .....	349	380	570	21 %
59 Industrial parachemical products .....	920	851	1,060	7 %
Total .....	2,428	3,071	4,364	34 %

Table 3

Imports of chemical products in relation to total imports into Guinea  
(Thousands of dollars)

Year	Total imports	Chemical products
1960 .....	42,296	2,428
	100 %	4.9 %
1961 .....	72,018	3,071
	100 %	4.3 %
1962 .....	64,776	4,364
	100 %	6.7 %

## VI. PLANNING THE CHEMICAL INDUSTRY IN GUINEA

The preceding tables refer only to imports, for in the chemical industries the volume of exports is negligible. In view of the lack of more detailed statistics and the shortness of the period of reference, it is not possible to discern a clearly defined tendency in the market for these products. That being so, for the forecasts, it seems necessary and reasonable to apply the increase rates calculated in the light of experience acquired in other countries.

#### VI.1. Pharmaceutical products

The quantities recorded do not provide usable figures, because of the diversity of the products. The increase rates of 101% calculated for average values and 165% for the figures per year in weight are extremely high, as the tonnage and the values recorded in 1960 and 1961 are particularly low.

	1962	Annual rate	1965	1970	1975	1980
Quantity (tons)	1097	Adjusted 6%	1410	1900	2500	3400
Value (\$1000)	1970	Adjusted 8%	2670	3900	5800	8500

As in other developing countries, a pharmaceutical industry could begin simply as a transformation industry based on pharmaceutical products imported in bulk from the great world industries, to be put up in tablet form and packed at small local works.

#### VI.2. Soap

The annual increase in the consumption of soap is 15 per cent by weight and 17 per cent by value. In view of the general trend in the soap market, which is likely to go down in the coming years, it seems wise to adopt the 18 per cent rate, i.e.:

	1962	Annual rate	1965	1970	1975	1980
Quantity (tons)	2826	Adjusted 8%	3600	5200	7700	11300
Value (\$1000)	600	Adjusted 8%	750	1100	1600	2400

The market is large enough to justify the installation of soap factories, which could use the pastes from the refining of groundnut oils and imported palm and palmetto oil.

Study of the plan for the Hassa oil refinery has already been completed and work is to be begun on it next October. It will be equipped with machines capable of treating daily 50 tons of copra, palmetto and cotton-seed and of refining the palm oil. Supplies will be brought by cabotage along the coast where there is copra and palm production amounting to 14,000 tons and 10,000 tons respectively. The factory could also refine 3,000 tons of palm oil, which is the amount of present local consumption.

There is also a project to install a groundnut oil refinery at Dabola with an initial capacity of 7,000 tons of nuts, producing 3,500 tons of refined oil.

The production of palm kernel oil is only increasing slowly. The first step will be to plant large nurseries of dwarf palms in the various palm groves. These dwarf trees will only produce nuts in 5 to 7 years. It will only be after extensive improvement in the cultivation of oil-yielding trees and after the creation of a surplus justifying industrialization, that full supplies of raw materials will be forthcoming for industries based on this surplus, such as the following:

Soap factories

Margarine factories.

### VI.3. Fertilizers

The annual increase in the consumption of fertilizers is 35 per cent by weight and 21 per cent by value. At present it is mainly the banana and pineapple crop for which fertilizers are used regularly. When the cultivation of cotton is started, a certain amount may be required for it. The use of fertilizers for the food crops (maize and rice) and for coffee, is being studied.

According to the Office des bananes et fruits de Guinée, imports of fertilizers in 1964 for the banana and pineapple plantations, were as follows:

Urea . . . . .	3,888 tons
Ammonium sulphate . . . .	373 "
Potassium chloride . . . .	4,490 "
Potassium sulphate . . . .	700 "
Magnesium sulphate . . . .	399 "

No phosphate was imported in 1964 as a two-year supply of 8,000 tons had been imported in 1963. After a great deal of research, the latest recommendations of the Institut des recherches fruitières at Foulayah on the use of fertilizers are as follows:

#### A. Bananas

Ammonium sulphate . . . . .	1 kg per plant per year
or technically prepared urea . . . .	0.5 kg " " " "
Potassium chloride . . . . .	0.5 to 0.8 kg per plant per year
Natural phosphate . . . . .	1 kg per plant in 2 years

It should be noted that growers are accustomed to natural phosphate, simply "ground", and so prefer it to superphosphate. It is expected that the amount exported will increase from 50,000 tons a year in 1965 to 120,000 tons in 1970, on the one hand,

by increasing the plantations to 5,000 hectares and, on the other, precisely, by improving the yield per hectare by using fertilizers.

The future annual consumption of natural phosphate may be estimated as follows:

0.5 kg x 2,000 plants x 5,000 hectares = 5,000 tons, i.e.:

Dicalcic phosphate, about . . .	2,500 tons per year
Potassium chloride . . . . .	2,500 " " "
Ammonium sulphate, about . . .	10,000 " " "
or technically prepared urea	5,000 " " "

B. Pineapple

Ammonium sulphate . . . . .	0.040 kg per plant in 18 months
Potassium sulphate . . . . .	0.028 kg " " " " "
Natural phosphate . . . . .	0.022 kg " " " " "

The number of plants per hectare is calculated to be between 38,000 and 44,000, and the cultivated surface 1,000 hectares. It is estimated that between now and 1970 exports will rise from 4,000 tons to 20,000 tons a year. It seems therefore that the cultivated area in 1970 would be about 4,000 hectares, which would mean:

(a) A consumption of natural phosphate of:

about 0.014 kg x 40,000 plants = 560 kg/hectare/year  
and 560 kg/hectare/year x 4,000 hectares = 2,240 tons/year  
i.e. in dicalcic phosphate, about ..... 1,000 tons/year

(b) A consumption of ammonium sulphate of

about 0.027 x 40,000 plants = 1.08 tons/hectare/year  
and 1.08 tons/hectare/year x 4,000 hectares = 4,320 tons/year

(c) A consumption of potassium sulphate of

about 0.019 x 40,000 plants = 760 kg/hectare/year  
and 760 kg/hectare/year x 4,000 hectares = 3,040 tons/year.

According to estimates based on data from the Office des bananes et fruits de Guinée, it seems that by 1970 Guinea could be expected to use, for bananas and pineapple:

Ammonium sulphate . . . . .	14,320 tons/year
Potassium chloride . . . . .	5,000 " "
Potassium sulphate . . . . .	3,040 " "
Dicalcic phosphate . . . . .	3,500 " "

Using the various sources of information, the estimates for 1970 work out as follows:

	Tons of N	Tons of P <sub>2</sub> O <sub>5</sub>	Tons of K <sub>2</sub> O
Calculation taken from the plan of the <u>Office des bananes et fruits de Guinée</u> - corrected for other crops	3,000	3,500	3,000
According to the ECA study <sup>(1)</sup>	2,500	1,800	..
According to F.W. Hauck <sup>(2)</sup>	2,000	2,000	2,000

Taking rounded figures and using the data of the Office des bananes et fruits de Guinée for reference, an average estimate would be:

	1965	1970	1975	1980
Tonnage of N	1,700	3,000	6,000	12,000
Tonnage of P <sub>2</sub> O <sub>5</sub>	2,000	3,500	6,000	12,000
Tonnage of K <sub>2</sub> O	1,700	3,000	6,000	12,000

General economic studies concerning the installation of a factory for ammonium and phosphate fertilizers are being carried out.

(1) Basic Chemicals and Fertilizers (E/CN.14/INR/73).

(2) F.W. Hauck - Soil Fertility and Fertilizers in West Africa (E/CN.14/INR/70).

#### VI.4. Plastics

The existing factory making plastic articles at present uses two raw materials based on PVC.

##### (a) PVC for sheets

PVC Solvic 136, 400 tons per year at 1700 frs per ton c.i.f. Conakry. Solvic 136 is imported from France (Solvic = Solvay France), but other sources have been used, for instance, Great Britain and Belgium. The various qualities of sheets are:

12/100 and 14/100 for raincoats

2/100 for tablecloths

30/100 for covers (as for cars, awnings, etc.)

The main uses are:

For raincoats, about .... 300,000 m<sup>2</sup>

For sheets of various kinds .... 300,000 m<sup>2</sup>

The waste material is used for making hosepipes and other flexible piping, etc. It should be noted that Guinea is the only country in West Africa to possess a factory for making sheet plastic.

##### (b) Benvic

This is an already plastified compound made from Solvic: 600 tons per year at 2420 frs per ton c.i.f. Conakry. This provides the material for making about 1 million pairs of footwear. It is estimated that the production of rainwear may be tripled to meet the demand. With regard to footwear, the risk that rubber or leather may take the place of plastic should not be exaggerated. It is true that plastic footwear could be much improved to suit the consumer's taste.

New types of production should be envisaged:

Various recipients for individual use (bowls, glasses, cups, etc...)

Various types of packing material or containers for the new industries, in particular the food industries,

Rigid or flexible piping for water adduction or waste pipes.

Without being able to give figures, as a study is now in progress, one is entitled to be very optimistic concerning the future of the plastic industry in Guinea.

It seems that the consumption of plastics for Guinea for 1965-1970 may be foreseen as follows:

	Annual rate	1965	1970	1975	1980
Quantity (tons)	x)	1500	4500	9000	14,500
including					
Tonnage of PVC	10%	1150	1850	3000	4,850
Tonnage of polyethylene	10%	-	800	1300	2,100

x) 25% now, 15% after 1970 and 10% after 1975

The market is too limited to justify the existence of a factory for basic products for Guinea alone; the problem of possible manufacture can only be considered within the framework of the sub-region. The possible production of basic products is connected with the utilization of chlorine and consequently with the electrolysis of marine salt. Studies are being made concerning a factory for polyvinyl chloride, to be obtained by the action of chloride on acetylene, the latter being produced from calcium carbide.

#### VI.5. Caustic soda

At present, the main consumer of caustic soda is the industry which processes bauxite to alumina. In addition to the various requirements in caustic soda for washing compounds, soaps and explosives, the present needs of FRIA are 30,000 tons a year. Two projects have been put forward for tripling the capacity of the Kimbo alumina works and bringing it from 480,000 tons to 1,400,000 per year, in successive stages of 240,000 tons per year.

Before very long the projects for installing an alumina plant in the region of Boké must also be taken into account. If the present capacity for making aluminium in Guinea were doubled, this would create a demand for 60,000 tons of caustic soda.

In these circumstances, future demand cannot be estimated by a simple extrapolation of the present market trends, for it depends largely upon the production of alumina.



Taking account of that situation, the estimates would work out as follows (round figures):

	1965	1970	1975	1980
Quantity (tons)	30,000	30,520	60,770	91,130
made up as follows:				
For soap production	-	520	770	1,130
For aluminium manufacture	30,000	30,000	60,000	90,000

General economic studies with a view to the installation of the caustic soda and chlorine factory are in progress. With the Konkouré dam, electrolysis of salt would give the quantity of caustic soda necessary for treatment of the bauxite by the Bayer process. Capacity of the factory: 30,000 - 35,000 tons of caustic soda. At the same time, 27,000 tons of chlorine would be available for the chemical industry. The study concerning the installation of a caustic soda factory in Guinea should begin by examining the possibility of making use of part of the chlorine which the factory would produce. In any case the problem is one to be considered at the level of the subregion.

#### VI.6. Disinfectants and solvents

At present it is mainly for the banana and pineapple crops that insecticides are regularly used. In spite of the fact that these products change very rapidly and that the newest insecticides may be more effective and are preferred by the specialists, it must be borne in mind that BHC continues to possess some undeniable advantages (simplicity in use and limited toxic effect on human beings and domestic animals), whereas serious precautions are necessary with the new products, which means that they can only be used by technical experts. According to the Institut de recherches fruitières, 25% BHC is sufficient to combat the banana weevil. For pineapples, parathion is advised.

According to the ECA study<sup>(1)</sup> the consumption of insecticides in Guinea in 1963 was:

DDT (75%) - 340 tons per year  
BHC (25%) - 700 " " "

(1) Basic Chemicals and Fertilizers (E/CN.14/INR/73)

In 1964 imports of insecticides for the banana and pineapple plantations amounted to 462 tons of 25% BHC. For the banana crop the recommendations of the Institut de recherches fruitières are:

2 spreadings of 30 grammes per plant per year, i.e.: 60 gr x 2,000 plants = 120 kg per hectare per year, which gives the following requirements for the banana plantations for 1970:

120 kg/hectare/year x 5,000 hectares = 600 tons per year of 25% BHC.

If we take into account the needs in other sectors of the anti-insect campaign and assume a 10 per cent annual increase, we arrive at the following estimates:

	Annual rate	1965	1970	1975	1980
Quantity (tons)	10%	2,200	3,600	6,000	9,500
including					
Tonnage of 50% DDT	10%	510	825	1,320	2,100
Tonnage of 25% BHC	10%	650	1,050	1,690	2,700

The market is expanding and is large enough to justify the development of local production. The manufacture of basic products should be examined at the level of the sub-region as a whole.

#### VI.7. Salt

All along the Atlantic coast there are small home industries for the production of sea salt, which could be developed into industrial production. Present local production of salt is reported to be about 3,000 to 5,000 tons a year, but it contains impurities and is apparently unfit for producing soda. Imports represent about 12,000 tons a year. Requirements for food and the future fisheries may be estimated at 30,000 - 40,000 tons per year.

Taking into account in addition the manufacture of soda for the aluminium factories, consumption estimates would be:

	1965	1970	1975	1980
Quantity (tons)	15,900	21,300	75,500	85,200
made up as follows:				
For food	15,900	21,300	28,400	38,100
For electrolysis	-	-	47,100	47,100

Economic studies concerning the installation of a salt works are being carried out. They relate to salterns or vacuum evaporation for the production of 30,000 tons of sea salt at Coyah or at Victoria, near Boké. A pilot installation could be put into operation to determine the most profitable technological process.

#### VI.8. Surface-active agents and washing compounds

In view of the increase in demand for these products in the other countries, the following consumption figures seem an appropriate estimate for Guinea for 1965-1980:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	174 <sup>x)</sup>	Adjusted 10%	205	480	1,100	2,500
Value (\$1000)	60 <sup>x)</sup>	Adjusted 18%	71	160	370	850

x) Estimated

The domestic market seems large enough to justify local production.

#### VI.9. Perfumes and cosmetics

The value of present consumption appears to be about \$200,000 a year. Adopting the 7 per cent per annum increase rate, estimates of future consumption work out as follows:

	1964	Annual rate	1965	1970	1975	1980
Value (\$1,000)	200 <sup>x)</sup>	Adjusted 18%	215	300	420	600

x) Estimated

It can be estimated that the production and packing firms could meet 60-80 per cent of the country's needs.

#### VI.10 Pigments, paints, varnishes

The present demand is estimated to be about 400 tons, representing \$240,000 a year. Taking into consideration the present very small per capita consumption (almost six times less than in the Ivory Coast and Ghana), it seems wise to adopt 12 per cent as the rate, which gives the following estimates:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	400 <sup>x)</sup>	Adjusted 12%	450	800	1,400	2,400
Value (\$1,000)	240 <sup>x)</sup>	Adjusted 12%	270	470	830	1,470

x) Estimated

The market is large enough to justify the development of local production. It should be possible to organize means of supplying about 60 to 80 per cent of the local market. Certain special paints will still have to be imported.

#### VI.11. Explosives

The quantities imported are not indicated. On the basis of comparison with the other countries, the estimates would be as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	1,200 <sup>x)</sup>	Adjusted 7%	1,280	1,800	2,500	3,500

x) Estimated

The market is too limited to justify the installation of a factory for basic products except for the sub-region as a whole. Only the putting up and packing of explosives can be envisaged.

#### VI.12. Calcium carbide

The import figures are not known. Here again estimates have to be calculated on a basis of comparison with the other countries.

Applying the 7 per cent rate adopted for the other countries, the estimates work out as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	250 <sup>x)</sup>	Adjusted 7%	270	380	530	740

x) Estimated

The market is not large enough to justify production by one country alone.

### VI.13. Mineral products

A list of Guinea's natural resources shows that the country possesses a vast range of mineral resources, some very extensive and, in general, of a fairly high content, which could therefore be exploited profitably. We have also seen that prospection of the mining resources is far from complete and consequently it is obvious that for the time being, industrial planning designed to turn the country's mining resources to account, can only be based on the mining of bauxite, diamonds and iron ore.

Prospecting for limestone deposits has not yet reached the stage at which estimates of extent and depth can be given and it is difficult as yet to draw any conclusions as to the possibilities of large-scale mining of these deposits. The importance of limestone for Guinea's economy is obvious: Crushed into gravel form, limestone would be much cheaper than granite, which is the only kind of stone at present used for that purpose in the country. The presence of a limestone deposit, if it did not contain too much magnesium, would mean that Guinea could set up a lime industry, necessary on account of the great distances and the humid climate, which prevents the transport of quicklime. The existence of large limestone deposits would make it possible to develop a cement industry based on the use of imported petroleum and the production of calcium carbide.

We should mention the fact that the programme of the Seven-Year Plan includes the construction of a cement works with a production capacity of 100,000 tons of cement to meet the needs for building and important infrastructure works. The first unit is to be built in collaboration with Sierra Leone. The second stage will include the installation of a clinker grinding plant at Conakry. Finally, when transport facilities have been improved, a factory will be built at Kouroundé, near Siguiri, close to the deposit.

#### VI.14. Other products

The fact that the countries surrounding Guinea are among the largest growers of hevea and the largest producers of rubber, indicates that there might be interesting possibilities for Guinea itself in this sphere. It is recommended that the possibilities of growing hevea in Guinea should be studied. If successful, it would open up interesting possibilities for industrialization, with the manufacture of motor tyres and inner tubes. With this end in view it is recommended that after successful cultivation of hevea in experimental plantations, contacts should be made with one of the main world tyre makers, to propose that it should consider starting a tyre industry in Guinea. The first stage would have to be to set up a low-investment works for retreading used tyres, the subsequent objective being to convert it gradually for the production of tyres and tubes.

This method has been used in other developing countries as a step towards the full production of tyres. It must be borne in mind that if a company is formed to develop cultivation of the hevea rubber tree, it will be from 5 to 10 years before one or more factories for the manufacture of tyres and tubes with local raw materials can start work.

It must be added that the project for setting up a retread works capable of dealing with 15,000 tyres a year is being studied.

VI.14.2. The fact that cassava (manioc) can be grown almost anywhere in Guinea and that it is one of the best crops for making starch, justifies installing a starch factory in the near future. With this end in view it is recommended that concentrated plantations of cassava should be sown in order to rationalize harvesting and transport towards one or more starch factories.

The present state of the international starch market guarantees the possibility of finding outlets for the exports of Guinea's surplus production.

VI.14.3. There is no doubt that fishing will continue to increase in Guinea, and that being so, the creation of an industry to absorb the seasonal surpluses will become necessary. It is recommended that a project for the production of fish meal should be studied now. The world market for fish meal is not saturated and the possibility of setting up this branch of industry in Guinea, in the fairly near future seems quite promising. The amount of capital required for starting fish meal factories is fairly modest compared with the value of their annual production.

VII. OTHER PROJECTS ENVISAGED IN THE SEVEN-YEAR PLAN

Guinea's Seven-Year Plan includes in its programme, under the heading of industrialization, 34 industrial operations and 7 mining operations, amounting to a total expenditure of 117.65 thousand million frs. G. including the investments for exploiting the main mining resources.

This sum is divided up as follows:

Mining.....	87.65	thousand million frs.	G
Chemical complex.....	9.00	"	"
Ironworks, electricity.....	5.00	"	"
Various industries.....	16.00	"	"
	117.65	thousand million frs.	G

Projects not so far mentioned, concerning which general economic studies are at present being made, include the following:

VII.1. Kankan juice and concentrates factory

This factory will be capable of processing seven tons per hour, i.e. 16,000 tons per year (with one shift), of citrus and other fruits from Upper Guinea and the forest region (tomatoes, lemons, oranges, mangoes, pineapples, papayas) to make concentrated juices and essential oils.

VII.2. Cotton-ginning plants

Installation capable of treating up to 4,000 tons of cotton to supply the textile factory. The cotton-seed will go to the Hassa oil factory.

VII.3. Pottery and ceramics factory

As an extension of the Kobayah factory or near the Coyah Kaolin and pegmatite deposits. Production of plates and toilet articles.

VII.4. Rope and sack factory

For making ropes, and cord and sacks for packing, from sisal fibre.

VII.5. Paper works

Manufacture of paper pulp from rice straw, and production of wrapping paper and printing paper.

VII.6. Mass production of cycles and motorcycles

Works to be installed at Kankan capable of assembling 15,000 two-wheeled machines: motorcycles, power-bicycles and bicycles.

VII.7. Assembly shop for radio sets

Chain assembly of 10,000 transistors, with repair shop and manufacture of electric batteries.

VII.8. Shoemaking and tanning works

Capacity: 200,000 pairs per year per shift.

It must be borne in mind that this is not an exhaustive list and that other projects may come into existence, either within the activities of the Seven-Year Plan for economic development or on the initiative of private enterprise.



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## G. SENEGAL

### I. GENERAL CHARACTERISTICS

#### I.1. Population

3,360,000 inhabitants (1963)

Annual growth rate 1958-1963: 2.6 per cent.

Population projection (in thousands)

1965:	3,475	1975:	4,145
1970:	3,765	1980:	4,630

#### I.2. Area:

196,200 km<sup>2</sup>

#### I.3. Population density:

17 inhabitants/km<sup>2</sup> (1963)

I.4. Geologically the relief of the country is fairly unified. It consists of a huge plain which rises towards the east, where the bed-rock gradually comes to the surface at heights barely exceeding 200 metres. The climate throughout Senegal consists of a short humid season followed by a long dry one (seven to nine months). This produces savannah vegetation, shrubby in the south but petering out into Sahelian forms towards the north.

The coast, however, enjoys exceptionally pleasant climatic conditions up to 20-40 kilometres inland, with a fairly humid atmosphere and mean maximum temperatures 3-10 degrees lower than in the interior.

The breakdown of the Senegalese population by economic activity is as follows:

Agriculture, stock raising, forestry and fishing	77.8 per cent
Industry and crafts	10.5 per cent
Trade and services	11.7 per cent

Out of a total area of about 20 million hectares, 7,600,000 ha are cultivable and 2,058,000 ha actually cultivated each year. The records for the 1963-1964 season show that one million hectares were sown with groundnuts (production 930,000 tons), 865,000 ha with sorghum millet (production 420,000 tons), 31,000 ha with maize, 95,000 ha with rice, 50,000 ha with niebes and 38,000 ha with cassava (manioc), the remainder being accounted for by vegetable-growing. The importance of the groundnut by comparison with other food crops is immediately evident.

Senegal eats more food than it grows, and has to import cereals (145,000 tons of rice were imported in 1963). Technical surveys and studies have shown that the food deficit is due to poor yields rather than insufficient acreage under cultivation. As a result the authorities, in addition to pursuing a crop diversification policy, have paid special attention to increasing area yields by intensive mechanization and by organizing campaigns against cereal-destroying pests.

Table 1 illustrates the part played by groundnuts in Senegal's exports.

The groundnut industries occupy a leading position in Senegal. Exports of groundnut products in the form of shelled nuts, raw and refined oil, cake, soap-making paste etc. account for 90 per cent of all exports.

In addition groundnut shells are used as fuel in electricity and edible oil production.

Foodstuffs industries also occupy an important place in the national economy. Senegal was the first of the countries of former French West Africa to become industrialized, which means that it can meet most of its own requirements and export general consumer goods to its neighbours.

The part played by industry in the national economy is shown in table 2.

Table 1

Exports from Senegal

(Quantities in thousands of tons, values in millions of dollars)

Description	1961		1962		1963		1964	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1. Shelled groundnuts	269.4	46.3	276.7	47.7	203.6	35.3	213.9	36.9
2. Raw groundnut oil	114.2	42.3	102.7	37.9	78.0	28.8	103.3	38.0
3. Refined groundnut oil	11.6	4.7	17.9	6.5	25.6	10.2	26.2	10.8
4. Groundnut cake	180.7	9.5	163.9	8.6	145.4	7.7	184.3	9.7
5. Calcium phosphate	308.6	4.2	350.4	4.7	346.3	4.7	633.2	8.7
6. Canned fish	4.3	3.9	3.3	4.4	7.0	7.1	5.2	4.6
7. Wheat flour	16.2	2.3	18.1	2.5	16.1	2.2	18.4	2.6
8. Bran	33.6	1.2	28.1	1.2	22.3	0.9	26.4	1.0
9. Aluminium calcium phosphate	90.3	1.0	86.0	0.8	49.4	0.6	88.2	0.9
10. Footwear	0.5	0.6	0.3	0.4	0.3	0.4	0.5	0.9
11. Phosphatic fertilizers	19.0	0.4	32.8	0.9	13.6	0.3	23.1	0.5
12. Hides and skins	1.5	0.9	1.1	0.8	1.2	0.6	1.3	0.8
13. Nuts, palm kernels	4.9	0.6	5.6	0.6	4.0	0.4	4.3	0.5
14. Other products	55.5	6.3	58.3	7.2	94.7	11.3	35.4	6.6
Total:	1,110.3	124.2	1143.2	124.2	1,007.5	110.5	1,363.7	122.5

Source: Statistical department, Situation économique du Sénégal, 1962, 1963 and 1964.

Table 2

Origin of gross domestic product at factor cost by branch of activity (value in millions of dollars)

Description	1959	1960	1961	1962
1. Agriculture	93.7	103.9	106.8	109.9
2. Energy and mines	9.7	11.2	14.4	11.7
3. Foodstuff industries	14.8	15.6	19.6	19.6
4. Textiles and leather	16.2	17.4	17.6	18.0
5. Miscellaneous industries	10.5	11.1	11.0	11.3
6. Building materials	22.8	20.6	21.0	24.9
7. Transport	28.6	28.0	25.3	24.7
8. Trade	166.1	166.0	185.6	198.9
9. Services	31.1	31.1	31.1	31.1
10. Administration (wages and salaries)	86.9	87.8	89.3	98.7
11. Domestic services	5.8	5.8	5.8	5.8
12. Statistical adjustment	2.6	8.7	0.7	3.2
- Gross domestic product at factor cost	488.8	507.2	528.2	557.8
13. Plus: indirect taxes	87.9	83.6	93.9	100.0
- Gross domestic product at market price	576.7	590.8	622.1	657.8

The National Assembly of Senegal adopted the first Four-Year Development Plan (1961-1964) on 8 May 1961.

After the Plan had been in operation for two years it was found that unexpected developments in the economic situation and various other factors necessitated "reorientating" the Plan by bringing its targets into line with the country's resources, and vice versa, although the basic aims remained the same. The revised Plan was adopted by the National Assembly in 1964.

The second Four-Year Plan has been in preparation since 1964. The Conseil Supérieur du Plan has adopted an outline growth forecast which aims at:

An annual growth rate of 3 per cent per capita in household consumption;

An annual growth rate of some 6 per cent in the gross domestic product (including rural producers' own consumption);

The highest possible gross investment rate consistent with general stability, i.e. approximately 16 per cent of the gross domestic product in the final year;

The maintenance at all costs of a balanced budget, which will entail restricting the annual increase in operating costs to a maximum of 5 per cent;

The following sectoral breakdown of investment:

Infrastructure	for CFA 13,000 million	11.8 per cent
Rural production	" " 32,000 "	29.0 per cent
Industry and trade (including modern- ization and 4,500 million for petroleum and mineral exploration)	" " 40,000 "	36.3 per cent
Education and training	" " 7,000 "	6.5 per cent
Hygiene and health	" " 2,000 "	2.0 per cent
Building and housing	" " 16,000 "	14.5 per cent

## II. MINERAL RESOURCES

The mineral resources at present worked are aluminium phosphate (Thiès), tricalcium phosphate (Taïba) and titanium-bearing sand (Sangomar). Sea salt is also mined at Kaolack.

The value of mineral production rose from \$6 million in 1962 to \$7.4 million in 1963 and \$8 million in 1964. The production figures are summarized in the following table, which includes sea salt.

<u>Production in thousands of tons</u>	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>
Aluminium phosphate	105.3	139.4	141.4	125.8	120.9
Dried aluminium phosphate	23.7	31.2	41.7	17.7	32.3
Phosphat (fertilizer)	0.9	7.0	5.7	0.8	9.8
Calcium phosphate	93.3	407.0	497.1	469.9	677.1
Ilmenite ( $\text{FeTiO}_3$ )	32.3	23.1	25.5	16.0	1.9
Rutile ( $\text{TiO}_2$ )	-	-	-	0.9	0.1
Zircon ( $\text{ZrO}_2$ , $\text{SiO}_2$ )	10.8	5.4	2.1	3.3	0.9
Sea salt	50	44	48.2	60	56

## II. 1. Aluminium phosphate

The Société Sénégalaise des phosphates de Thiès works a deposit at Pallo which is unique of its kind. It is estimated to contain 40 million tons of ore with a composition of 28-30 per cent  $\text{P}_2\text{O}_5$ , 27-32 per cent alumina  $\text{Al}_2\text{O}_3$ , 6-10 per cent iron oxide  $\text{Fe}_2\text{O}_3$ , 8-11 per cent  $\text{CaO}$ , 1-7 per cent  $\text{SiO}_2$  and about 2 per cent  $\text{TiO}_2$ . Water in combination represents 15-16 per cent.

There are believed to be another 60 million tons of a poorer grade. Mining is by the open-pit method: after the first two or three metres of laterite have been cleared by bulldozer, the ore is loaded on to lorries, screened to remove the fines, crushed and finally graded into three sizes (4-10 mm, 10-40 mm and 40-70 mm).

Some of the ore is calcined at  $500^\circ$  in order to give an enriched  $\text{P}_2\text{O}_5$  content of 35 per cent and make some of the product (approximately 23 per cent) soluble in citrate. The dried phosphate contains 9 per cent  $\text{CaO}$  and 25.5 per cent  $\text{Al}_2\text{O}_3$ .

## II. 2. Calcium phosphate

At Lam-Lam, near Thiès, there is a small reserve estimated to contain 3.5 million tons with a  $\text{P}_2\text{O}_5$  content of 18 per cent, which after crushing is sold under the name of "Balyphos". With its high  $\text{Fe}_2\text{O}_3$  content of 10 per cent, however, the product is only suitable for the home market, and working has virtually been at a standstill since 1953. The crushing and screening plants are used to process ore from Pallo. (Eighty four tons of Balyphos were sold in 1963 and 214 tons in 1964). Prospecting is nevertheless in progress in this sector and new lenses have been found.

The Taïba deposit, 100 km from Dakar and 40 km from Thiès, is estimated to contain 115 million tons of ore with a tricalcium phosphate content of 57 per cent; this can be enriched to give 40 million tons with a concentration of 82 per cent, i.e. 37.5 per cent  $\text{P}_2\text{O}_5$  and 52-54 per cent  $\text{CaO}$ . The product is extracted by clearing the overburden

down to a depth of 20 metres to reach the layer of phosphate, which is then removed, broken up, cleaned and screened. The resulting slurry is then carried by a current of water to the concentration (flotation) and drying plants at a rate of 5,000 tons per day.

The fines (45 per cent) are eliminated and the product is then filtered and stored wet (storage capacity 150,000 tons) prior to being dried in a rotary kiln, which reduces the humidity from 17 to 1.5 per cent. The product can be stored locally or shipped to Dakar, where storage facilities exist for a further 50,000 tons at the harbour. Vessels are loaded at the rate of 1,000 tons per hour.

The capacity of the plant is about 2,000 tons per day, equal to more than 700,000 tons per annum. Scheduled improvements should raise this figure to 1-1.2 million tons by 1965/1966 and 1.8 million by 1969. Additional reserves of 100 million tons are thought to exist at a depth of 30 metres, as well as unevaluated quantities of poorer phosphate.

Other phosphate deposits have been located at Sebikotane and Pointe Sarène, but they seem less interesting economically (the content is 20-25 per cent  $P_2O_5$  plus 12-15 per cent  $Fe_2O_3$ ). A deposit of one million tons exists at Civé near the Mauritanian frontier. This was worked in 1957 but has since been abandoned. In 1964 the average selling price of Senegalese phosphate was \$11.6 per ton. Local consumption in that year was 1,390 tons.

## II. 3. Titanium-bearing sands

There are several deposits on the coast near Rufisque and Djifère. The old Joal-Nianing dune, 120 km from Dakar, is reckoned to contain over 1 million tons of ilmenite, and there are estimated to be another 350,000 tons in Casamance. (The sand has a 10 per cent concentration of ilmenite).

Other reserves north of Dakar, evaluated at several thousand million tons of sand, are believed to have an average concentration of 2 per cent. All these deposits are suitable for open-pit working.

The Société Minière Graziello et Compagnie (SOMICA) has been working these deposits since 1933 and producing the following:

Ilmenite concentrates with 58 per cent  $TiO_2$ ;

Rutile concentrates with 96 per cent  $TiO_2$ ;

Zircon concentrates with 66 per cent  $ZrO_2$ .



The raw ore contains 40-80 per cent of heavy substances (66 per cent ilmenite, 21 per cent silica, 10 per cent zircon and 2 per cent rutile). After pre-concentration on a fibreglass screen in a workshop wagon to obtain 97 per cent heavy substances, the product is transported to Djifère for mechanical processing. This involves washing (to eliminate soluble salts), drying and magnetic separation. It was proposed to set up a new plant at M'Bour to work the deposit intensively, but an excess of chromium in the ore caused the project to be abandoned. The titanium oxide is used in paints and special alloys and the zircon in refractories.

#### II. 4. Sea salt

The present rate of extraction at the Sine-Saloum salt-pans depends on the limited loading facilities at the port of Kaolack, and is confined to 70,000 tons per annum. The salt is sold in 9, 18, 25 and 50-kg bags, or in the case of table salt in small plastic bags. There are still a few artisanal salt-works in existence.

#### II. 5. Iron

Deposits estimated at 40 million tons of 62-64 per cent ore have been found at Kenieba, but they are too widely dispersed and lie 750 km from the coast.

#### II. 6. Limestone

The Bargny deposit, in the Thiès area, supplies the Rufisque cement-works (SOCOCIM), whose capacity was due to be increased to 300,000 tons per annum in 1966 and 400,000 tons two years later.

#### II. 7. Clay

A number of deposits exist, mainly in the Thiès and Kaolack areas.

#### II. 8. Gold

Alluvial deposits have been worked on the Falénie and Tinkisso Rivers since 1950.

#### II. 9. Petroleum

The Diani Niadé oil-field produced 2,400 tons in 1961, 640 tons in 1962 and 1,000 tons in 1963. Other borings are in progress in northern Casamance. The 1961-1964 Plan allowed \$24 million for the development of exploration.

#### II. 10. Natural gas

Occurrences of natural gas are reported near Sebikotane.

#### II. 11. Miscellaneous resources

Occurrences of the following have been found:

Lead and molybdenum in the Tinkoto area;

Diamonds on the Gambia River;

Columbite (tantallite) in the Diambelaye area, etc.

Senegal's mineral resources place it in a favourable position for developing a chemical industry.

### III. ELECTRIC POWER, FUEL AND WATER

Senegal lacks sources of natural energy; it has no oil, or at least none so far, no coal, no dams visible in the immediate future and no harnessable tide - in short, there is an almost total lack of energy and consequently an inevitable dependence on foreign sources.

#### III. 1. Electric power

There are several generating companies in Senegal, the leading undertaking being the Compagnie des Eaux et Electricité de l'Ouest Africain, which produces and distributes electricity in western Senegal. The company has a modern thermal power station at Bel-Air (Dakar) which feeds power to a fairly extensive network. Particular mention should be made of the 30-kV double transmission line between Dakar and Thiès, the Thiès-Saint-Louis, Thiès-M'Bour, Thiès-Tatick and Thiès-Khombole-Bambey-Kaolack-Guinguinéo transmission lines (all 30-kV) and the 90-kV Dakar-Thiès-Taïba transmission line, which is intended to serve the calcium phosphate extraction plant at Taïba. These high-voltage lines are connected to low-voltage distribution networks in the towns en route. The company also has two standby plants, one at Saint-Louis and the other at Kaolack. The other companies operate small power stations supplying the towns in which they are situated.

The following table shows the expansion of electric power production and distribution over the past ten years.

Table 3

Public distribution of electric energy in Senegal  
Growth over ten years

	1953	1963
Installed capacity (kW)	12,800	64,000 (increase: x 5)
Load (kW)	9,000	36,800 (increase: x 4)
Annual power sales (1,000 kWh)	43,200	173,003 (increase: x 4)
No. of consumers	23,188	65,185 (increase: x 2.8)

Source: Dakar Chamber of Commerce, Agriculture and Industry, L'économie du Sénégal, July 1965.

The Compagnie des Eaux et Electricité de l'Ouest Africain has drawn up an expansion programme for 1963-1968 based on projects totalling some \$14 million. The programme includes a new power station and new transmission and distribution lines and the electrification of various centres.

The new power station, to be built near Cap des Biches, will in itself cost about \$6.4 million. An initial 25,000 kW of installed capacity is due to be commissioned in May-June 1966. Depending on future requirements, the installed capacity will be increased to 100,000 kW in 25,000-kW stages. The power station is of the thermal type and will run on fuel oil supplied by the Société Africaine de Raffinage. The kWh price is expected to be \$0.0286, and may even drop to \$0.02 for selected large-scale undertakings.

In Senegal, by contrast with the position in most of the other countries studied, such a tariff enables the undertaking to supply industries in which electric power is not a major factor.

### III.2 Fuel

The Société Africaine de Raffinage was created in April 1961. Holdings were taken up by the big distributing companies. The agreement to set up a refinery was approved on 6 April 1962. The complex has been built between the Rufisque road and the sea, 18 km from Dakar. Seventy-eight hectares of ground, of which about 35 ha are covered by the existing installations, were cleared for the purpose.

The refinery is capable of supplying the products hitherto imported to meet the energy requirements of Senegal's economy: propane, butane, petrol (ordinary and super), paraffin, jet aviation spirit, gas oil, diesel oil and fuel oil. The project cost \$16 million and comprises the following:

A distillation plant with an annual capacity of 600,000 tons, with provision for duplication;

A naphtha catalytic reforming plant;

An auxiliary plant producing steam and electricity from waste heat boilers;

Storage tanks for crude oil (84,000 m<sup>3</sup>) and products (26,000 m<sup>3</sup>);

A distribution network serving the town and the harbour (for loading tankers of up to 60,000 tons) and including a gas pipeline for butane and propane.

Crude oil is imported from Gabon or the Sahara. The existing refinery capacity corresponds to the 1967 consumption forecasts for Senegal, Mauritania and Mali. To enable the refinery capacity to be increased as soon as outlets permit, the main plants (in particular the fractionating tower) have been designed to handle 1,200,000 tons of crude oil. This would simply mean adding a few extra components at a later stage. The refinery employs a staff of about 210, including 70 French technicians. The establishment of this refinery, which enables crude oil to be converted into products, benefits the Senegalese economy by a value-added figure of some \$2 million per annum.

In 1964 the average price of one ton of fuel oil before tax was \$19.4. There is a likelihood that prices will drop considerably when the M'Bao refinery comes on stream.

### III.3 Water

In Senegal, like everywhere else in the world, supplies of fresh water for the inhabitants, industry, crops and livestock are a major problem to which solutions frequently become obsolete owing to demographic, social and economic changes.

The infrastructure set up to supply Dakar with water comprises the following:

The point B pumping station, which collects water from ten wells in area B and pumps it to reservoirs in Avenue Borgnis Desbordes;

The Mamelles station, covering six bore-holes;

The Thiaroye pumping station (six abstraction points);

The Sebikotane plant (four bore-holes).

The distribution network was considerably extended in 1964, when 62 km of mains were laid in newly-developed areas. A new aquifer is also being tapped between Gout and Thiès. This project should provide the city of Dakar with an additional 15,000-20,000 m<sup>3</sup> of water.

The following schemes are due for completion concurrently in 1965:

The laying of 42 km of mains;

The building of two reservoirs (2,500 and 5,000 m<sup>3</sup>);

The erection of a water tower (5,000 m<sup>3</sup>).

A project to abstract water from Lake Guiers has also been studied at top government level. The provision of pumping stations and treatment plants and the laying of 254 km of mains would give the city nearly 100,000 m<sup>3</sup> more water per day.

The Government regards water supply problems as one of its major concerns, and has set up a Ministry of Energy and Water Engineering to promote studies, surveys and detailed projects. The Ministry's activities are now beginning to make themselves felt. In 1963 additional bore-holes were drilled at centres such as Tivaonane, Thiès, Meckhé, N'Doffane, Khombole, Nioro du Rip and Bakerl.

During 1964/1965 it is proposed to improve supplies to Saint-Louis by building a 2,000-m<sup>3</sup> water tower. Once the bore-holes at Sebikotane are drilled, a further 24 km of mains will be laid and water supplied to some ten villages in the direction of Pepenguine.

Ziguinchor will receive an additional 2,400 m<sup>3</sup> per day as a result of the sinking of additional wells and the provision of the necessary electrically-powered pumping units and supply mains.

#### IV. EXISTING INDUSTRY

The following table shows the breakdown of Senegal's main industries by area and sector of activity:

Table 4

Breakdown of industrial establishments by regions

Sector	Area	Cap Vert	Casa- mance	Diour- bel	Fleuve	Eastern Senegal	Sine- Saloum	Thiès	All Senegal
Mining and quarrying		12	-	-	-	-	3	1	16
Foodstuffs		34	1	-	-	-	-	1	36
Edible oil processing		4	1	1	-	-	1	-	7
Beverages		8	-	-	1	-	-	-	9
Tobacco		1	-	-	-	-	-	-	1
Textiles		7	-	-	-	-	-	-	7
Clothing		13	-	-	-	-	-	-	3
Footwear		1	-	-	-	-	-	-	1
Timber (1)		5	1	-	-	-	3	-	9
Paper and board		1	-	-	-	-	-	-	1
Printing		4	-	-	-	-	-	-	4
Chemicals		11	-	-	-	-	-	-	1
Petroleum and petroleum products		1	-	-	-	-	-	-	1
Non-metallic minerals		9	1	-	-	-	1	1	12
Metalworking (2)		23	-	-	-	-	1	1	25
Transport equipment (3)		4	-	-	-	-	-	-	4
Water and electricity		3	-	-	-	1	-	-	4
Total		141	4	1	1	1	9	4	161

Source: Situation économique du Sénégal, 1963

(1) Excluding carpentry firms.

(2) Excluding garages.

(3) Two ship-yards and one trailer factory.

It should be noted that the above table does not include artisanal undertakings (bakeries, carpentry firms, repair shops, etc.) nor building and civil engineering enterprises. The majority of industrial undertakings are located in the Cap Vert area by reason of its infrastructure (harbour, roads, etc.), the density of its population, the standard of living of its inhabitants, the presence of government offices and numerous other advantages (local availability of spare parts, technicians, etc.)

The following table shows the structure of employment in the main undertakings.

Table 5

Employment in industrial undertakings (excluding building and public works)<sup>1/</sup>

Sector	Number of undertakings			Number employed		
	Less than 50 employees	50 employees and over	Total	Less than 50 employees	50 employees and over	Total
Mining and quarrying	3	9	12	79	1,381	1,460
Canning	2	5	7	87	1,293	1,380
Grain and meal	3	3	6	92	622	714
Fish	6	2	8	82	458	540
Edible oil processing	-	7	7	-	2,784	2,784
Other foodstuffs industries	14	3	17	264	254	518
Tobacco	-	1	1	-	173	173
Textiles	4	8	12	90	2,000	2,090
Clothing	9	4	13	172	427	599

<sup>1/</sup> The remarks concerning the previous table also apply to the present one. The data on the number of employees may not always be very recent.

It will be noted that in some sectors the number of undertakings is fewer than in the previous table. This is because undertakings whose staff figures are not known have been excluded.

The trend in production in this area of the economy can be judged from the index of industrial output. The year 1959 has been taken as a basis. The weighting coefficients represent the proportion of value added by each sector (and not merely by the undertakings represented) out of the total value added in 1959. The index is of the Laspeyres' type and its coefficients are constant. The field covered varies according to the sector concerned. The trend in the group and overall indices, which are calculated on an actual output basis, remains unaffected by price movements.

Table 5 (continued)

	Number of undertakings			Number employed		
	Less than 50 employees	50 employees and over	Total	Less than 50 employees	50 employees and over	Total
Footwear	-	1	1	-	589	589
Timber	-	3	3	-	478	478
Paper and board	-	1	1	-	85	85
Printing	4	-	4	63	-	63
Chemicals	7	4	11	141	764	905
Petroleum	-	1	1	-	200	200
Non-metallic minerals	6	4	10	75	484	559
Metalworking	20	5	25	320	500	820
Transport equipment	1	2	3	36	420	456
Water and electricity	2	2	4	24	1,573	1,597
Total	81	65	146	1,525	14,485	16,010

Source: Situation économique du Senegal, 1963.

Table 6

Index of industrial output (1959 = 100)

Sector	Number of undertakings	Weighting coefficient	Annual results				
			1960	1961	1962	1963	1964
Electricity	1	136	127,7	143,7	162,2	165,9	187,1
Mining and quarrying	3	20	167,2	395,6	477,2	438,5	549,1
Building materials	2	56	99,3	106,3	107,0	111,5	116,6
Chemicals	5	45	105,6	101,4	104,2	116,4	109,0
Tobacco, matches	2	129	95,7	94,1	115,9	91,6	85,6
Edible oil processing	6	352	102,4	109,1	107,0	111,2	122,3
Grain and meal <u>1/</u>	5	62	100,6	107,0	112,0	108,4	102,4
Beverages, sugar and confectionery	7	47	96,2	113,2	130,8	143,0	140,7
Canning	5	10	168,6	162,9	203,0	224,5	173,1
Textiles and related products	7	63	113,3	124,8	122,3	134,6	134,0
Footwear	2	36	132,1	159,6	127,6	188,2	158,7
Miscellaneous	6	44	320,4	324,3	223,1	148,3	184,9
Total	51	1,000	117,0	130,0	132,2	131,2	139,0

Source: Statistical Department, Bulletin statistique et économique mensuel, Nos. 1 and 2, 1965.

1/ Including bisquit-making.

Details concerning the main products themselves are given in table 7.



Table 7

## Main industrial products

	Unit	1959	1960	1961	1962	1963	1964
Titanium ore	1,000 tons	38.6	32.3	23.1	25.5	16.0	1.9
Calcium phosphate	1,000 tons	-	93.3	407.0	497.1	469.9	677.1
Aluminium phosphate							
Raw	1,000 tons	95.3	105.3	139.4	141.4	125.8	120.9
Dried	1,000 tons	16.2	23.7	31.2	41.7	17.7	32.3
Conserves	1,000 cans <sup>1/</sup>	12.9	-	15.5	20.4	30.1	...
Metal drums	1,000	57.4	69.8	52.8	59.4	40.7	...
Cement	1,000 tons	171.0	167.7	182.0	183.2	189.6	204.9
Paints and varnishes	tons	1,624	1,912	2,156	2,071	2,863	...
Storage batteries	No.	7,000	8,216	7,970	8,109	9,156	...
Matches	cases <sup>2/</sup>	18,424	11,740	14,897	11,274	10,411	9,735
Tobacco manufactures	tons	1,295	1,283	1,234	1,576	1,235	...
Groundnut oil							
Raw <sup>3/</sup>	tons	99.2	105.6	116.7	107.4	105.0	119.0
Refined <sup>3/</sup>	tons	36.2	38.3	36.0	45.8	52.9	56.4
Soap	tons	10,984	11,438	10,439	10,968	11,492	...
Beer	1,000 hl	102.8	82.5	88.7	97.2	108.7	103.9
Aerated beverages <sup>4/</sup>	1,000 hl	75.8	88.8	117.5	132.6	145.2	...
Canned tunny products	tons <sup>5/</sup>	4,684	7,898	7,627	9,508	10,516	...
Lump sugar	1,000 tons	12.5	11.5	13.7	17.9	17.9	...
Cotton yarn <sup>6/</sup>	tons	360	359	450	602	645	360
Printed cotton fabrics	tons	967	1,211	1,238	1,124	1,177	1,213
Cotton blankets <sup>7/</sup>	tons	417	618	758	688	258	245
Sisal products	tons	1,224	1,454	1,711	1,646	2,065	...
Footwear	1,000 pairs	3,044	3,756	4,765	3,894	5,746	...
Cardboard packagings	tons <sup>9/</sup>	2,780	2,990	3,682	4,060	4,987	...
Oxygen	1,000 m <sup>3</sup>	300	310	294	298	321	...
Acetylene, dissolved	1,000 m <sup>3</sup>	79	81	77	80	84	...
Salt	1,000 tons		50	44	48.2	60	56

Source: Statistical Department, situation économique du Sénégal, 1963; Bulletin statistique et économique mensuel, Nos. 1 and 2, 1965.

- 1/ Standard 1/4-can basis
- 2/ Case containing 7,200 boxes of approximately 50 matches.
- 3/ Figures given on seasonal basis.
- 4/ Confined to output of three main plants.
- 5/ Processed fish.
- 6/ For sale.
- 7/ The difference between these figures and those published in the Bulletin is due to including the output of other undertakings.
- 8/ Rugs, bags and baskets.
- 9/ Processed board.

#### IV.1 Foodstuffs industries

##### Canning

The canning industry is principally concerned with processing sea food. In addition to local activities such as oven cooking (from Rufisque to Gambia), smoking (Casamance and Sine-Saloum), fermentation (Saint-Louis and Fleuve), salting and drying, which involve 1,000 artisan workers and have an annual turnover of some \$1.2 million, five plants with a processing capacity in the region of 30,000 tons and employing over 2,000 workers have been set up.

The main product handled by the industry is tunny, the entire catch being bought by COSICA on behalf of the processing factories. The quantity canned in 1963 was 8,700 tons.

SICA has already started processing the sardinella type of sardine.

A further point of note is that the Dakar processing industry proposes to convert part of its activities to vegetable canning and will participate in the tomato concentrate plant whose introduction is now under study.

##### Beer and aerated beverages

Dakar has only one brewery, SOBOA, which was built in 1929 and has an annual production capacity of 150,000 hl of beer. The cellarage amounts to 20,000 hl and output can rise to 300,000 bottles per day. The refrigerating capacity is 1 million frigories and the daily ice production 64 tons. SOBOA's waste carbon dioxide is used not only for its own aerated beverages but also for those manufactured by SODAGA. In addition to beer, the brewery makes soda water (Spark), an aerated pure fruit juice drink (Judor), various kinds of flavoured drinks (Ricqlès and Simstonic), lemonade and syrups. SODAGA, an associated company, manufactures Coca-Cola and Fanta Soda Water. Sodas de Dakar handles Vérigoud and OK Fip Fop, a soda water which is very well known on the African coast. Tonic Afric supplies Schweppes and Pepsi-Cola, in addition to which there are the Khébé factory, also highly modernized and producing Seven-Up and an excellent soda water called Dakar Exquais, and the Mard Diallo firm, which makes Cap-Vert soda water. The larger cities inland all have their small-scale lemonade concerns.

Beer consumption in Senegal is at present 100,000 hl per annum. As regards aerated beverages, the market has been expanding fairly regularly for some years, and is now estimated at 150,000 hl per annum. The total capacity of the manufacturing plants and small-scale bottling concerns is estimated at 200,000 hl per annum.

### Milling

Two grain mills were built in Dakar after the second world war. Their present crushing capacity is about 150,000 tons of corn, giving approximately 110,000 tons of flour. The whole of Senegal's requirements amount to barely half the grinding capacity of the Dakar mills.

There is also a third mill producing semolina and alimentary pastes and capable of supplying 30,000 tons of processed products per annum. Output is nevertheless far below this figure because consumption is highly seasonal and there is competition from heavy imports of United States millet.

### The sugar industry

The Compagnie Africaine des Produits Alimentaires (CAPA), the only local processing industry, operates a solidifying plant which produces loaf sugar from crystallized sugars imported from France or Madagascar.

Two production lines incorporating up-to-date equipment enable the various operations of drying, packet production and packaging to take place on a fully automatic basis. Output in 1963 exceeded 18,000 tons.

Under the industrialization plans for Senegal, CAPA has recently signed an agreement with the Government to set up a 30,000-ton sugar refinery within three years. This represents an additional investment of some \$2 million.

### Tobacco and cigarettes

There is a large cigarette industry. In 1964 the total output of the Manufacture des Tabacs de l'Ouest Africain (MTOA) was 59,155,000 packets of cigarettes, equal to some 1,216 tons of tobacco. MTOA's equipment is of the very latest design and enables it to produce a consistently first-class product with excellent keeping qualities.

Cigarettes are made from blends of various imported leaf tobaccos. Since 1958 MTOA has been carrying out tests with a view to promoting tobacco-growing in Senegal on an industrial scale. Following trials an experimental station has been set up at Bignona.

### The refrigerating industry

SOBOA not only manufactures ice but also produces the refrigeration required for its production of beer and aerated beverages. The existing refrigerating capacity is 1,065,000 frigories per hour.

The Port of Dakar's cold stores also produce a certain amount of ice for industrial and domestic purposes.

The Société des Frigorifiques du Sénégal (SOFRIGAL) specializes in treating and freezing fish. Its freezing capacity is 90 tons of fish per 24 hours, with a potential of 1,800 tons.

Industrial and domestic ice-making plants are numerous, but not all operate on a permanent basis.

The following figures are representative:

Port of Dakar cold stores	120 tons per day
SOBOA, Dakar	90 " " "
SOFRIGAL, Dakar	20 " " "
Froid Industriel, Dakar	11 " " "
AMERGER, Ziguinchor	6 " " "
SEIB, Diourbel	10 " " "

Ice consumption in Senegal will probably reach 50,000 tons per annum; 35,000 tons of this will be taken by the fishing industry and the remainder by Greater Dakar and Senegal's other large centres in the proportion of two thirds and one third respectively.

#### IV.2 Timber industries

Senegal's annual demand for lumber and sawn timber is in the region of 25,000 m<sup>3</sup>, only 5,000 m<sup>3</sup> of which can be supplied from local sources. The remaining 20,000 m<sup>3</sup> has to be imported. This dual source of supply means that the processing industries are located either in the timber-growing areas or at Dakar, which is both the port of entry and the main consumer centre. The regional saw-milling figures for 1963 were as follows:

Bignona Plantations 939.8 m<sup>3</sup>, Nourrit saw-mill (Bignona) 61 m<sup>3</sup>, Kurth (Messeirah) 1,060 logs, Société Forestière du Maine (Koutal and Dakar) 3,168 m<sup>3</sup>, Herb (Kaolack) 135 logs, Huber (Sokone and N'Dramé) 1,221 logs.

Apart from match factories, the processing industries are nearly all carpentry firms and furniture manufacturers, the two activities often being combined in one undertaking. The enterprises concerned vary in size from the small artisanal undertaking to the industrial combine.

#### IV.3 The packaging industry

Most new paper or board packaging comes from the cardboard factory at La Rochette, which employs over 100 workers. Output rose from 2,780 tons in 1959 to more than 5,000 tons in 1964. The raw materials (flat board, board and kraft paper in roll form and sodium silicate glue) are imported. The construction of a paper and board mill in Senegal is at present under study.

Groundnut, cocoa, coffee and paddy rice bags are manufactured by SOCOSAC. Jute sacking was originally imported and made up locally, but SOCOSAC subsequently turned to dah, which grows naturally in Casamance, and then to sisal. In 1964 production amounted to 2,000 tons (bags, rope, baskets and rugs). The firm employs 300 permanent staff.

The FUMOA concern specializes in the manufacture of metal drums for paraffin distribution and aviation spirit storage, and also produces smaller drums, notably for the paint industry. The present production capacity is 800 210-litre drums or 1200 smaller drums per day.

ELMAF's field is the production of lightweight metal containers for the food canning industry. Output in 1963 amounted to 15,662,000 1/4 cans, 3,831,000 1/2 cans and 2,278,000 1/6 cans.

The market's supplies of polyethylene packaging bags come from SIMPA.

#### IV.4 Textile industries

Senegalese manufactures fall into three clearly defined sectors, representing three successive stages in the conversion of raw cotton:

Spinning and weaving;

Dyeing and printing;

Clothing manufacture proper, including hosiery.

##### Spinning and weaving

The main supplies come from three large firms, ICOTAF (industrie Cotonnière Africaine), Manufactures de Rufisque and Cotonnière du Cap-Vert. ICOTAF employs 500 workers. The yarn mill comprises 11,500 continuous spinning spindles and 4,550 continuous doubling spindles. The weaving shed contains 100 SACM looms and 16 ASTRA looms for cotton blanket weaving. ICOTAF's annual output is approximately 2 million metres of 140-cm twill and calico, 400-500 tons of yarn for sale direct and 250,000 blankets. The dyeing shop can handle 300,000 metres of cloth per month. Manufactures de Rufisque employs a staff of 350. Its basic equipment comprises 9,100 spinning spindles and 160 narrow Ruti looms. These produce 5 million metres of cretonne and Guinea cloth per annum. Cotonnière du Cap-Vert is mainly a spinning and doubling concern, four fifths of its output being sold to industrial or artisan weavers. The production of single, doubled and cabled yarns is supplemented by the manufacture of standard twines, hosiery and fishing-net twine. The 5,000 spinning spindles and 1,600 doubling spindles give an annual output of approximately 400 tons of finished products.

To the above three undertakings must be added a more highly specialized concern, Société cotonnière transocéanique, which manufactures all kinds of cotton blankets from locally purchased cotton yarn or waste and imported wool or viscose rayon staple. The present staff totals 200. Output considerably exceeds 450,000 blankets.

Dyeing and printing

Two concerns, SOTIBA and SIMPAFRIC, carry on dyeing, bleaching, dressing and printing. SOTIBA employs 300 workers and has a capacity of about 25 million metres per annum. SIMPAFRIC has a staff of over 100 and a production capacity of 10 million metres of printed fabric per annum.

Clothing and hosiery manufacture

The production of clothing and hosiery can be divided into the industrial and artisan aspects. At the industrial level the activities of CITEC, SIV and DITEX are of particular importance. SITEC, with 180 employees, sells some 300,000 garments per annum (shirts of all kinds, Tergal trousers and various types of overall). SIV employs a staff of 250 and has a total manufacturing capacity of 600,000 articles per annum. It produces standard items (trousers and shirts) as well as lightweight Tergal suits and waterproofs. DITEX is a local manufacturer of shirts and blouses.

Hosiery is represented by Etablissements Tardy, with fourteen modern knitting machines, and the Société de tricotage mécanique du Sénégal (TMS). The capacity of the two factories is considerably in excess of their output, which is in the region of 1,500,000 garments per annum (knitted underwear and blouses).

Lastly, COTOA and the Société Cauvin-Yvose manufacture blinds and sell tarpaulins and bags.

#### IV. 5 Footwear

The industry developed rapidly as soon as staff could be trained and supplies reverted to normal. The present manufacturing range is the result of successive stages of expansion.

The Bata factory at Rufisque covers 8,000 m<sup>2</sup>, representing an investment of over \$4 million. Seven hundred workers and technicians are engaged in the manufacture of leather sandals and shoes, rubber shoes and plastic shoes and sandals. Increasing use is made of locally-manufactured textiles to produce uppers. The annual output is about 6 million pairs of footwear.

#### IV. 6 Metalworking industries

Dakar has shipyards capable of building sea-going or river vessels of up to 500 tons. They also maintain and repair ships calling at Dakar. A third yard specializes in building wooden craft. The production rate is about twelve to fifteen vessels per month. These yards include boiler-making and structural metalwork shops.

The Ateliers de mécanique générale et chantiers de Bel-Air employ a staff of 200 workers and technicians. The total covered workshop area is 8,000 m<sup>2</sup> and there are 55 machine tools. Major activities include the manufacture of edible-oil, hydrocarbon and water storage tanks, a water tower, tank wagons, sluice gates, steel skeletons for cinemas and shed buildings, gangways, pylons and various types of gantries, the maintenance of workshop equipment and work on vehicle bodies.

The Ateliers des chantiers de Dakar have a staff of 130. In addition to building the "Méron" and the "Torpan" they have constructed a number of 200-m<sup>2</sup> water tanks. They also possess the full range of equipment needed for structural metalworking and vehicle body-building. The firm has a licence to assemble Marrel dump bodies, 5,150 of which are included in its manufacturing programme for fitting to Berliet lorries.

SAMF, in addition to making the "Senegal Sieve", 4,500 of which entered service in 1964, started off by producing metal furniture. The firm's extremely comprehensive equipment enables not only structural metalwork but also sheet and plate items to be bent, polished, welded, finished and painted.

The Société Alfred Nordon specializes in the manufacture of tube products and sheet-metal articles and also makes metal furniture in order to ensure full employment for its staff of 100. Amongst the firm's more recently completed orders are a 10,000-m<sup>3</sup> storage tank, fifteen storage tanks ranging in capacity from 150 m<sup>3</sup> to 1,500 m<sup>3</sup>, aircraft fuelling equipment and various piping installations.

The wire nail market in Senegal amounts to about 700 tons. Only 80 tons were imported in 1963, however, due to the activities of FERAFRIC, which makes not only nails but also metal beds, and CSTM, which manufactures both nails and kitchen ranges. FERAFRIC employs about fifty workers and CSTM about thirty. The Médina bed factory, along with FERAFRIC, produces beds and spring mattresses. It intends to diversify into furniture manufacture and metalworking, and employs a staff of about 300.

SISCOMA's activities involve the manufacture of agricultural machinery which can be used in Senegal under the country's investment programmes. Provision has been made for an annual output of 4,000 pulled implements, which will probably be supplemented by a smaller quantity of lightweight units. The factory has been erected in the Pout area, near Dakar, on a site extending over 37,000 m<sup>2</sup>. The main buildings cover 5,000 m<sup>2</sup>, together with an additional 1,000 m<sup>2</sup> of outbuildings.

#### IV. 7 Cement and brick industries

In the vicinity of Rufisque there is a deposit of Lutetian limestone which was thoroughly prospected by SOCOGIM in 1942. The favourable location of the deposit (near the Dakar-Thiès road and the railway) enabled the cement works to be built at a point 3 km from Rufisque. The capacity initially provided for was 60,000 tons per annum, a figure which was subsequently increased to 160,000 and then 200,000 tons per annum as a result of successive improvements (output in 1964 was 204,000 tons). The present capacity could quickly be expanded to 400,000 tons.

The output of the factory amply covers Senegal's requirements, which at present amount to 160,000-170,000 tons of asbestos cement per annum. The main items produced will be asbestos-cement roofing components and piping.

The Société industrielle des briqueteries africaines, whose factory is at Pout, manufactures hollow and solid bricks, flat and curved tiles, flower-pots, drain-pipes and filler blocks. The company works clay deposits at the foot of the hills outside Thiès. Changes have been made in both the plant and the manufacturing programme, resulting in a current production capacity in the region of 10,000 tons per annum.

#### IV. 8 Printing

In 1964 there were nearly thirty public or private concerns in Senegal. More than 500 management, technical, clerical and industrial staff are available to an expanding clientele.

The largest of the private printing firms has a permanent staff of 140.

#### IV. 9 Mining industries

See II.



#### IV. 10 Chemical and para-chemical industries

See V.

#### V. CHEMICAL AND PARA-CHEMICAL INDUSTRIES

The principal companies engaged in the chemical industry in Senegal are briefly described below.

##### Vegetable oil processing

Senegal has six edible-oil factories handling 500,000 tons of groundnuts (shell weight) year in year out, representing approximately 165,000 tons of raw oil and 185,000 tons of cake. The leading concern is the Société Lesieur-Afrique, whose factory is at Dakar. This is followed by Ets. V. Q. Pertersen, (Dakar), SODEC (Lydiane, near Kaolack), SEIB (Diourbel), SEIC (Ziguinchor) and CFAO (Rufisque). The location of these concerns either near the growing areas (in the case of SODEC, SEIB and SEIC) or close to a port, railway line or made-up roads restricts expensive handling operations at one end or the other. Thirty thousand tons of oil are consumed locally and the remainder exported. The oil factories employ a permanent staff of approximately 3,500.

##### Soap

There are three soap factories: Bourgi, producing about 600 tons, Industrie Sénégalaise de Savons et Annexes (ISSA), with an output of some 1,500 tons, and Nouvelles Savonneries de l'Ouest Africain (NSOA), which covers the remainder of the country's production. NSOA, founded in 1930, is therefore easily the largest concern. It modernized its manufacturing process in 1959 by installing a Mazzoni plant at the cooling stage for continuous vacuum treatment of the soap after it leaves the boiling pans. This plant enables a very wide range of soaps to be produced, including the 72 per cent household soap known as "savon de Marseille" and the 80 per cent superior dry toilet soap. The plant has an hourly output capacity of 3,000 kg of finished products and an annual capacity of 16,000 tons. The amount of soap produced in 1963 was 10,000 tons, the factory having operated at three-fifths capacity.

The raw materials required for the manufacturing process come in the form of ground-nut pastes from local edible-oil refineries, palm kernel oil from Casamance and palm oil from Dahomey; the necessary additional fatty substances and caustic soda are imported from other foreign countries. The factory at present employs 150 clerical and industrial workers.

##### Oxygen and acetylene

SEGOA, a subsidiary of Air Liquide, makes not only industrial and medical oxygen but also acetylene and markets them throughout Senegal and Mauritania. The oxygen is manufactured in two plants made up of modern process units whose production capacity exceeds three times Senegal's present demand.

Acetylene is produced by decomposing imported calcium carbide. The annual production capacity is 500,000 m<sup>3</sup> of oxygen and 180,000 m<sup>3</sup> of dissolved acetylene.

The Compagnie Industrielle de Pikine manufactures carbon dioxide, which is used in a compressed liquified form. In the saturated gaseous hydrocarbons sector, the GALIAF concern bottles butane and propane for the main distributors of petroleum products.

#### Perfumery and insecticides

In 1964 Senegal imported non-alcoholic perfumes to the value of \$65 million and perfumery products of all categories and kinds to the value of \$800,000.

These figures have justified the creation of factories or miscellaneous artisanal enterprises engaged in apparently simple activities which nevertheless require specialized equipment, such as powder and pomade homogenizing machines, dosing, filling, can sealing and capsulating machines and plastic bag sealers.

In order to expand their business many of these firms have branched out from perfumery into household cleaning products.

The most important Senegalese concern in the perfumery field is DICOPA. It has a modern plant which enables it to obtain licences for mixing and bottling perfumes of established reputation. It is extending its range of products to items traditionally sold in Senegal. The firm will shortly begin packing Cutex nail varnish, face powder, British talcum powder and various perfumed powders and pomades of British, German or Italian make. DICOPA's present production capacity is about 500,000 items per month and it employs 60 workers. It proposes to extend its range to include the packing of products containing a certain percentage of mint alcohol.

The SEIB factory produces perfumed pomades in glass jars and liquid brilliantines in bottle.

SAPROMA employs some thirty workers and has two distinct sections. The first is the perfumery side producing ordinary eau de cologne and alcoholic and non-alcoholic perfumes. It also packs perfumed pomades, brilliantines and talcum powders. The second activity is the packaging of domestic, agricultural and industrial insecticides.

#### Pharmaceutical products

The Government's first Four-Year Plan included the building of a pharmaceuticals packing factory. A protocol of agreements was subsequently signed with Société Valdafrique in March 1963. On the basis of the existing equipment, this new industry will cost \$320 million, but the project may quickly expand to \$600,000-700,000.

The Valdafrique concern started up at Rufisque, and since 1946 has been obtaining gum from Senegal and neighbouring countries. Valda products include Valda cough tablets, Valdouce children's tablets, Valda cough syrup, Valda menthol antipruritic ointments and Pyro Valda ointments for the relief of muscular pain. Four million containers were

produced in 1963 and 120 tons of Senegalese and Mauritanian gum consumed. Sales of 4-gramme containers of ointment have increased steadily despite British competition. 350,000 tubes were sold in 1963.

#### Paints

Materials used in Senegal are subject not only to heat and dryness but also to humidity, and need adequate protection. Paints and varnishes are therefore of particular importance. The establishment of two large processing and packing factories (SAEC and La Seigneurie) at Dakar has resulted in a considerable cut in imports.

The quantity imported in 1961 was in fact 639 tons, but this dropped to 489 tons in 1962, 425 tons in 1963 and 322 tons in 1964. The total output of paints and varnishes rose from 2,156 tons in 1961 to 2,863 tons in 1963. Some constituents such as oxides, drying agents, turpentine oil, white spirit, thinners, solvents and oils still have to be imported, however. Expanded production at the M'Bao refinery will soon obviate the need to import solvents. Seventy tons of putty to the value of \$32,000 were also imported in 1964.

The building industry naturally takes most of the paint, either as external or internal finishes. Highly effective anti-corrosive paints are also produced for industrial structures, and the manufacturing range includes both industrial enamels and a wide range of marine paints.

SAEC has approximately 100 employees and accounts for about two-thirds of the output. La Seigneurie's Dakar factory employs about 30 workers.

#### Fertilizers

Phosphate sales in Senegal rose rapidly from 4,165 tons in 1960 to 30,000 tons in 1963. Groundnuts are treated with 6-20-10 fertilizer in the Kaolack, Tambacounda and Ziguinchor areas. In the Thiès and Diourbel districts 10-13-8 and 6-10-20 mixtures are used, supplemented at Diourbel by 5-22-8. Millet is uniformly treated with a 14-7-7 fertilizer. These mixtures are applied after sowing in doses of 150 kg per hectare, either broadcast or around each plant.

Fertilizers are marketed from January to June. During the 1963/1964 season 40,000 tons were distributed. A 10-10-20 part-nitrate, part-amonia nitrogenous fertilizer is used on vegetable crops. The theoretical weekly consumption is approximately 20 g/m<sup>2</sup>.

The Société Sénégalaise des Phosphates de Thiès works a local deposit of aluminium calcium phosphate. Thermal treatment gives a new product with a 34 per cent content of P<sub>2</sub>O<sub>5</sub>, 26 per cent of which is soluble in citrate. This is known as Phosphal. Finely ground and bagged, it is directly assimilable by plants, but users need to study their soil conditions before applying it. Another product, Baylifos (30-33 per cent P<sub>2</sub>O<sub>5</sub>), is obtained by drying and grinding calcium phosphate.

### Plastics processing

We have already touched on plastics in connexion with packaging (chapter IV.3) and footwear (chapter IV.5). The SIMPA concern makes polyethylene bags, sandals, tumblers, bowls, piping, combs, etc. Bata make plastic sandals. The range of products will soon be extended as a result of the recent establishment at Thiès of a new firm called Société Sénégal Plastique.

### Matches

The Compagnie Africaine Forestière et des Allumettes (CAFAL) was set up in 1951. It has a factory at Thiaroye which was originally capable of producing 1 million matches per hour. The present production capacity is 3 million matches per hour, representing 1,000 cases of 7,200 boxes per month.

## VI. THE PRESENT MARKET FOR CHEMICALS

Customs statistics cover the period from 1961 to 1964. The returns for the period prior to this also include the foreign trade figures of Mali and Mauritania, which it has been impossible to separate from those for Senegal. The growth rates are therefore based on a period of three years except where a particular figure is unrepresentative.

The magnitude of Senegal's foreign trade means that attention must be confined to the major imports, namely those whose value in 1964 (in most cases) exceeded \$40,000. Salt (25-01-08 and 25-01-09) and calcium and aluminium phosphate (25-01-08 and 25-01-13) are excluded from the table because they are exported from Senegal. Although other products in sector 28 have also been excluded, imports of them nevertheless exceeded \$10,000 in 1964. Examples are sulphuric acid (\$10,800), ammonia (\$15,600) and hydrogen peroxide (\$14,400).

Table 8 relates to quantities imported. Table 9 shows the value of the imports in dollars. The code numbers are those of the Brussels Nomenclature.

Table 8

Imports: chemical products and fertilizers (tonnage)

(tons)

Code	Commodity	1961	1962	1963	1964	Annual rate
25-20-01	Gypsum	3589	1685	5596	5151	12%
.....	.....	..	..	..	..	..
<u>Chapter 25</u>	Mineral products	3764	1808	5783	5244	12%
27-11	Caseous hydrocarbons	2132	2320	2335	1506	Minus
.....	.....	..	..	..	..	..
<u>Chapter 27</u>	Petroleum products	2147	2338	2412	1540	Minus
28-17-08	Caustic soda	1700	2501	2867	2550	15%
28-56	Carbides	387	416	464	399	Variable
.....	.....	..	..	..	..	..
<u>Chapter 28</u>	Inorganic chemicals	2262	3236	3524	3180	12%
<u>Chapter 29</u>	Vitamins, alkaloids, antibiotics	2	n	n	n	Negligible
30-02	Sera, vaccines, toxins	2	-	-	2	Variable
30-03-01	Phosmacop medicaments not put up for retail sale	63	111	41	107	Variable
30-03-13	Pharmaceutical specialities put up for retail sale	655	492	582	515	Minus
30-04	Wadding, gauze, bandages, etc.	66	29	60	47	Minus
.....	.....	..	..	..	..	..
<u>Chapter 30</u>	Pharmaceutical products	817	641	695	678	Minus
31-02	Nitrogenous fertilizers	9078	10463	7619	12502	11%
31-03	Phosphatic fertilizers	6402	3530	5384	8430	9%
31-04	Potassic fertilizers	3921	2545	2434	5605	13%
.....	.....	..	..	..	..	..
<u>Chapter 31</u>	Fertilizers	19529	16638	15553	26884	11%

Table 8 (continued)

		(tons)				
Code	Commodity	1961	1962	1963	1964	Annual rate
32-09-10	Varnishes and lacquers	16	25	44	37	32%
32-09-20	Paints and enamels	639	489	425	322	Minus
32-09-30	Dyes put up for retail sale	83	43	61	22	Minus
.....	.....	..	..	..	..	..
Chapter 32	Paints and varnishes	785	586	573	399	Minus
36-02	Explosives	11	11	25	56	72%
36-06	Matches	-	n	n	4	Variable
.....	.....	..	..	..	..	..
Chapter 36	Explosives and matches	11	11	25	60	76%
38-11-08	Disinfectants, put up (1-kg)	292	251	152	182	Minus
38-11-10	Disinfectants not put up for retail sale	757	529	541	1296	19%
38-18	Solvents and thinners	26	28	47	64	35%
.....	.....	..	..	..	..	..
Chapter 38	Disinfectants and solvents	1075	808	740	1542	13%
39-01	Condensation and polycondensation products	140	111	158	174	7%
39-02	Polymerization and copolymerization products	1112	1287	1653	1249	Variable
39-07-3	Other moulded articles	60	61	57	45	Minus
39-07-32	Other laminated articles	19	23	27	28	11%
39-07-39	Other plastic articles	149	135	255	162	Variable
.....	.....	..	..	..	..	..
Chapter 39	Plastic materials	1480	1617	2150	1658	4%
51-01-09	Synthetic yarn (continuous), not put up for retail sale	3	12	13	16	75%
51-04-18	Synthetic fabrics, + 85%	100	86	219	221	30%
51-04-19	Synthetic fabrics, - 85%	37	42	50	63	19%
.....	.....	..	..	..	..	..
Chapter 51	Man-made fibres	143	143	286	305	29%

Tableau 9

Imports: chemical products and fertilizers (value)

(thousands of dollars)

Code	Commodity	1961	1962	1963	1964	Annual rate
25-20-01	Gypsum	52	35	56	56	2%
.....	.....	...	...	...	...	...
<u>Chapter 25</u>	Mineral products	72	54	76	74	1%
27-11	Gaseous hydrocarbons	208	224	216	40	Minus
.....	.....	...	...	...	...	...
<u>Chapter 27</u>	Petroleum products	214	226	233	146	Minus
28-17-08	Caustic soda	120	152	180	216	21%
28-56	Carbides	52	51	56	48	Variable
.....	.....	...	...	...	...	...
<u>Chapter 28</u>	Inorganic chemicals	210	258	279	312	14%
<u>Chapter 29</u>	Vitamins, Alkaloids, antibiotics.	10	3	3	5	Variable
30-02	Sera, vaccines, toxins	34	5	23	41	Variable
30-03-01	Pharmacop medicaments not put up for retail	168	180	56	144	Minus
30-03-13	Pharmaceutical speciali- ties put up for retail	2620	1716	1652	1944	Minus
30-04	sale Wadding, Gauze, banda- ges, etc.	120	56	116	104	Minus
.....	.....	...	...	...	...	...
<u>Chapter 30</u>	Pharmaceutical products	3019	1990	1881	2256	Minus
31-02	Nitrogenous fertilizers	688	708	392	624	Minus
31-03	Phosphatic fertilizers	484	264	348	544	4%
31-04	Potassic fertilizers	222	144	128	316	12%
.....	.....	...	...	...	...	...
<u>Chapter 31</u>	Fertilizers	1464	1128	879	1511	3%

Table 9 (continued)

Code	Commodity	1961	1962	1963	1964	Annual rate
32-09-10	Varnishes and lacquers	10	16	26	22	30%
32-09-20	Paints and enamels	356	300	284	240	Minus
32-09-30	Dyes put up for retail sale	52	60	80	32	Minus
.....	.....	...	...	...	...	...
<u>Chapter 32</u>	Paints and varnishes	432	385	402	299	Minus
36-02	Explosives	9	9	14	32	53%
36-06	Matches	-	n	n	3	Negligible
.....	.....	...	...	...	...	...
<u>Chapter 36</u>	Explosives and matches	9	9	14	35	57%
38-11-08	Disinfectants, put up (1-kg) packings	196	160	168	212	3%
38-11-10	Disinfectants not put up for retail sale	236	200	216	308	9%
38-18	Solvents and thinners	13	16	30	37	42%
.....	.....	...	...	...	...	...
<u>Chapter 38</u>	Disinfectants and solvents	445	376	414	557	8%
39-01	Condensation and polycondensation products	128	92	124	160	7%
39-02	Polymerization and copolymerization products	764	792	904	760	Variable
39-07-31	Other moulded articles	112	116	104	84	Minus
39-07-32	Other laminated articles	37	44	60	68	22%
39-07-39	Other plastic articles	312	300	460	340	Variable
.....	.....	...	...	...	...	...
<u>Chapter 39</u>	Plastic materials	1353	1344	1652	1412	2%
51-01-09	Synthetic yard (continuous), not put up for retail sale	14	37	52	64	66%
51-04-18	Synthetic fabrics, + 85%	1072	724	888	1896	21%
51-04-19	Synthetic fabrics, - 85%	352	204	216	356	Variable
.....	.....	...	...	...	...	...
<u>Chapter 51</u>	Man-made fibres	1452	982	1171	2335	17%



# VII. PLANNING THE CHEMICAL INDUSTRY IN SENEGAL

Although the foregoing tables relate to imports, the quantities and values of exports must also be taken into account. The relevant figures are as follows:

## Quantities (tons)

Classification		1961	1962	1963	1964
25-01-08	Crude salt	10,688	12,408	43,300	5,460
25-01-09	Other salt	-	4	2,100	6,453
25-10-08	Calcium phosphate	308,559	350,381	346,257	633,200
25-10-13	Aluminium calcium phosphate	90,268	86,030	49,384	88,239
.....	.....	...	...	...	...
<u>Sector 25</u>	Mineral products	409,515	448,823	441,041	733,352
31-03-08	Phosphatic fertilizers	18,981	32,810	13,578	23,051
36-06	Matches	1	n	10	4

## Value (\$1000)

25-01-08	Crude salt	96	124	564	100
25-01-09	Other salt	-	-	33	120
25-10-08	Calcium phosphate	4,116	4,612	4,612	8,600
25-10-13	Aluminium calcium phosphate	972	824	564	872
.....	.....	...	...	...	...
<u>Sector 25</u>	Mineral products	5,184	5,560	5,773	9,692
31-03-08	Phosphatic fertilizers	348	844	252	448
36-06	Matches	1	n	6	3

Although the chapter 25 products listed have not been chemically processed, they are included in the above table because they can serve as raw materials for local industries. The phosphatic fertilizer referred to under code number 31-03-08 is calcined or ground aluminium calcium phosphate containing an average of 23 per cent assimilable  $P_2O_5$ .

Both exports and local production must be taken into account when considering the various sectors listed below.

#### VII.1 Pharmaceutical products

Imports are falling off, probably owing to the activities of local firms, which also export low-value products. The main outflow of foreign exchange is in fact accounted for by purchases of packed pharmaceutical specialities.

The adoption of an 8 per cent growth rate as assumed for Ivory Coast would give the following figures:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	800 <sup>x/</sup>	Adjusted 8%	860	1,300	1,900	2,700
Value (\$1000)	2.700 <sup>x/</sup>	Adjusted 8%	2,920	4,300	6,300	9,300

<sup>x/</sup> Estimated (imports + local production).

An analysis of these forecasts shows that the turnover envisaged by Valdafrique (see V) is very low. The market is expanding, and is large enough to justify setting up other undertakings. A further point of interest is that the Veterinary Research Laboratory prepares vaccines. Its production potential exceeds 12 million doses per annum, which satisfies the requirements of Senegal and many other countries in West Africa.

#### VII.2 Soap

Imports into Senegal of the soap known as "savon de Marseille" have virtually ceased, and the 1964 customs statistics showed only 100 tons of soap in containers. The country is nevertheless a good outlet for recognized brands of scented soap, 232 tons of which, i.e. approximately 2 million 100-gramme bars, were imported in 1964. Senegalese output has remained in the region of 11,500 tons for four years.

The adoption of a 4 per cent growth rate as assumed for Ivory Coast gives the following trend for soap consumption in Senegal:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	11,000	Adjusted 4%	11,450	13,900	16,900	20,600

The home market in Senegal seems too small to justify building new soap factories. All it can do is to enable the existing concerns to operate at full capacity.

### VII.3 Surface-active agents and washing preparations

It is mainly in this sphere that difficulties arise in assessing trends. It must be remembered, however, that washing powders are handled by powerful brand proprietors, and few of them have yet had to face any problem of local packing, which in the last resort would only mean a slight saving.

The extent to which local processing based on fatty acids has cut the sales of the big brands cannot yet be ascertained from the import figures. The customs statistics show the following:

Detergent washing materials containing soap:

1962: 101 tons; 1963: 407 tons; 1964: 489 tons

Detergent washing materials not containing soap:

1962: 771 tons; 1963: 497 tons; 1964: 490 tons.

Although imports of fatty acids have dropped, it is quite impossible to establish any relationship between the import figures for the former and those for washing materials, which have now increased.

The general trend in the market for these products, which should expand in the future, suggests the advisability of adopting an 11 per cent growth rate, giving the following:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	1,229	Adjusted 11%	1,360	2,300	3,900	6,500
Value (\$1000)	680	Adjusted 11%	755	1,270	2,140	3,600

The market is growing, and is large enough to warrant the development of local manufacture.

### VII.4 Perfumes and cosmetics

The fact that imports have noticeably declined during the last few years is due to two factors: the dispersion of purchasing power and the local manufacture of eau de cologne, perfumes and numerous hair preparations.

Some of the most expensive perfume imported into Senegal is used for laying-out. This is a way of paying homage to the dead and also of making their burial less unpleasant in hot weather, and partly explains why Lanvin, Guerlain, Millot, Dior and Coty continue to sell luxury perfumes in Senegal despite their prices.

Many Senegalese also enjoy using scent, especially in the country, and a luxury perfume is still highly prized as a gift.

There is also a considerable clientele for cheap scents.

Senegal's total demand for perfumes and cosmetics is expected to increase as follows:

	1964	Annual rate	1965	1970	1975	1980
Value (\$1000)	1,200 <sup>x/</sup>	Adjusted 4%	1,250	1,500	1,850	2,250

<sup>x/</sup> Estimated.

The market offers possibilities for extending local production.

#### VII.5 Pigments, paints and varnishes

The Senegalese paint and varnish market is characterized by gradually falling imports, accompanied by an increase in local production. The paint industry is protected in Senegal and benefits from compensation agreements with various West African republics which ensure it a certain level of exports. Mauritania, however, is by far the largest outlet for the two factories in Dakar. The Nouakchott and Port Etienne infrastructures and the Miferma installations have been absorbing substantial quantities for the past two or three years.

Senegal's future consumption should develop as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	3,400	Adjusted 7%	3,640	5,100	7,200	10,000
Value (\$1000)	1,800	Adjusted 7%	1,930	2,700	3,800	5,300

The market therefore offers prospects for the future. New projects should enable some 80 per cent of the local demand to be met. Certain special paints will probably continue to be imported.

#### VII.6 Disinfectants and solvents

Pesticides are already formulated and packed in Senegal. In the specific case of disinfectants the statistics show two significant import figures for 1964, namely 182 tons in small containers and 1,296 tons in large containers.

No preferential arrangements of a permanent nature have been entered into as regards supplies of insecticides, fungicides and spraying machines. The Bambey Agricultural Research Centre (CRA) puts out tenders for supplies for pre-treating seeds.

It is true to say that as regards plantation spraying before harvesting, the education of trained staff and local instructors and of the agricultural population in general is still very haphazard, because it is a field in which no hard-and-fast rules can be laid down. The result in the initial stages is that just as much spraying still takes place before sowing as after harvesting, although even this represents a considerable step forward.

The estimates of future consumption in Senegal are as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	1,542	1,800	3,000	4,500	8,000
Value (\$1000)	557	648	1,080	1,600	2,900
including					
50% DDT (tons)	50 <sup>x/</sup>	100	300	600	900
25% BHC (tons)	350 <sup>x/</sup>	500	1,000	1,500	2,200

<sup>x/</sup> Estimated

The market is expanding, and is large enough to justify developing local production. The manufacture of basic products must be viewed in the context of the entire sub-region.

#### VII.7 Explosives

The consumption of explosives is rising sharply (annual growth rates of 72 per cent by weight and 53 per cent by value). This probably reflects the level of mining activity and major civil engineering projects.

The over-all consumption forecast for these products is as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	56	Adjusted 10%	62	100	160	260

Outlets are insufficient to justify envisaging the possibility of local manufacture. This question should be examined at the sub-regional level.

#### VII.8 Plastics

The extremely low growth rates (4 per cent in quantity and 2 per cent in value) are due to the existence of local processing concerns. The general trend in the market for these products, which should expand in the future, suggests the advisability of adopting a 20 per cent growth rate for the current period and 15 per cent and 10 per cent growth rates for the periods subsequent to 1970 and 1975 respectively. This gives the following:

	1964	1965	1970	1975	1980
Quantity (tons)	1658	1990	4,990	10,000	16,000
including:					
PVC (tons)	1000 <sup>x/</sup>	1200	2400	3,600	5,400
Polyethylene (tons)	255 <sup>x/</sup>	300	1400	3,000	5,000

<sup>x/</sup> Estimated.

The market is growing, but the quantities involved are too small for the local manufacture of basic products. On the other hand it is possible to develop the injection moulding and extrusion sectors, since no form of import seems feasible.

#### VII.9 Caustic Soda

Caustic soda is linked to soap production, for which an annual growth rate of 4 per cent has already been adopted. Caustic soda requirements for soap production can be estimated at:

	1964	1965	1970	1975	1980
Quantity (tons)	1,150	1,200	1,400	1,700	2,100

For the time being the market is therefore somewhat narrow. This problem concerns the entire sub-region.

# VII.10 Calcium carbide

Calcium carbide consumption is fairly variable, and the main consumer, who uses it for manufacturing acetylene, has surplus capacity. The use of gases from the M' Bao refinery would only be justified with a large plant owing to purification problems.

On the cautious basis of a 7 per cent growth rate as adopted for the other countries the forecast works out as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	400	Adjusted 7%	430	600	840	1,200

Calcium carbide manufacture must therefore be examined from the sub-regional angle.

# VII.11 Fertilizers

Despite the local manufacture of certain phosphatic fertilizers, this sector came third in chemical imports in 1964. Information from various sources gives the following consumption forecasts:

Year	Source of estimate	Tons N	Tons P <sub>2</sub> O <sub>5</sub>	Tons K <sub>2</sub> O
1964	Statistics <sup>1/</sup>	2,620	5,900	3,350
	CINAM study, minimum <sup>2/</sup>	5,000	8,000	5,000
	CINAM study, maximum <sup>2/</sup>	7,000	11,000	7,000
1965	Statistics <sup>1/</sup>	2,900	6,000	3,800
	Plan <sup>3/</sup>	4,700	6,200	4,100

(continued)

Year	Source of estimate	Tons N	Tons P <sub>2</sub> O <sub>5</sub>	Tons K <sub>2</sub> O
1968	Plan <sup>3/</sup>	10,600	14,100	9,000
1970	Statistics <sup>1/</sup>	3,200	6,200	4,300
	F.W. Hauck <sup>4/</sup>	8,000	12,000	8,000
	J. Kellerman <sup>5/</sup>	22,000	32,000	?
	CINAM study, minimum <sup>2/</sup>	18,000	26,000	16,000
	CINAM study, maximum <sup>2/</sup>	27,000	39,000	24,000
1974	CINAM study, minimum <sup>2/</sup>	27,000	39,000	24,000
	CINAM study, maximum <sup>2/</sup>	31,000	44,000	27,000
1975	Statistics <sup>1/</sup>	4,400	6,600	6,200
1980	CINAM study <sup>2/</sup>	36,000	51,000	31,000

- <sup>1/</sup> On the assumption that 1964 imports relate to ammonium sulphate containing 21 per cent N, single superphosphate containing 18 per cent P<sub>2</sub>O<sub>5</sub> and potash containing 60 per cent K<sub>2</sub>O. The growth rates adopted allow for the production and export of calcined phosphate (which reduces the P<sub>2</sub>O<sub>5</sub> figure from 9 per cent to 2 per cent).
- <sup>2/</sup> CINAM, Note su l'industrialisation au Sénégal, March 1961.
- <sup>3/</sup> 1965-1969 Plan. The consumption data are based on treating the area under cultivation (groundnuts, millet, maize, rice, cotton, vegetables and bananas) with standard quantities of fertilizers of recommended formulae.
- <sup>4/</sup> E/CN.14/INR/70 - F.W. Hauck, Soil Fertility and Fertilizers in West Africa.
- <sup>5/</sup> J. Kellerman, La consommation des engrais en Côte-d'Ivoire, February 1963.



The estimates vary considerably according to the hypothese adopted. The annual growth rates would work out as follows for the respective periods under review:

Annual growth rate:

	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
1961-1964 statistics (consumption)	11%	2%	13%
CINAM study, 1964-1970, minimum	18%	17%	18%
CINAM study, 1964-1970, maximum	16%	15%	14%
1965-1969 Plan	31%	31%	30%

The differences in the estimates are generally due to over-optimistic forecasting, as has been the case with the previous countries.

The following table shows the trends in fertilizer consumption for various crops.

Table 10

Fertilizer consumption (in thousands of tons)

Year	Groundnuts	Millet	Rice	Vegetable crops	Total
1961	11.3	1.6	0.4	0.1	13
1962	27.9	1.6	0.7	0.8	31.0
1963	21.0	2.8	0.8	1.8	26.4

Source: Statistical Department, Situation économique du Sénégal, 1963.

The forecasts contained in the Plan have not been borne out in this sector owing to a lack of technical personnel and the failure of some of the agricultural population to grasp the importance of the operation.

The targets contained in the Plan are reproduced in table 11.

Table 11

Fertilizer consumption - Plan forecasts (in thousands of tons)

Year	Groundnuts	Millet	Rice	Vegetable crops	Total
1961	18.6	2.4	1.0	0.2	22.2
1962	37.2	4.6	2.0	0.7	44.5
1963	45.8	6.9	3.0	1.0	56.7
1964	64.6	9.2	4.0	1.5	79.1

Source: Statistical Department, Situation économique du Sénégal, 1963.

The proportion of the above targets actually achieved was thus 70 per cent in 1962 and a little over 45 per cent in 1963.

Taking the 1964 figures and the present trend in this sector in Senegal as a basis, the following fertilizer consumption can be forecast:

	1964	1965	1970	1975	1980
Tons N	2,620	3,000	8,000	16,000	24,000
Tons $P_{25}O_5$	5,900	6,000	12,000	24,000	36,000
Tons $K_2O$	3,350	4,000	8,000	16,000	24,000

The Société Industrielle d'Engrais which is an officially approved priority undertaking, proposes to build a compound fertilizer factory over a period of three years. It would have an annual capacity of 130,000 tons, representing an investment of some \$9.6 million. The plant would use local phosphate and imported sulphur, ammonia and potash.

In July 1964 the Government signed a guarantee for the purchase of an equivalent of 7,200 tons N and 12,000 tons  $P_{25}O_5$ .

## VII.12 Salt

The Senegalese market is constantly expanding, and may even be developing beyond the official frontiers. But the fact that salt finds increasing outlets is largely due to the development of fish preservation. Another point is that the campaigns to encourage cattle breeders to market the hides of their livestock also result in their using salt, which is the most practical and reliable method available to them for preserving the skins.

The total quantity of salt exported in 1964 was 48,000 tons, mainly to Ivory Coast, Upper Volta, Dahomey and Cameroon. Senegal's consumption in that year was approximately 8,000 tons (L'économie du Sénégal, 1965).

Taking into consideration the fact that the per capita consumption is low, the adoption of a 7 per cent growth rate is justified. This gives the following forecasts:

	1964	Annual growth rate	1965	1970	1975	1980
Quantities (tons)	8,000	Adjusted 7%	8560	12,000	16,900	23,600
Value (\$1000)	160	Adjusted 7%	170	240	340	470

Salt manufacture in Senegal is largely carried on by a concern at Kaolack, the Société des Salines du Sine-Saloum.

This employs local labour and provides work not only for a hundred or so permanent employees but also for many seasonal workers.

The salt-marsh has a capacity of about 100,000 tons and there are substantial possibilities for extending it. The salt is of good quality and is produced in the form of large crystals, which are highly prized on some African markets, although changing patterns of taste are now steering production towards medium grains of graded sizes. The salt is harvested by manual methods. It is first of all broken up and then passed down the line from man to man and loaded into narrow-gauge trucks. The poor quality of the soil precludes mechanical working. The supporting layer of salt which this method gives rise to over a period of several years means that the harvested salt is clean and does not require washing.

A problem arises as to price and exports to African territories whose rainfall level prevents the formation of salt pans. Salt is a poor article which cannot support many overheads. The selling price at point of production often accounts for less than the transport charges, and Senegal's geographical position is not always helpful as regards freight. Although Kaolack is an ocean-going port it has no regular services, and an adequate freight rate is required to induce a vessel to call. There is no question of loading at Dakar, because the road transport costs would immediately make Mediterranean salt more competitive.

Artisanal salt-works also exist in Senegal. Although their output is small they provide employment for a few hundred persons.

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## H. NIGER

### I. GENERAL CHARACTERISTICS

#### I.1 Population:

3,117,000 inhabitants (1963);

annual growth rate 1958-1963: 3.2 per cent.

Estimated population (in thousands)

1965:	3,270	1975:	4,085
1970:	3,625	1980:	4,675

1.2 Area: 1,267,000 km<sup>2</sup>.

1.3 Population Density: 2.5 inhabitants per km<sup>2</sup> (1963).

1.4 Niger has been an independent State since 3 August 1960. Its population is largely rural. Only four towns have more than 10,000 inhabitants and they account for only 2.7 per cent of the total population. Nearly all the active population is engaged in agriculture, from which 95 per cent of the country's inhabitants gain their living.

In 1964 there were approximately 16,900 declared workers in Niger, 8,100 of them being in the private sector and 8,800 in the public sector.

The workers in the private sector are very unequally distributed amongst the various activities: construction and civil engineering employ the most (3,500), followed by domestic service, trade and general engineering. Industry proper accounts for about 990 persons.

Niger's aridity is certainly the most serious obstacle to its development. Water represents a fundamental problem. Only the area to the south of the 14th parallel has a rainfall of over 500 mm. This is the most heavily populated part of Niger and is devoted to agriculture, especially groundnut-growing. Between the 300-mm and 500-mm isohyets there is a typically Sahelian area devoted to livestock-rearing and millet and sorghum-growing. Beyond the 300-mm isohyet crops become very sporadic. These are the areas with Sahelo-Saharan and ultimately Saharan climates, in which the population density is extremely low. In certain areas, however, there are excellent transhumance pastures, although the lack of water often prevents them from being utilized efficiently.

Over all, the country seems to meet its food (cereal) requirements out of its own production, and even exports a little millet, sorghum, niebes, groundnuts and onions. Considerable efforts are being made to expand agricultural production. These include plant improvement methods (selection of seeds, use of fungicides, etc.).

The efforts have already begun to bear fruit. Since 1961 Niger has been exporting millet to neighbouring countries. The production of paddy rice is developing rapidly. Tomato, niebe and onion-growing are showing a substantial increase. In the Magaria district groundnut-growing is expanding particularly fast, and an output of 150,000 tons (shelled nuts) is forecast for 1970. Cotton production (5,000 tons in 1963) should reach 15,000 tons by 1968.

Livestock are bred on a large scale. This is one of the country's basic resources, and virtually the only resource for the nomads (20 per cent of the total population).

Table 1 illustrates the part played by groundnuts and livestock in Niger's exports.

Table 1

Exports from Niger

(quantities in thousands of tons, values in millions of dollars)

	1962		1963		1964	
	Quantity	Value	Quantity	Value	Quantity	Value
Total	135.7	19,581	137.1	21,626	124.4	18,899
including:						
Cattle, weight	20.6	3,384	18.5	2,991	14.7	1,748
"    head	...	-	61,527 <sup>1/</sup>	-	56,743	-
Sheep and goats, weight	2.9	1,059	2.3	1,026	1.8	673
"        "    head	...	-	120562 <sup>2/</sup>	-	106,472	-
Fish dried, salted, smoked	1.9	533	1.2	198	0.5	115
Onions	5.7	272	1.5	100	1.1	12
Beans	14.1	760	7.5	438	2.6	75
Millet	3.5	156	2.9	108	0.7	21
Shelled groundnuts	72.1	11,195	91.4	13,705	75.2	10,933
Raw groundnut oil	1.9	484	3.1	858	5.5	1,668
Groundnut cake	5.5	243	4.0	177	17.5	491
Hides and skins	0.4	320	0.4	297	0.4	292
Reptile skins	0.4	31	0.02	64	0.02	213
Bulk ginned cotton	0.002	0.4	1.1	577	1.9	1,096

Source: Office of the Commissioner-General for the Plan, Statistical Department, Bulletin de statistique (1965).

<sup>1/</sup> Estimated actual exports for 1963 according to animal husbandry department 175,000 head.

<sup>2/</sup> Estimated actual exports for 1963 according to animal husbandry department: 235,000 head.

The only resources exploited are salt and cassiterite (tin ore), and these are still worked in an artisan fashion. Industry in Niger is virtually non-existent. The average per capita income is estimated at \$67. Niger has no energy resources, raw materials, capital, trained personnel or industrial traditions. Its industrialization prospects cannot therefore be other than slender, and industrial development is not at present regarded as an end in itself but as a means of improving the standard of living of the masses and of providing fresh outlets for agriculture and stock-raising.

The Government has drawn up ten-year projections for 1965-1974 and a four-year plan for 1965-1968. Under the plan Niger will devote its efforts to reducing the cost of energy, prospecting for raw materials, expanding industries which will reduce building costs (building materials industries) and developing industries on the input and output sides of agriculture and stock-raising, whose development depends on them. In the immediate future attention will be concentrated on industries connected with agriculture.

In the sphere of basic industries Niger's unvarying policy is to co-operate with other West African countries in iron and steel production and phosphate mining. The measures proposed in the plan should help towards a more rational type of development than in the past, when newly-created industries had to be supported and subsidized shortly after starting-up because they proved uneconomic.

In a few years' time more capital and trained personnel may be available. The industrialization of the country will then become one of the main aims of Niger's economic policy, and it is possible that as early as the second plan, for the period 1969-1972, a considerably larger place will be allotted to industry than in the initial one, since industrialization is a prerequisite for the country's development. The total investment under the four-year plan amounts to more than \$26 million and will mean nearly 2,000 new jobs.

The share of the industrial sector in the gross domestic product will rise from 3 per cent in 1962 to 8.5 per cent in 1968 and 13.5 per cent by 1974 (the final year of the ten-year projections), with value-added figures of \$25.2 and \$46 million respectively.

## II. MINERAL RESOURCES

Tin. The output of 70 per cent cassiterite concentrates during recent years has been estimated at:

<u>Year</u>	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>
<u>Tons</u>	77	68	59	80	74



The deposits concerned are at El Meelni and Tarrouadji in the Air Massif and are worked by artisan methods. Ore processing is difficult owing to the lack of water (dry separation) and the limited reserves, estimated at 1,000 tons of metal, rule out the possibility of extensive mechanization.

The product is exported to Nigeria and smelted at Jos.

Wolfram. A few tons were mined before 1945 and a further ten tons were reported for 1957.

Rock salt. The salt-pans at Bihan, Agadès, Fagha and Manga are not proper deposits but merely shallow efflorescences.

Iron. Haematite is worked by artisan methods involving the use of charcoal. Two areas have been prospected, at Saoua and Say, and although the former seems too small, the latter is believed to involve several hundred million tons of reserves with a content of 49-56 per cent iron and 10 per cent silica.

Copper. A number of small scattered deposits are reported. The largest would appear to contain 1,000 tons with a content of 1.5 per cent.

Gold. Occurrences have been reported in the Sorba district.

Limestone. Limestone is found in the Tahoua and Konui Madaoua districts and could be used to supply the projected cement works at Malbaza.

Gypsum. A number of apparently unprofitable deposits are reported which may nevertheless be of use in the cement industry.

Clay and china clay. Several deposits are reported, especially in the Niamey, Maradi, Tahoua, Koni and Zinder regions.

Granite. This is found in the Maradi and Zinder districts.

Other minerals. Deposits of barytes, galena, beryl, columbite, etc., have been found in various districts but they do not constitute a sufficiently economic proposition.

Petroleum. Prospecting is being carried out in the sedimentary basin of Madaoua in the west of the country, but so far without success. None of the mineral resources can serve as a basis for a chemical industry.

### III. ELECTRIC POWER, FUEL AND WATER

Electric power is produced by power stations belonging to the SAFELEC concern. The installed capacities are as follows: Niamey 600 kW, Maradi 550 kW, Zinder 580 kW and Tahoua 168 kW. The amount of electricity supplied to the network by thermal power stations doubled in the period 1960-1964.

Table 2

Electric power production (in thousands of kWh)

1956	1960	1962	1963	1964
3,500	7,800	10,880	13,770	14,900

According to statistics the average price of electricity is about \$0.1 per kWh, but at Niamey it is supplied at \$0.076 per kWh. A research programme is in progress covering different sources of energy, e.g. solar energy and the utilization of charcoal and of groundnut shells. In the years to come, an expansion of the existing electric power stations is planned, together with the construction of two new stations, giving an increase in installed capacity of 10,260 kW.

The average price of a ton of diesel spirit is estimated at \$40. The price of fuel oil would therefore appear to be \$27 per ton. These prices are unconfirmed and may incorporate special benefits (tax concessions).

Hydrogeological studies are in progress to evaluate the country's water resources.

#### IV. EXISTING INDUSTRY

IV.1. The industrial sector proper only accounts for a very small proportion of the country's business. The total paid in salaries and wages by all enterprises in 1964 was \$75 million, i.e. 3 per cent of the gross domestic product. Industrial enterprises alone paid slightly more than \$0.4 million. Exports of industrial products represented 4 per cent of total exports in 1962, 5 per cent in 1963 and 11 per cent in 1964.

The survey on industrial and commercial establishments carried out during the year 1963 and the annual report of the Labour Department gave the following data for 31 December 1963:

	Personnel employed	Wages paid (in millions of dollars)	Turnover (in millions of dollars)
Water and electricity	141	0.22	2.0
Food and beverages	60	0.04	0.5
Various industries	291	0.13	2.5
Mining and quarrying	231	0.04	0.1
Total	723	0.43	5.1
Construction	3,448	2.35	7.3
Total general	4,171	2.78	12.4

These industrial enterprises are, in general, on a small or medium scale, as can be seen from the table below, which classifies them according to the number of persons employed:

Enterprises employing	Water and electricity	Food	Miscellaneous	Construction	Total
1-9 persons	-	-2	3	8	13
10-24 persons	-	2	4	22	28
25-49 persons	2	1	1	-	4
50-249 persons	1	-	2	11	14
Over 250 persons	-	-	-	3	3

#### IV.2 Existing industry comprises:

Food industries (abattoirs, a confectionery factory, a flour mill and a rice mill) and several plants manufacturing aerated beverages.

A brick works (the first factory in Niger) and a tile manufacturing plant at Niamey.

Three concerns assembling furniture and metal structures.

Two cotton-ginning mills at Maradi and Madaoua.

The following were under construction in 1965:

A factory for assembling agricultural machinery and metal furniture.

A brick works which will supply 12,000 tons of bricks, tiles and hollow blocks.

A cement works at Malbaza with an annual capacity of 45,000 tons (the proposed investment in \$3 million).

An abattoir.

A printing works.

Future projects include:

A textile factory (\$4.8 million).

Various foodstuffs factories (meat and tomato canneries, dairies, etc.).

A brewery.

A bag factory.

A body work and bicycle assembly factory.

A plant manufacturing particle board agglomerated with millet straw or groundnut shell binders.

IV.3 Existing industries directly connected in some way with the chemical or related industries are as follows:

Three oil-extraction mills producing 6,800 tons of groundnut oil and 7,300 tons of cake per annum, but with treble that capacity.

A plastics processing factory, which is being enlarged.

A small perfume factory at Niamey.

A soap factory is under construction (\$120,000).

Projects include two hide and skin tanneries.

#### V. THE PRESENT MARKET FOR CHEMICAL PRODUCTS

The customs statistics cover the period 1960-1964, and this enables an approximate estimate to be made of the market. Owing to the low volume of trade involved, imports of certain chemicals amount to less than \$10,000 per annum, but they are nevertheless included in the tables so that the same headings are listed as for the other countries. Some items, such as nitrogenous fertilizers, are negligible, however, and have not been recorded. The annual growth rate is based on a period of four years, except where a particular figure is missing or unrepresentative.

Table 3 relates to quantities imported and table 4 shows their value in dollars. The classification is that of the Brussels Nomenclature.

Table 3

Imports: chemical products and fertilizers (tonnage)

Code number	Commodity	1960	1961	1962	1963	1964	Annual rate
25.01.02	Crude Salt	716	1856	4809	4142	6465	73%
25.01.09	Other Salt	871	2608	2825	1173	239	Variable
.....	.....	...	...	...	...	...	...
<u>Chapter 25</u>	Mineral products	1587	4471	7642	5315	6704	42%
27.11	Gaseous hydrocarbons	24	135	298	142	189	67%
.....	.....	...	...	...	...	...	...
Chapter 27	Petroleum products	24	137	298	147	191	68%

Table 3 (continued)

Code number	Commodity	1960	1961	1962	1963	1964	Annual rate
28.17.08	Caustic soda	-	12	4	5	2	Negative
28.56	Carbides	-	1	2	7	2	Variable
.....	.....	...	...	...	...	...	...
<u>Chapter 28</u>	Inorganic chemicals	3	31	72	31	34	Variable
<u>Chapter 29</u>	Vitamins, alkaloids, antibiotics	-	n	n	n	1	Negligible
30.02.01	Vaccines, sera	-	n	n	n	7	Variable
30.03.01	Pharmacop. medicaments, not put up for retail sale	1	2	6	2	7	63%
30.03.13	Pharmaceutical specialities put up for retail sale	n	34	140	59	121	53%
30.04.11	Other impregnated articles	n	16	8	9	21	Variable
.....	.....	...	...	...	...	...	...
<u>Chapter 30</u>	Pharmaceutical products	3	66	174	89	171	38%
31.02	Nitrogenous fertilizers	n	1	n	-	172	Variable
31.03	Phosphatic fertilizers	-	1	-	-	186	Variable
.....	.....	...	...	...	...	...	...
<u>Chapter 31</u>	Fertilizers	n	2	n	101	358	Variable

Table 3 (continued)

Code number	Commodity	1960	1961	1962	1963	1964	Annual rate
32.09.20	Paints	13	120	145	89	198	97%
32.09.30	Dyes put up for retail sale	2	4	14	41	20	78%
.....	.....	...	...	...	...	...	...
<u>Chapter 32</u>	Paints and varnishes	17	129	174	138	226	91%
36.02	Explosives	-	1	10	10	n	Variable
36.06	Matches	25	262	70	89	103	43%
.....	.....	...	...	...	...	...	...
<u>Chapter 36</u>	Explosives and matches	25	263	80	99	103	43%
38.11.08	Disinfectants, put up (1-kg)	3	22	40	20	56	108%
38.11.10	Disinfectants not put up for retail sale	54	153	64	104	304	54%
.....	.....	...	...	...	...	...	...
<u>Chapter 38</u>	Disinfectants and solvents	57	176	106	125	379	61%
39.02	Polymerization and copolymerization products	2	9	33	54	215	188%
39.07.39	Other plastic articles	3	39	42	55	59	11%
.....	.....	...	...	...	...	...	...
<u>Chapter 39</u>	Plastic materials	10	53	97	119	281	77%
<u>Chapter 51</u>	Man-made fibres	n	2	1	n	1	Negligible

Table 4

Imports: chemical products and fertilizers (value)

(thousands of dollars)

Code number	Commodity	1960	1961	1962	1963	1964	Annual rate
25.01.08	Crude salt						134%
25.01.09	Other salt						Variable
.....	.....	..	..	..	..	..	..
<u>Chapter 25</u>	Mineral products						103%
27.11	Gaseous hydrocarbons						48%
.....	.....	..	..	..	..	..	..
<u>Chapter 27</u>	Petroleum products						49%
28.17.08	Caustic soda						Variable
28.56	Carbides						Negligible
.....	.....	..	..	..	..	..	..
<u>Chapter 28</u>	Inorganic chemicals						66%
<u>Chapter 29</u>	Vitamins, alkaloids antibiotics						Negligible
30.02.01	Vaccines, sera						19.1%
30.03.01	Pharmacop medicaments not put up for retail sale						32%
30.03.13	Pharmaceutical spécialités put up for retail sale						44%
30.04.11	Other impregnated articles						60%
.....	.....	..	..	..	..	..	..
<u>Chapter 30</u>	Pharmaceutical products						41%
31.02	Nitrogenous fertilizers						Variable
31.03	Phosphatic fertilizers						Variable
.....	.....	..	..	..	..	..	..
<u>Chapter 31</u>	Fertilizers						Variable

Table 4 (continued)

Imports: chemical products and fertilizers (value)

(thousands of dollars)

Code number	Commodity	1960	1961	1962	1963	1964	Annual rate
32.09.20	Paints						90%
32.09.30	Dyes put up for retail sale						86%
.....	.....	..	..	..	..	..	
<u>Chapter 32</u>	Paints and varnishes						45%
36.02	Explosives						Variable
36.06	Matches						40%
.....	.....	..	..	..	..	..	
<u>Chapter 36</u>	Explosives and matches						40%
38.11.08	Disinfectants, put up (1-kg)						119%
38.11.10	Disinfectants not put up for retail sale						48%
.....	.....	..	..	..	..	..	..
<u>Chapter 38</u>	Disinfectants and solvents						63%
39.02	Polymerization and copolymerization products						126%
39.07.39	Other plastic articles						40%
.....	.....	..	..	..	..	..	..
<u>Chapter 39</u>	Plastic materials						66%
<u>Chapter 51</u>	Man-made fibres						Negligible



## VI. PLANNING THE CHEMICAL INDUSTRY IN NIGER

The foregoing tables relate solely to imports, since the volume of chemicals exported is negligible. The period of four years covered by the statistics is quite often sufficient to reveal a market trend, although the significance of some figures is not absolutely clear. The majority of the annual growth rates still need to be revised in order to give more reasonable estimates.

### VI.1 Pharmaceutical products

The growth rate is based on a three-year period, since 1960 was not a representative year. Despite this precaution the resulting rates (38 per cent per annum by quantity and 41 per cent by value) seem too high for the future, and it is therefore advisable to adopt the rate of 10 per cent assumed for the other countries. This gives the following forecasts:

	1964	Annual growth rate	1965	1970	1975	1980
Quantity (tons)	172	Adjusted 10%	190	300	500	800
Value (\$ 1000)	699	Adjusted 10	770	1200	2000	3200

As in other developing countries, a pharmaceutical industry can begin purely as a packing industry based on bulk imports of pharmaceutical products supplied by major world concerns and put up and packed in local factories.

A laboratory is also being built at Niamey for the animal husbandry department, which envisages the following output of vaccines:

Rinderpest:	400,000 doses + 100,000 attenuated
Blackleg:	500,000 "
Anthrax:	500,000 "
Bovine pasteurellosis:	250,000 "
Contagious bovine pleuro-pneumonia:	500,000 "
Rabies:	1,000 "

Fowl pox and other  
fowl diseases: depending on scale of poultry-breeding.

A plan exists to build a school for assistants and a school for veterinary workers.

## VI.2 Soap

Current consumption is very low. A comparison between the present per capita consumption in Niger and that in other West African countries suggests that a growth rate of 16 per cent, higher than that for the other countries (except Mauritania), should be adopted, giving the following:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	650 <sup>x/</sup>	Adjusted 16%	800	1600	3300	7000
Value (\$ thousands)	200 <sup>x/</sup>	Adjusted 16%	230	490	1020	2150

<sup>x/</sup> Estimated.

The market is large enough to justify setting up soap factories, which can obtain groundnut paste from local oil-extraction mills and import other items such as caustic soda. A soap factory with a capacity of 1,200 tons per annum is already under construction.

## VI.3 Surface-active agents and washing preparations

In the light of the demand trend in the other countries, the following consumption of these products can be envisaged in Niger:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	200	Adjusted 16%	230	490	1020	2200
Value (\$ 1000)	64	Adjusted 16%	74	160	330	700

The home market seems large enough to justify local packing.

## VI.4 Perfumes and cosmetics

Present consumption seems to be about \$200,000 per annum. On the basis of an annual growth rate of 7 per cent, future consumption would be as follows:

	1964	Annual rate	1965	1970	1975	1980
Value (\$ 1000)	200 <sup>x/</sup>	Adjusted 7%	215	300	420	600

<sup>x/</sup> Estimated

The market offers possibilities of expanding local production to meet 60-80 per cent of the country's requirements.

#### VI.5 Pigments, paints and varnishes

The year 1960 was a launching period, a fact which distorts the growth rate calculation. With the calculation based on the years 1961-1964, the rate drops from 91 to 20 per cent in quantity and from 45 to 23 per cent in value.

If the figures are rounded off and a corrected and more realistic growth rate adopted comparable to those assumed for the other countries, the average estimates work out as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	230	Adjusted 12%	260	450	800	1400
Value (\$ 1000)	134	Adjusted 12%	150	260	470	820

#### VI.6 Disinfectants and solvents

The fairly high growth rates of 61 per cent in weight and 63 per cent in value are based on the reference period figures, and probably reflect the level of locust control activities. Insecticides and fungicides have been distributed under Government auspices since 1963.

On the basis of the 1964 figures, the present trend in this sector in Niger would give the following results:

	1964	1965	1970	1975	1980
Quantity (tons)	379	800	1600	3200	6400
Value (\$ 1000)	126	250	500	1000	2000
including:					
50% DDT (tons)	50 <sup>x/</sup>	100	200	400	800
25% BHC (tons)	150 <sup>y/</sup>	300	600	1200	2400

x/ Estimated

The turnover is too small to justify manufacturing the basic materials locally, and local formulation and putting up alone can be envisaged.

#### VI.7 Explosives

Imports of explosives were negligible in 1960 and 1964. If the country's present demand is estimated at some 8 tons per annum, the future consumption of these products would work out as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	8 <sup>x/</sup>	10	20	40	80

<sup>x/</sup> Estimated

Outlets are insufficient to justify studying the possibility of local manufacture. The question needs to be viewed from the sub-regional angle.

#### VI.8 Plastics

Once again the growth rates have been based on a period of three years, because 1960 was not a representative year. Even so the resulting figures are too high. The general market trend in these products suggests the advisability of adopting a growth rate of 35 per cent for the current year and 25 per cent for the period after 1965, giving the following:

	1964	1965	1970	1975	1980
Quantity (tons)	281	380	1160	3540	10,790
including:					
PVC (tons)	100 <sup>x/</sup>	125	350	1000	3,000
Polyethylene (tons)	100 <sup>x/</sup>	125	350	1000	3,000

<sup>x/</sup> Estimated

The market is expanding, but conditions are not suitable for manufacturing basic items. The injection and extrusion sector can nevertheless be developed.

VI.9 Caustic soda

Imports of caustic soda are insignificant, but the new soap factory under construction may alter the position. Future requirements of caustic soda for soap manufacture can be estimated as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	-	-	160	330	700

The market is a small one. The question of production concerns the entire sub-region.

VI.10 Calcium carbide

Imports are variable and negligible. Future consumption of this item can be estimated at:

	1964	1965	1970	1975	1980
Quantity (tons)	4	6	25	50	100

The market is not large enough to be treated on a national basis.

VI.11 Fertilizers

The comment about pesticides also applies to fertilizers, which benefit from government aid under the plan. The statistics are insufficient to enable growth rates to be worked out, but the reports referred to earlier contain two estimates for 1970. Assuming the fertilizers consumed in 1964 to be ammonium sulphate and single super-phosphate, the results are as follows:

(tons of fertilizer)

Reference year	1964	1965	1970	1975
Source of estimate:	36	45	140	430
Statistics (reference year 1964)				
$P_{205}$	33	41	125	380
J. Kellerman (reference year 1970) (1)				
N	-	16	50	150
$P_{205}$	-	16	50	150
F.W. Hauck (reference year 1970) (2)				
N	-	162	500	1500
$P_{205}$	-	325	1000	3000
$K_{205}$	-	162	500	1500

- 1/ J. Kellerman: La consommation des engrais en Côte d'Ivoire, February 1963.
- 2/ F.W. Hauck, Soil Fertility and Fertilizers in West Africa (E/CN.14/INR/70)

The statistical projections occupy an intermediate position.

The type of crop involved must nevertheless be allowed for when estimating requirements, and it therefore seems advisable to adopt the forecasts of F.W. Hauck as valid for 1970. This gives the following results:

		1964	1965	1970	1975	1980
N	(tons)	36	50	500	1500	3000
P <sub>2</sub> O <sub>5</sub>	(tons)	33	60	1000	3000	6000
K <sub>2</sub> O	(tons)	20	40	500	1500	3000

The market is expanding, but the quantities involved are still very small and do not justify studying the possibility of local manufacture on a purely national basis. The problem can only be viewed in the sub-regional context.

#### VI.12 Salt

Although Niger has its own salt pans, imports of salt are rising considerably, probably as a result of competition from Senegal. In any case salt consumption is growing very rapidly. On the basis of the salt demand in the other countries, annual growth rates of 7 per cent in quantity and 5 per cent in value can probably be adopted. This gives the following forecasts:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	6704	Adjusted 7%	7170	10100	14100	19800
Value (\$ 1000)	393	Adjusted 5%	410	530	670	860

The market is expanding, and is large enough to justify studying all possible means of developing local production. In any case the question needs examining from a sub-regional standpoint.

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## I. SIERRA LEONE

### I. GENERAL CHARACTERISTICS

#### I.1 Population

2,180,350 (1963)

Annual growth rate 1958-1963: 2 per cent.

Population projection (in thousands):

1965: 2,710                      1975: 3,310

1970: 3,000                      1980: 3,660

#### I.2 Area 72, 326 km<sup>2</sup>.

#### I.3 Population density: 30 inhabitants/km<sup>2</sup> (1963).

I.4 Sierra Leone has been an independent Dominion since 27 April 1961 and is a member of the Commonwealth. Ninety per cent of the population are rural and are engaged in purely agricultural activities or in arts and crafts connected with agriculture. There are approximately 62,000 wage-earners in the industrial sector.

Three vegetation zones can be distinguished: the low coastal area, to which the sharply undulating Sierra Leone peninsula is an exception, with an abundance of mangrove and palm trees and with swamps in the south; the centre, which is covered with secondary forest varying in density according to how much has been cleared for cultivation; and the north, which is accidented and has mountains with less cover (wood savannah or parkland savannah) ranging from 400 to 1,800 metres in altitude.

Land use is as follows: cultivable land 55.5 per cent, forest (reserves) 4.0 per cent, meadow and pasture (savannah) 30.5 per cent, swamps, etc. 10.0 per cent. Most of the easily accessible land is already worked. The land still available is of poorer quality than that already under cultivation and would only be suitable for use after costly expenditure (on irrigation, drainage, clearance, provision of access roads, etc.).

Sierra Leone is essentially an agricultural country. Agriculture not only meets the country's basic food requirements but also makes a substantial contribution to exports. The basic food is rice, which at a production level of 250,000 tons (of paddy rice) per annum represents more than half the estimated volume of total agricultural output. The other food crops include sorghum, millet, cassava, sweet potatoes, groundnuts, fruit and vegetables.

Palm kernels constitute the leading agricultural export in terms of value. Other export crops are kola nuts, piassava fibres, cocoa, coffee (high-quality Robusta, used to produce ground coffee), ginger, sesame seeds, groundnuts, copra, tobacco, cotton, sugar cane, hevea and bananas.



Ten years ago agricultural products represented about half the country's exports. Today their total value has somewhat diminished and mineral substances represent 83 per cent of exports in terms of value.

Table 1 illustrated the part played by mineral and agricultural products in Sierra Leone's exports.

Table 1

Exports from Sierra Leone

(quantities in thousands of tons, values in millions of dollars)

Description	1961		1962		1963		1964	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Diamonds (in thousands of carats)	2,046	44.7	1,158	19.9	1,738	45.3	1,650	55.8
Iron ore	1,758	13.1	1,983	14.3	1,954	13.8	1,980	14.6
Bauxite	-	-	-	-	20	0.1	155	0.6
Chromite	9	0.3	9	0.3	9	0.2	...	...
	3,813	58.1	3,150	34.5	3,721	59.4	3,785	71.0
Palm kernels	58	6.8	61	6.9	53	6.9	52	6.3
Coffee	5	1.7	2	0.9	4	1.8	6	3.8
Cocoa	3	1.3	5	2.1	3	1.6	3	1.6
Piassava	6	0.8	5	0.7	6	0.8	7	1.0
Ginger	0.6	0.2	0.5	0.4	0.6	0.2	0.6	0.5
Kola nuts	1	0.3	0.9	0.2	0.6	0.2	1	0.4
	73.6	11.1	74.4	11.2	67.2	11.5	69.6	14.1
Miscellaneous		1.3	0	0.9		0.3		0.1
Total		70.5		46.6		71.2		85.2

Source: Quarterly Statistical Bulletin (1964), Central Statistics Office, Freetown, Sierra Leone.

The above table shows that nearly all the exports of mineral products consist of diamonds and iron ore. Chromium, on the other hand, has become far less important, although the prospects for bauxite are wholly favourable.

Whereas the country's output of mineral raw materials has emerged as the leading export, the processing industries remain in an embryonic state despite the latest progress.

The Government's ten-year development plan (1962/63-1971/72) is divided into two equal stages.

In percentage terms the proposed expenditure per sector in the first five years is as follows:

Medical and health	21.4
Education	10.5
Housing and country planning	4.1
Roads and bridges	17.3
Port and marine	2.4
Civil aviation and meteorology	1.3
Public works (other)	3.6
Electricity	11.1
Water supplies	1.9
Agriculture, etc.	7.7
Trade and industry	9.1
Information and broadcasting	3.6
Other	<u>6.0</u>
Total	100

Source: Ten-Year Plan of Economic and Social Development for Sierra Leone, 1962/63-1971/72, Sierra Leone Government.

As regards industry the main role is left to private enterprise, although the Government seems anxious to play a larger part.

## II. MINERAL RESOURCES

The subsoil of Sierra Leone is rich on account of the variety of minerals it contains, but not all of them are in a particularly suitable state for working.

### II.1 Diamonds

Diamonds are one of the country's main exportable riches. Sierra Leone is the world's second producer of precious stones and its third producer of industrial diamonds. Diamonds occur both alluvially and in veins. As alluvial diamond production, carried on by a large number of individual prospectors (estimated at 35,000-40,000) declines, that of vein diamonds is increasing. Reserves of the latter appear to be considerable. Vein diamonds are worked by a large (American) private company, Sierra Leone Selection Trust. Total output now amounts to 1.8 million carats.

## II.2 Iron

Iron ore occurs in two very large deposits. The Marampa iron mine, some 100 km inland, produces 2 million tons of 65 per cent concentrates per annum. This figure will be increased to approximately 3 million tons by 1966. The iron content is average (40-45 per cent), but although reserves are substantial and the plant very modern, the low grade of the ore will prevent it from competing indefinitely, particularly with ore from Mauritania and Liberia, in view of the high transport costs involved.

Another important deposit is at Tonkolili near the frontier with Guinea. Reserves are estimated at approximately 100 million tons, but the ore cannot be enriched by existing methods. Private companies seem uninterested in exploiting the deposit at the moment owing to severe competition on the iron ore market and the heavy infrastructural (transport) costs which would be involved in bringing the deposit into production.

## II.3 Bauxite

Sierra Leone started producing bauxite in the second half of 1963 with the first shipment from the mines in the Mekanji Hills. The ore is of an exceptionally high grade averaging 57 per cent of alumina. Production, initially 100,000 tons per annum and over 150,000 tons in 1964, will gradually be increased to 400,000 tons. Reserves are large but have not yet been evaluated. It is likely that further deposits of high-grade ore will be discovered.

## II.4 Other minerals

Deposits of platinum, gold, coal, ilmenite, molybdenum and corundum also exist, but either in small quantities only or else in forms not at present exploitable. Amongst other minerals chromite was once fairly important, but mining stopped in 1963 owing to the falling market price and the fact that working had become difficult.

## III. ELECTRIC POWER, FUEL AND WATER

All the electricity at present generated is of thermal origin. Electricity production has expanded as follows during the last four years:

Table 2

Electric power production

Year	Number of undertakings	Installed capacity (1,000 kW)	Total output (100 kWh)	Annual sales (1,000 kWh)
1961-1962	14	10.8	38,500	29,100
1962-1963	18	14.0	44,600	33,100
1963-1964	19	14.0	52,300	39,800
1964-1965	20	16.0	56,800	45,400

Source: Sierra Leone Electricity Corporation.

A new thermal power station (King Tom) with a capacity of 12,000 kW is under construction near Freetown.

Under the ten-year Plan 11.1 per cent of the total expenditure in the first five years is earmarked for expanding electricity supplies. The International Bank for Reconstruction and Development has loaned the equivalent of \$3.8 million for developing electric power generating and distribution facilities.

So far no petroleum deposits have been discovered in Sierra Leone. The prospecting which was in progress until quite recently has produced no results and has been abandoned.

A scheme exists to build an oil refinery. The output, most of which would be for bunkering supplies, could easily cover home consumption at the same time.

A very large reservoir is at present under construction in the Sierra Leone peninsula to supply the town with water and possibly to provide supplies for a hydro-electric power station.

Domestic water production capacities are as follows:

Freetown	approximately 54,000 m <sup>3</sup>	per day
Koidu	" 2,700 "	" "
Kabala	" 1,800 "	" "
Kenema	" 1,800 "	" "
Port Loko	" 1,800 "	" "
Kambia	" 1,800 "	" "
Lunsar	" 1,800 "	" "
Rokupr	" 1,800 "	" "
Pujehun	" 1,400 "	" "
Bunpe	" 900 "	" "
Njala	" 900 "	" "
Kamakwie	" 1,800 "	" "
Batkanu/Mateboi	" 1,600 "	" "
Bonthe	" 1,600 "	" "
Mattru	" 1,600 "	" "
Rotifunk	" 1,600 "	" "
Mano	" 1,400 "	" "
Gbangbatoke	" 500 "	" "
Segbwema	" 1,600 "	" "
Blama	" 1,600 "	" "
Buedu	" 800 "	" "
Jimni Bagbo	" 500 "	" "
Kassiri/Kychom/Kyamadi	" 1,100 "	" "
Makali	" 500 "	" "
Mambolo	" 1,100 "	" "
Pendembu	" 1,400 "	" "
Potoru	" 500 "	" "
Songo	" 500 "	" "
Sumbuya	" 1,400 "	" "
Tihun	" 500 "	" "
Yengema	" 1,100 "	" "

Source: A Progress Report on Economic and Social Development, April 27, 1961 - March 31, 1965, Sierra Leone Government.

#### IV. EXISTING INDUSTRY

IV.1 The existing industries can be separated into two categories depending on whether they process local or imported raw materials. Both categories produce exclusively for the home market.

The following table shows the structure of employment in the industrial sector at 31 December 1964.

Table 3

Number of persons employed in the industrial sector  
(December 1964)

	Persons employed
Agriculture	4,902
Mining and quarrying	6,610
Processing industries	5,184
Building	11,932
Electricity and water	1,640
Trade	4,958
Transport	7,933
Services	18,540
Total	61,699

Source: Quarterly Statistical Bulletin No.4, 1964, Central Statistics Office, Freetown.

The fact that the number of wage-earners in the mining industry is low in relation to the paramount position occupied by this sector in the country's exports is due to the high degree of mechanization in the mines. There is nevertheless an unknown quantity (several thousands) of diamond prospectors working either intermittently or permanently for their own account.

Table 4 gives further details regarding the manufacturing industry.

Table 4

Number of persons employed in manufacturing industry  
(December 1964)

	Persons employed
Grain and flour	546
Bakeries	128
Distilleries	61
Breweries	167
Non-alcoholic beverage plants	273
Tobacco and cigarettes	387
Umbrella factories	35
Sawmills	825
Furniture factory	74
Printing establishments	490
Chemicals	70
Oil-extraction mills	904
Building materials	44
Metalworking	17
Garages	1,163
Total	5,184

Source: Quarterly Statistical Bulletin No.4, 1964,  
Central Statistics Office, Freetown.

The above tables indicate clearly the structure of employment and provide information about the position occupied by industry proper.

IV.2 It is impossible in the context of this report to give an exact description of all the existing undertakings in the processing industry. The following table is therefore confined to giving the names, products and capacities of certain existing concerns.

Table 5

Existing establishments built in the period 1961-1965

Undertaking	Principal products	Annual capacity	
		Quantity	Value in thousands of dollars
1. Van Camp Sierra Leone Ltd. (wholly American)	Frozen Tunny	cold storage capacity 2,500 tons	-
2. Sea Products Ltd. (Danish/Sierra Leonean)	Frozen fish	cold storage capacity 1,500 tons	-
3. Sierra Leone Tomato Factory (Italian, S.L. Government)	Canned tomato products	2,500,000 cans	532
4. Wellington Distilleries, Ltd. (British, S.L. Government)	Gin, whisky, brandy	100,000 cases	1,680
5. Sierra Leone Brewery, Ltd. (British/Dutch)	Beer	3 million litres	1,960
6. Aureol Tobacco Co.Ltd. (British)	Tobacco and cigarettes	800 million cigarettes	7,560
7. Sierra Leone Knitting Mills Ltd. (Kenyan/Sierra Leonean)	Knitted goods	120,000 dozen	1,008
8. West African Shoe and Rubber Industries Ltd. (Swedish/S.L. Government)	Leather and rubber footwear	725,000 pairs	935
9. Plastics Manufacturing (Sierra Leone) Ltd. (Bata/Lebanese/S.L. Government)	Plastic sandals	1 million pairs	700
10. Metropolitan Industries Sierra Leone Ltd. (Indian/Sierra Leonean)	Clothing	50,000 dozen	420
11. West African Umbrella Factory Ltd. (Indian)	Umbrellas	25,000 dozen	560



Table 5 (continued)

Undertaking	Principal productions	Annual capacity	
		Quantity	Value in thousands of dollars
12. Forest Industries Corporation, Kenema (S.L. Government)	Boards, furniture, prefabricated houses	...	840
13. Katema Saw Mills, Ltd., Panguma (Swiss)	"	...	280
14. Sierra Leone Paper Factory Ltd. (British/Sierra Leonean)	Paper-board and paper-board packagings		462
15. Sierra Leone Tyre Factory Ltd. (British/Sierra Leonean)	Tyre retreads	1,750 car tyres, 1,750 lorry and tractor tyres	78
16. Sierra Leone Oxygen Factory, Ltd. (Italian)	Oxygen, acetylene and carbon dioxide	2,592 tons of oxygen, 172.8 tons of carbon dioxide and 864 tons of acetylene	144
			53
			179
17. Sierra Leone Produce Marketing Board (S.L. Government) (12 undertakings)	Palm oil	...	...
18. Sierra Leone Paint Manufacturing Co. Ltd. (Lebanese)	Paint	800 tons	...
19. Sierra Leone Cement Works Ltd. (Israeli/S.L. Government)	Cement from imported clinker	55,000 tons	847
20. Sierra Leone Manufacture Co. Ltd. (Lebanese/Sierra Leonean)	Wire nails	1,000 tons	1,120
21. Sierra Leone Diamonds, Ltd. (American/S.L. Government)	Cut and polished diamonds	20,000 carats	2,800

Source: A Progress Report on Economic and Social Development, April 27, 1961 - March 31, 1965, Sierra Leone Government.

The following activities should also be noted:

Paddy rice is husked in three mills, including a new one at Kissy (Freetown); all three belong to the Government and the total daily capacity is 115 tons. There are smaller private mills inland;

A factory under construction at Bo (Southern Province) will manufacture margarine, table oil, soap and candles from local oil-seeds and will handle 7,000 tons of palm fruits, groundnuts and sesame seeds per annum;

There is a tunny canning factory at Freetown, with an annual capacity of 10,000 tons;

Various building materials (tiles and bond stones) are supplied in small quantities by local works;

Small factories produce metal door and window frames, etc.

In its present form the industrial sector is a collection of scattered and structurally unco-ordinated units, and cannot constitute an efficient stimulus to development. It was, moreover, set up to help remedy the persistent imbalance in the country's foreign trade, and in most cases it needs substantial protection to be competitive.

#### IV.3 Existing industries having some direct connexion with the chemical or related industries

Apart from the oil-extraction mills, the oxygen, acetylene and carbon dioxide works and the paint, margarine/soap, plastics and tyre retread concerns described above, the existing industries have little connexion with chemistry.

#### V. THE PRESENT MARKET FOR CHEMICALS IN SIERRA LEONE

The following tables are based on a selection of chemical and related products listed in the customs statistics for the years 1960-1964, which have been adopted as the reference period. Generally speaking the growth rates are based on a four-year period, except where a particular figure is missing or unrepresentative. Table 6 relates to quantities imported. Table 7 shows their value in dollars. Table 8 then illustrates the share represented by chemicals in Sierra Leone's foreign trade.

Table 6

Imports: chemical and related products (tonnage)

						(Tons)
Classification	1960	1961	1962	1963	1964	Annual rate
<u>Group 271. Fertilizers, crude</u>						
271.1 Natural fertilizers of animal or vegetable origin, not chemically treated	1	10	2	21	743	
271.2 Natural sodium nitrate	..	..	..	5		
271.3 Natural phosphates, whether or not ground	..	..	..	..		
271.4 Natural potassic salts, crude	12	34	9	32		
<u>Group 276. Other crude minerals</u>						
276.3 Salt	7514	7347	6463	8862	8840	4%
<u>Section 5. Chemicals</u>						
<u>Group 512. Organic chemicals</u>						
512.2 Alcohols, phenols, glycerine	13	21	25	105	66	50%
512.5 Acids and their derivatives	1	2	1	1	...	-
512.9 Other organic chemicals	..	..	..	..	...	-
<u>Group 513. Inorganic chemicals</u>						
513.3 Inorganic acids and oxygen compounds of metalloids	56	43	33	28	197	37%
513.6(2) Caustic soda (sodium hydroxide)	111	355	201	170	168	25%
<u>Group 514. Other inorganic chemicals</u>						
514.9(4) Calcium carbide	47	93	268	107	4	3%
514.9(9) Other inorganic compounds n.e.s.	...	...	...	...	...	

Table 6 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
<u>Group 521. Mineral tar and crude chemicals from coal, petroleum and natural gas</u>						
521.1 Mineral tar	142	211	195	114	140	Minus
521.4 Oils and other products of the distillation of coal tar	28	44	24	35	283	78%
<u>Group 531. Synthetic organic dyestuffs, natural indigo and colour lakes</u>						
531.0 Synthetic organic dyestuffs, natural indigo and colour lakes	5	14	21	17	24	48%
<u>Group 532. Dyeing and tanning extracts, and synthetic tanning materials</u>						
532.1 Dyeing extracts (vegetable and animal)	1	2	1	2	5	50%
<u>Group 533. Pigments, paints, varnishes and related materials</u>						
533.1 Colouring materials, n.e.s.	263	513	268	246	309	4%
533.2 Printing inks	4	5	7	6	5	6%
533.3(1) Prepared pigments, opacifiers, enamels, glazes, lustres, etc.	651	864	801	787	1350	20%
<u>Group 541. Medicinal and pharmaceutical products</u>						
541.1 Vitamins and provitamins	...	...	...	...	...	...
541.3 Penicillin, streptomycin, tyrocidine and other antibiotics	...	...	...	...	...	...
541.4 Opium alkaloids, cocaine, caffeine, quinine and other vegetable alkaloids, their salts and other derivatives	...	...	...	...	...	...

Table 6 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
541.6(3) Bacterial products, sera, vaccines	...	...	...	...	...	...
541.7(2) Unguents, liniments	...	...	...	...	...	...
541.9(1) Bandages, etc., impregnated or coated with pharmaceutical products or put up for retail sale	...	...	...	...	...	...
541.9(9) Other pharmaceutical goods	...	...	...	...	...	...
<u>Group 551. Essential oils, perfume and flavour materials</u>						
551.1 Essential oils and resinoids	4	15	35	67	20	50%
<u>Group 553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)</u>						
553.1 Perfumery	12	25	19	20	26	21%
553.2 Dentifrices	26	25	36	43	62	24%
553.3 Talcum and powders	78	105	62	59	60	Minus
553.4 Pomades	36	54	29	20	27	Minus
553.9 Other perfumery, cosmetics and toilet preparations	...	...	...	...	69	?
<u>Group 554. Soaps, cleansing and polishing preparations</u>						
554.1(1) Toilet soaps	147	183	269	241	268	16%
554.1(2) Common soap	3035	3648	2856	3046	3450	3%
554.2 Surface-acting agents and washing preparations	112	172	212	250	467	43%
554.3 Polishes, pastes, powder and similar preparations for polishing and preserving leather, wood, metal, glass and other materials	93	135	105	170	191	20%

Table 6 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
<u>Group 561. Fertilizers, manufactured</u>						
561.1 Nitrogenous fertilizers (ammonium sulphate)	20	128	327	580	1	Variable
561.1(9) Other nitrogenous fertilizers	...	14	1	7	208	Variable
561.2(1) Superphosphates	286	..	1	380	6	Variable
561.2(9) Other phosphatic fertilizers	3	474	10	565	203	Variable
561.3 Potassic fertilizers	21	11	77	380	...	Variable
561.9 Fertilizers, n.e.s.	3	6	29	300	5	Variable
<u>Group 571. Explosives and pyrotechnic products</u>						
571.1(1) Propellant powders	70	90	488	90	58	Minus
571.1(2) Other prepared explosives	67	92	52	109	121	16%
571.2 Fuses, primers and detonators	20	23	34	22	19	-
571.3 Pyrotechnical articles	...	...	...	...	...	...
571.4 Hunting and sporting ammunition	...	...	...	...	...	...
<u>Group 581. Plastic materials, regenerated cellulose and artificial resins</u>						
581.9 Artificial plastic materials	6	22	7	10	98	101%
<u>Group 599. Chemical materials and products, n.e.s.</u>						
599.2(1) Disinfectants	64	65	84	69	75	4%
599.2(2) Insecticides and fungicides	...	...	...	...	...	
599.9 Chemical products and preparations, n.e.s.	...	...	...	...	...	

Source: The Sierra Leone Trade Reports 1960-1964

Table 7

Imports: Chemical and related products (value)

(thousands of dollars)

Classification	1960	1961	1962	1963	1964	Annual rate
<u>Group 271. Fertilizers, crude</u>						
271.1 Natural fertilizers of animal or vegetable origin, not chemically treated	0.2	0.8	0.6	0.4		
271.2 Natural sodium nitrate	0.1	...	...	0.1	29.0	
271.3 Natural phosphates, whether or not ground	...	...	0.1	...		
271.4 Natural potassic salts, crude	0.4	1.4	0.5	2.1		
<u>Group 276. Other crude minerals</u>						
276.3 Salt	330.2	332.4	290.7	407.7	358.3	2%
<u>Section 5. Chemicals</u>						
<u>Group 512. Organic chemicals</u>						
512.2 Alcohols, phenols, glycerine	4.8	8.5	8.8	38.0	26.1	53%
512.5 Acids and their derivatives	0.3	1.1	0.4	0.9	...	Variable
512.9 Other organic chemicals	22.1	22.8	23.1	32.6	30.9	9%
<u>Group 513. Inorganic chemicals</u>						
513.3 Inorganic acids and oxygen compounds of metalloids	14.5	14.0	10.9	10.4	56.7	41%
513.6(2) Caustic soda (sodium hydroxide)	33.1	70.8	60.2	54.1	77.1	23%
<u>Group 514. Other inorganic chemicals</u>						
514.9(4) Calcium carbide	11.9	25.2	38.3	24.8	39.7	35%
514.9(9) Other inorganic compounds n.e.s.	56.1	116.8	83.9	161.8	205.3	38%

Table 7 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
<u>Group 521. Mineral tar and crude chemicals from coal, petroleum and natural gas</u>						
521.1 Mineral tar	13.1	18.6	13.3	10.5	13.0	-
521.4 Oils and other products of the distillation of coal tar	4.2	8.1	4.2	7.3	14.6	36%
<u>Group 531. Synthetic organic dyestuffs, natural indigo and colour lakes</u>						
531.0 Synthetic organic dyestuffs, natural indigo and colour lakes	14.6	33.2	43.5	40.1	66.2	46%
<u>Group 532. Dyeing and tanning extracts, and synthetic tanning materials</u>						
532.1 Dyeing extracts (vegetable and animal)	2.2	2.8	1.5	3.0	4.2	18%
<u>Group 533. Pigments, paints, varnishes and related materials</u>						
533.1 Colouring materials, n.e.s.	85.1	153.9	86.4	120.6	131.3	11%
533.2 Printing inks	3.1	3.4	5.6	4.4	5.0	13%
533.3(1) Prepared pigments, opacifiers, enamels, glazes, lustres, etc.	375.2	481.4	420.1	418.7	433.9	4%
<u>Group 541. Medicinal and pharmaceutical products</u>	1068.6	1667.3	1213.4	1334.1	1720.6	13%
541.1 Vitamins and provitamins	11.0	13.0	9.0	24.5	12.2	3%
541.3 Penicillin, streptomycin, tyrocidine and other antibiotics	46.8	68.9	49.1	64.5	55.7	5%
541.4 Opium alkaloids, cocaine, caffeine, quinine and other vegetable alkaloids, their salts and other derivatives	4.3	5.7	6.4	3.7	3.9	Minus
541.6(3) Bacterial products, sera, vaccines	10.4	6.8	18.7	26.6	...	Variable



Table 7 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
541.7(2) Unguents, liniments	205.1	248.0	203.7	185.5	245.6	5%
541.9(1) Bandages etc., impregnated or coated with pharmaceutical products or put up for retail	66.4	94.2	94.5	85.3	92.9	9%
541.9(9) Other pharmaceutical goods	724.6	1230.7	832.0	994.0	1310.3	16%
<u>Group 551. Essential oils, perfume and flavour materials</u>						
551.1 Essential oils and resinoids	12.3	60.9	61.2	267.0	138.0	83%
<u>Group 553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)</u>						
553.1 Perfumery	52.9	111.5	79.5	64.2	100.5	17%
553.2 Dentifrices	48.4	54.6	100.4	75.1	101.2	20%
553.3 Talcum and powders	96.8	118.9	67.6	62.9	74.4	Minus
553.4 Pomades	29.2	48.0	32.6	17.2	25.5	Minus
553.9 Other perfumery, cosmetics and toilet preparations	121.5	156.7	141.0	109.4	134.1	3%
<u>Group 554. Soaps, cleansing and polishing preparations</u>						
554.1(1) Toilet soaps	93.0	110.0	132.9	128.8	142.3	11%
554.1(2) Common soaps	559.4	690.9	554.4	614.1	673.9	5%
554.2 Surface-acting agents and washing preparations	52.2	81.9	100.3	133.7	168.7	34%
554.3 Polishes, pastes, powder and similar preparations for polishing and preserving leather, wood, metal, glass and other materials	61.0	106.5	79.2	96.4	118.3	18%

Table 7 (continued)

Classification	1960	1961	1962	1963	1964	Annual rate
<u>Group 561. Fertilizers, manufactured</u>						
561.1 Nitrogenous fertilizers (ammonium sulphate)	1.2	6.5	11.9	29.6	...	?
561.1(9) Other nitrogenous fertilizers	..	1.3	2.4	0.4	19.7	Variable
561.2(1) Superphosphates	9.3	...	0.1	30.7	0.3	Minus
561.2(9) Other phosphatic fertilizers	0.6	28.4	0.5	16.4	6.5	81%
561.3 Potassic fertilizers	1.4	0.8	6.6	27.5	...	Variable
561.9 Fertilizers, n.e.s.	0.6	1.5	2.9	20.8	1.3	Variable
<u>Group 571. Explosives and pyrotechnic products</u>						
571.1(1) Propellant powders	48.3	63.3	47.6	69.4	44.1	Minus
571.1(2) Other prepared explosives	51.2	54.3	43.9	75.9	88.8	15%
571.2 Fuses, primers and detonators	29.5	38.0	45.5	46.0	35.0	5%
571.3 Pyrotechnical articles	6.0	18.2	6.0	23.8	9.7	13%
571.4 Hunting and sporting ammunition	83.3	117.4	90.5	45.0	109.0	7%
<u>Group 581. Plastic materials, regenerated cellulose and artificial resins</u>						
581.9 Artificial plastic materials	12.5	18.9	15.6	11.7	90.0	64%
<u>Group 599. Chemical materials and products, n.e.s.</u>						
599.2(1) Disinfectants	34.7	50.9	49.2	46.7	56.3	13%
599.2(2) Insecticides and fungicides	55.4	82.9	110.2	74.6	161.2	30%
599.9 Chemical products and preparations, n.e.s.	79.2	116.9	97.3	113.5	152.9	18%
Section 5 total	3249	4767	3893	4441	5277	

Source: The Sierra Leone Trade Reports 1960-1964.

Table 8

Chemicals as a component of the foreign trade of Sierra Leone  
(Values in thousands of dollars)

Year	Imports (c.i.f.)		Exports (f.o.b.)		Re-exports (f.o.b.)	
	Total	Chemicals	Total	Chemicals	Total	Chemicals
1960	73,758 100%	3,249 4.4%	72,595 100%	... ...	10,370 100%	22 0.2%
1961	91,110 100%	4,767 (52%)	70,465 100%	... ...	11,776 100%	29 0.3%
1962	85,218 100%	3,893 4.6%	46,620 100%	... ...	10,850 100%	15 0.1%
1963	83,593 100%	4,441 5.3%	71,233 100%	... ...	9,809 100%	16 0.2%
1964	99,426 100%	5,277 5.3%	85,237 100%	... ...	9,914 100%	17 0.2%

Source: The Sierra Leone Trade Reports 1960-1964.

## VI. PLANNING THE CHEMICAL INDUSTRY IN SIERRA LEONE

An examination of the above tables enables estimates to be made of:

The market development trend;

The relative values of present requirements of chemicals.

With certain product groups the quantities or values recorded in 1960 and 1961 were extremely low, and the growth rates are therefor abnormally high. The figures concerned will therefore need adjustment in order to give more reasonable estimates.

### VI.1 Medicinal and pharmaceutical products

The growth rate calculated from the statistics (13 per cent in value) gives a good estimate of the rise in current consumption. As regards the future it will probably be wiser to adopt a rate of 8 per cent as based on the estimates of the other countries. This gives the following forecasts:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	500 <sup>x/</sup>	Adjusted 8%	540	800	1200	1700
Value (\$ 1000)	1721	Adjusted 8%	1860	2700	4000	5900

x/ Estimated

As in other developing countries, a pharmaceuticals industry can start out purely as a processing industry.

#### VI.2 Soap

The quantity growth rates recorded in the customs statistics are 16 per cent for toilet soap and 3 per cent for common soap, the respective value figures being 11 per cent and 5 per cent.

If the figures are rounded off and an over-all growth rate of 6 per cent is adopted, the average consumption estimates work out as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	3720	adjusted 6%	4000	5300	7100	9400
Value (\$ 1000)	816	adjusted 6%	870	1200	1600	2100

The market is expanding, and is large enough to justify developing local production. As already pointed out, a factory is being built at Bo to manufacture soap and other articles from local oil-seeds.

#### VI.3 Surface-active agents and washing preparations

Consumption of these items has increased at a fairly high rate (43 per cent by quantity and 34 per cent by value).

In view of the general market trend, consumption in Sierra Leone is likely to be as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	470	adjusted 11.5%	524	900	1560	2700
Value (\$ 1000)	169	adjusted 11.5%	188	320	560	970

The home market seems large enough to justify local packing.

#### VI.4 Perfumes and cosmetics

Consumption of perfumery and dentifrices has increased at rates of 21 per cent and 24 per cent respectively in quantity and 17 per cent and 20 per cent respectively in value. On the other hand, imports of talcum and other powders and pomades have dropped.

The over-all demand is expected to increase as follows:

	1964	Annual rate	1965	1970	1975	1980
Value (\$ 1000)	436	adjusted 5%	460	600	750	950

The market offers possibilities for local formulation and packing to meet 60-80 per cent of the demand.

#### VI.5 Pigments, paints and varnishes

Despite local production, imports have risen considerably. The present consumption level seems to be about 2,300 tons per annum. On the basis of a 7 per cent growth rate, comparable to that adopted for the other countries, the average estimates would be as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	2300 <sup>x/</sup>	adjusted 7%	2460	3450	4800	6800
Value (\$ 1000)	790 <sup>x/</sup>	adjusted 7%	840	1180	1650	2300

<sup>x/</sup> Estimated

The market is expanding and is large enough to justify developing local production.

#### VI.6 Disinfectants and solvents

The annual value growth rates recorded in the customs statistics are 13 per cent for disinfectants and 30 per cent for insecticides and fungicides.

Future consumption, comparable with that of the other countries, would work out as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	75	100	200	400	800
including:					
50% DDT (tons)	8	10	20	50	100
25% BHC (tons)	30	40	70	140	280

Outlets are insufficient to justify studying the possibilities of local manufacture. This problem concerns the whole sub-region.

#### VI.7 Explosives

Present consumption is about 198 tons per annum. The future consumption of this item can be estimated at:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	198	adjusted 7%	210	300	420	580

The turnover is too narrow for local manufacture.

#### VI.8 Plastics

The annual growth rates recorded in the statistics are extremely high (101 per cent in weight and 64 per cent in value), because the 1960 tonnage and value figures were particularly low, in fact almost negligible. As in other cases, adjusted growth rates comparable to those adopted for the other countries (35 per cent in the current period and 25 per cent after 1970) must be assumed, giving the following:

	1964	1965	1970	1975	1980
Quantity (tons)	98	132	440	1340	4100
including:					
PVC (tons)	30	40	130	400	1200
Polyethylene (tons)	20	30	120	350	1200

A factory producing plastic footwear already exists. The market is too small to produce basic materials locally for Sierra Leone alone, although the injection and extrusion sector could be developed.

#### VI.9 Caustic soda

The caustic soda market shows a steady increase (25 per cent per annum in quantity and 23 per cent per annum in value).

Future requirements of caustic soda for soap production can be estimated at:

	1964	1965	1970	1975	1980
Quantity (tons)	-	-	530	710	940

The market is a restricted one. The question of production concerns the entire sub-region.

### VI.10 Calcium carbide

The consumption of carbide has increased at an annual rate of 33 per cent in weight and 35 per cent in value.

The forecasts for 1965-1980 work out as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	147	adjusted 7%	160	230	320	440

This question should be viewed from the sub-regional standpoint.

### VI.11 Fertilizers

The present annual consumption of plant nutrients seems to be as follows:

N: approximately 100 tons

P<sub>2</sub>O<sub>5</sub>: approximately 200 tons

K<sub>2</sub>O: approximately 100 tons

On the basis of the present trend in this field in Sierra Leone, future requirements can be estimated at:

	1964	1965	1970	1975	1980
N (tons)	100	150	1000	2000	4000
P <sub>2</sub> O <sub>5</sub> (tons)	200	250	1000	2000	4000
K <sub>2</sub> O (tons)	100	150	1000	2000	2000

The forecasts by F.W. Hauck<sup>1/</sup> for 1970 (200 tons of each nutrient) seem extremely pessimistic.

1/ F.W. Hauck, Soil Fertility and Fertilizers in West Africa (E/CN.14/INR/70)

The market is expanding, but the quantities involved are still far too small to justify considering the possibility of local manufacture on a purely national basis. This problem can only be dealt with in a sub-regional context.

VI.12 Salt

The consumption of salt has risen steadily at an annual rate of 4 per cent by quantity and 2 per cent by value.

Taking into consideration the demand for salt in other countries and Sierra Leone's fisheries development programme, it seems reasonable to adopt annual growth rates of 6 per cent in weight and 4 per cent in value. This gives the following forecasts:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	8840	adjusted 6%	9400	12500	16800	22400
Value (\$ 1000)	858	adjusted 4%	370	450	550	670

The market is expanding and is fairly large. This question will be dealt with from the sub-regional angle.



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J. DAHOMEY

I. GENERAL CHARACTERISTICS

I.1 Population:

2,250,000 inhabitants (1963)

Annual growth rate 1958-1963: 3 per cent.

Population projection (in thousands):

1965: 2,355

1975: 2,935

1970: 2,600

1980: 3,555

I.2 Area: 112,600 km<sup>2</sup>.

I.3 Population density: 20 inhabitants/km<sup>2</sup> (1963).

I.4 Dahomey has been an independent Republic since 1 August 1960. The structure of employment is roughly as follows: rural pursuits, upwards of 90 per cent; industry and arts and crafts, 5 per cent; services, 5 per cent. The number of wage-earners, nearly all of whom are in the secondary and tertiary sectors, does not exceed 25,000. At a very approximate estimate 50,000 Dahomey nationals work abroad (on coffee and cocoa plantations in Togo and Ghana).

The south, where the climate is hot and very humid for about 150 kilometres inland, has a rich clayey soil known as terre de barre. In the centre the climate is drier and the soil poorer. The north consists of woodland savannah and dry savannah, with the exception of the arid area of the Atacora Mountains in the north-west and, by contrast, the highly fertile valley of the Niger.

It is inevitable that the economy of Dahomey, a country hitherto lacking in mineral resources and in any industry worthy of the name, should be directly dependent on agriculture. In 1964 agricultural products accounted for 94.6 per cent of total exports in terms of quantity (84,886 tons) and value (\$12.5 million).

The main food crops are as follows:

(a) In the south and centre:

Cassava (estimated production 1 million tons);

Maize (approximately 220,000 tons);

Sweet potatoes (approximately 17,000 tons);

Beans (10,000 tons);

A wide variety of fruit and vegetables, and also of kola nuts;

Oil palms.

(b) In the north:

Yams (estimated total production over 500,000 tons - also found in the centre and south);

Sorghum and millet (approximately 75,000 tons);

Groundnuts (33,000 tons, a small proportion of which is exported);

Shea, the production of which fluctuates considerably;

Fonio, rice, fruit and vegetables in very small quantities.

Oil-palm products occupy a leading position amongst the cash crops, which are especially important to the country's economy because they account for virtually the whole of its exports.

Other export crops are groundnuts, shea, coconuts, copra, the castor-oil plant, coffee, cotton, tobacco, kola nuts and a few other foods in small quantities.

Table 1 illustrates the part played by agricultural products in Dahomey's exports.

Table 1

Exports from Dahomey, 1964

(Quantities in thousands of tons, values in thousands of dollars)

Product	Quantity	%	Value	%
Fish and shell-fish	0.14	0.2	51.3	0.4
Coconut (shredded copra)	1.78	2.0	313.7	2.4
Coffee	1.07	1.2	621.2	4.7
Groundnuts, shelled	3.99	4.5	613.7	4.7
Palm kernels	56.16	62.5	7,081.6	53.7
Shea	7.40	8.2	428.2	3.2
Castor oil plant	0.29	0.3	32.5	0.3
Palm oil	12.71	14.2	2,655.7	20.7
Tobacco, raw	0.29	0.3	177.6	1.3
Cotton, ginned	1.07	1.2	496.6	3.8
Building materials	0.03	-	2.3	-
Other products	4.88	5.4	707.6	5.4
Total	89.81	100.0	13,182.0	100.0

Source: Bulletin de statistiques, Central Statistics and Computerized Data Department, Ministry of Finance, Economic Affairs and the Plan.

No minerals are produced in Dahomey at present.

The only industrial processing activity of any importance is represented by the palm-oil factories.

Dahomey's first four-year plan (1962-1966) is based on the ten-year forecasts worked out in broad outline in 1960. The primary target was to double the agricultural income over ten years, an aim which has finally taken shape as an attempt to double the per capita national income in twenty years. The plan is based on an annual growth rate of 6.5 per cent (actual) in the gross domestic product. The major effort is to be devoted to agriculture (40 per cent of the budget credits). Two main aspects are involved: the over-all organization and modernization of production structures and the expansion of oil-palm growing as a leading source of exports.

## II. MINERAL RESOURCES

The Onigblo limestone deposit near Arlan, 90 kilometres from Cotonou, is the main workable resource. The main point of note is that reserves are estimated at 9 million tons, with a calcium carbonate content of 80 per cent and less than 2 per cent magnesium carbonate.

Current prospecting has revealed occurrences of the following minerals:

Gold: In the alluvium of various rivers such as the Perma, the Sinai Siré and the Tannako-Koko. Quartz veins containing 90 grammes per ton have been found in deposits worked in 1936. Gold is also found in association with tin, tantalum and lithium, but the total represents a mere 130 kg of recoverable gold.

Phosphates: The deposits in Togo are believed to continue into Dahomey in the Loma series, particularly at Doto, where there are 50 per cent tricalcium beds 10 cm thick. The Pohé area may contain deposits identical to those at Oshosum in Nigeria. Exploration has shown these deposits to be too poor for exploitation.

Iron: A large deposit has been reported in the Kandi area, with reserves estimated at 1,000 million tons of 45 per cent goethite capable of enrichment to 52 per cent, but only a quarter of the deposit appears to be workable and the distance from the workings to the coast would be 750 km.

Chromium and nickel: Traces are believed to exist in the Bontomo district (the chromium ore has a 45 per cent metal content and the serpentine has a 9 per cent nickel content) but the reports are unconfirmed.

Prospecting for diamonds and petroleum is also taking place.

### III. ELECTRIC POWER, FUEL AND WATER

At the present time there is still no hydro-electric plant in operation in Dahomey. Electricity is supplied exclusively by thermal power stations at Cotonou (12,000 kW), Porto-Novo (900 kW) and Parakou (360 kW). Many towns and villages nevertheless have small-scale generating plants of their own run by the local authorities.

The production of electric power has risen as follows (in thousands of kWh):

<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>
9,600	11,400	13,900	17,600

The average price per kWh is \$0.068. The development plan provides for a total expenditure of \$360,000 in the coastal belt. The main source of energy for the vast majority of villagers is still firewood.

As regards petroleum exploration, reserves have not yet been properly evaluated, but geological and geophysical prospecting has been undertaken.

There are a few lignite deposits in the southern part of the country, but from the economic angle they seem relatively unattractive.

According to customs statistics, fuel prices appear to be \$27 per ton for fuel oil and \$40 per ton for diesel oil (figures subject to confirmation). These prices may alter where special conditions such as tax concessions apply.

### IV. EXISTING INDUSTRY

IV.1 Dahomey has no mines and no beneficial sources of energy. Labour is fairly costly, more so than in neighbouring countries.

In addition, the home market is restricted to 2 million customers, so it is not surprising that industrial activities are still confined to the processing of agricultural products.

The biggest concern is the Société Nationale des Huileries du Dahomey (SNADHA), which operates four palm-oil processing plants at Avrankou, G'Bada, Bohicon and Ahozon.

The total capacity of these mills is 13,000 tons of low-acidity oil per annum, but they are not fully utilized. The Government's plantation programme suggests that six new plants will need to be built in stages between now and 1970.

In the processing of agricultural products the activities of greatest over-all importance are of an artisan kind, namely palm oil manufacture (mainly for local consumption), maize milling, and production of shea butter, shredded coconut (at one small mill), ginned cotton and kapok (at a number of mills), shelled groundnuts and castor seeds.

There is also a large brewery at Sobrado, another brewery at Overseas, an industrial gases factory, a number of soap works (the largest being that of Etablissements Paterson at Porto-Novo) and a perfume factory. At Savé SOCOTAB processes 200-300 tons of dry leaf tobacco per annum.

In most parts of the country there are modest concerns such as brickworks, several small sawmills and a number of wooden furniture factories which cater for local needs.

New undertakings include companies manufacturing building materials, textile firms and a number of small-scale mechanical engineering and electrical concerns.

The main projects cover a cement works, various food and canning factories, the textiles industry and tobacco and cigarette manufacture.

#### IV.2 Existing industries having some direct connexion with the chemical and related industries

The country's limited mineral resources and the price of energy have so far acted as a deterrent to the establishment of a chemical industry in Dahomey. With the exception of the oil-extraction mills, the soap works, the perfume factory and an oxygen and acetylene plant, none of Dahomey's industries has any connexion with chemistry.

#### V. THE PRESENT MARKET FOR CHEMICAL PRODUCTS

The customs statistics for 1961-1964 provide data for estimating the trend in internal consumption, but owing to the extent of the market the minimum value adopted in selecting individual items for inclusion in the tables is \$20,000 for 1964 (instead of \$40,000 as in the case of the Ivory Coast). Generally speaking the growth rates are based on a three-year period, except where a particular figure is missing or unrepresentative.

Table 2 relates to quantities imported. Table 3 shows their value in dollars.

Table 2

Imports: chemical and related products (tonnage)

(Tons)

Code	Commodity	1961	1962	1963	1964	Annual rate
25.01.08	Crude salt	582	522	588	806	11%
25.01.09	Other salt	971	436	552	457	Minus
.....	.....	..	..	..	..	..
<u>Chapter 25</u>	Mineral products	1,643	968	1,337	1,278	Minus
27.11	Gaseous hydrocarbons	161	167	(?)	257	16%
.....	.....	..	..	..	..	..
<u>Chapter 27</u>	Petroleum products	165	175	(?)	257	16%
28.17.08	Caustic soda	347	345	(?)	425	7%
28.56	Carbides	144	233	164	210	13%
.....	.....	..	..	..	..	..
<u>Chapter 28</u>	Inorganic chemicals	515	639	(?)	670	9%
<u>Chapter 29</u>	Vitamins, alkaloids, antibiotics	1	1	n	1	Negligible
30.02.01	Vaccines and sera, pharmacopoeial	n	n	11	1	Variable
30.03.02	Other pharmacop. medicaments not put up for retail sale	n	n	2	24	?
30.03.13	Pharmaceutical specialities put up for retail sale	112	137	197	196	20%
30.04.01	Wadding	1	2	10	21	176%
30.04.11	Other impregnated articles	15	19	1	9	Negative
.....	.....	..	..	..	..	..
<u>Chapter 30</u>	Pharmaceutical products	132	162	234	265	26%
31.02	Nitrogenous fertilizers	17	103	70	444	196%
31.03	Phosphatic fertilizers	n	85	40	691	185%
31.04	Single potassic fertilizers	88	843	66	72	Negative
.....	.....	..	..	..	..	..
<u>Chapter 31</u>	Fertilizers	108	1,031	175	1,210	124%

Table 2 (continued)

Code	Commodity	1961	1962	1963	1964	Annual rate
32.09.20	Paints	61	119	169	147	35%
.....	.....	..	..	..	..	..
<u>Chapter 32</u>	Paints and varnishes	74	143	210	194	38%
36.02	Explosives	86	180	116	?	16%
36.06	Matches	21	7	101	?	120%
.....	.....	..	..	..	..	..
<u>Chapter 36</u>	Explosives and matches	107	187	217	116	Variable
38.11.08	Disinfectants, put up (1-kg)	56	44	69	57	Negligible
38.11.10	Disinfectants not put up for retail sale	60	36	74	65	3%
.....	.....	..	..	..	..	..
<u>Chapter 38</u>	Disinfectants and solvents	120	87	150	129	2%
39.02	Polymerization and copolymerization products	51	58	66	71	11%
39.07.39	Other plastic articles	29	37	66	68	33%
.....	.....	..	..	..	..	..
<u>Chapter 39</u>	Plastic materials	89	103	143	160	22%
51.04.19	Synthetic fibres, - 85%	1	2	4	8	100%
.....	.....	..	..	..	..	..
<u>Chapter 51</u>	Man-made fibres	2	2	9	10	71%



Table 2

Imports: Chemical and related products (value)

(Thousands of dollars)

Code	Commodity	1961	1962	1963	1964	Annual rate
25.01.08	Crude salt	21	18	22	27	9%
25.01.09	Other salt	31	22	27	28	Negative
.....	.....	..	..	..	..	..
Chapter 25	Mineral products	55	41	53	57	1%
27.11	Casacus hydrocarbons	32	32	?	44	11%
.....	.....	..	..	..	..	..
Chapter 27	Petroleum products	33	34	?	46	11%
23.17.08	Caustic soda	34	32	?	45	10%
25.56	Carbides	23	38	24	32	11%
.....	.....	..	..	..	..	..
Chapter 28	Inorganic chemicals	65	80	?	87	10%
Chapter 29	Vitamins, alkaloids, antibiotics	9	3	2	2	Minus
30.02.01	Vaccines and sera, pharmacopoeial	10	11	21	33	35%
30.03.02	Other pharmacop. medicaments not put up for retail sale	n	4	4	50	254%
30.03.10	Pharmaceutical specialities put up for retail sale	346	384	672	724	33%
30.04.01	Wadding	2	4	17	49	190%
30.04.11	Other impregnated articles	20	31	15	26	9%
.....	.....	..	..	..	..	..
Chapter 30	Pharmaceutical products	386	444	1,751	906	33%
31.02	Nitrogenous fertilizers	1	7	4	27	200%
31.03	Phosphatic fertilizers	1	7	4	46	259%
31.04	Potassic fertilizers	6	54	4	5	Minus
.....	.....	..	..	..	..	..
Chapter 31	Fertilizers	8	68	13	80	115%

Table 3 (continued)

Code	Commodity	1961	1962	1963	1964	Annual rate
32.09.20	Paints	35	62	92	80	32%
.....	.....	..	..	..	..	..
<u>Chapter 32</u>	Paints and varnishes	48	86	114	105	30%
36.02	Explosives	62	134	84	?	16%
36.06	Matches	11	4	77	?	165%
.....	.....	..	..	..	..	..
<u>Chapter 36</u>	Explosives and matches	72	138	84	73	Variable
38.11.08	Disinfectants, put up (1-kg)	33	29	48	44	10%
38.11.10	Disinfectants not put up for retail sale	22	22	48	29	9%
.....	.....	..	..	..	..	..
<u>Chapter 38</u>	Disinfectants and solvents	57	54	100	77	10%
39.02	Polymerization and copolymerization products	59	68	84	88	14%
39.07.39	Other plastic articles	53	68	82	79	14%
.....	.....	..	..	..	..	..
<u>Chapter 39</u>	Plastic materials	128	153	186	198	16%
51.04.19	Synthetic fibres, - 85%	5	14	28	55	115%
.....	.....	..	..	..	..	..
<u>Chapter 51</u>	Man-made fibres	14	19	46	72	50%

## VI. PLANNING THE CHEMICAL INDUSTRY IN DAHOMEY

The foregoing tables relate solely to imports, since the volume of exports in the chemical sector is negligible. With certain product groups the quantities or values recorded in 1960 were extremely low, and the growth rates are therefore abnormally high. Consequently the figures concerned need to be corrected, for instance by adopting growth rates comparable with those assumed for the other countries.

### VI.1 Medicinal and pharmaceutical products

The growth rates calculated from the statistics (26 per cent in weight and 38 per cent in value) are fairly high, because the quantity and value figures recorded for 1960 were extremely low. The adoption of average growth rates would give the following results:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	266	Adjusted 10%	290	500	800	1,200
Value (\$1000)	908	Adjusted 10%	1,000	1,600	2,600	4,300

The pharmaceutical industry can start up purely as a processing industry.

### VI.2 Soap

Oil-extraction mills are the country's main industrial activity. Since the Government is determined on large-scale attempts to improve crop methods and expand oil production, it seems logical to conclude that soap manufacture will increase. The adoption of an annual growth rate of 8 per cent gives the following forecast for soap consumption:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	2,500 <sup>*/</sup>	Adjusted 8%	2,700	4,000	5,800	8,500
Value (\$1000)	750 <sup>*/</sup>	Adjusted 8%	810	1,190	1,750	2,600

<sup>\*/</sup> Estimated.

The market is expanding, and is large enough to justify developing local manufacture.

### VI.3 Surface-active agents and washing preparations

In view of the general trend in the market for these items, which should expand very considerably in the years to come, the following level of consumption seems possible in Dahomey:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	140 <sup>*/</sup>	Adjusted 17%	160	360	790	1,700
Value (\$1000)	80 <sup>*/</sup>	Adjusted 17%	94	200	450	1,000

<sup>\*/</sup> Estimated.

The internal market seems large enough to justify local packing.

### VI.4 Perfumes and cosmetics

Present consumption seems to be about \$300,000 per annum. The total demand can be expected to rise as follows:

	1964	Annual rate	1965	1970	1975	1980
Value (\$1000)	300 <sup>*/</sup>	Adjusted 5%	315	400	500	650

<sup>\*/</sup> Estimated.

The market offers possibilities for expanding the existing perfume industry.

### VI.5 Pigments, paints and varnishes

The market is steadily expanding, the relevant growth rates being 38 per cent by quantity and 30 per cent by value.

If the figures are rounded off and an adjusted and more realistic growth rate adopted comparable to those assumed for the other countries, the average estimates work out as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	200	Adjusted 11%	220	350	600	1,000
Value (\$1000)	105	Adjusted 11%	120	200	330	560

The market therefore offers prospects for the future.

#### VI.6 Disinfectants and solvents

Present consumption is still very low. The expansion of agricultural production and the improvement of crop methods may well bring about a very rapid increase in the demand for pesticides.

Future consumption, comparable with that of the other countries, would work out as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	129	150	220	440	880
Value (\$1000)	77	90	130	260	530
including:					
50% DDT (tons)	10	15	30	60	120
25% BHC (tons)	40	50	80	160	300

These items can be formulated and packed locally, but manufacture, which is the only question of concern to the chemical industry, would necessitate cheap electricity and adequate outlets.

#### VI.7 Explosives

The consumption of explosives depends on major civil engineering projects, since mining activity is at a low level. The growth rate is 16 per cent by both weight and value, but the quantities involved are small.

The future consumption of explosives can be estimated at:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	150 <sup>*/</sup>	Adjusted 7%	160	230	320	440

<sup>\*/</sup> Estimated.

The demand is insufficient to justify the existence of a local industry.

#### VI.8 Plastics

The imports recorded in the statistics already exceed the quantities forecast in a study whose probable date was 1962 (the growth rate concerned is 15 per cent). Thus 160 tons are shown for 1964 as against the 147 tons forecast for 1965.<sup>1/</sup> The difference

<sup>1/</sup> Beyrard, Etude sur les conditions générales d'industrialisation au Dahomey, IDET.

is nevertheless minute in terms of value - \$198 in 1964 by comparison with the figure of \$208 estimated for 1965. Consequently the growth rate based on the customs statistics (22 per cent in quantity) can probably be retained:

	1964	1965	1970	1975	1980
Quantity (tons)	160	195	530	1,400	3,800
including:					
PVC (tons)	40 <sup>*/</sup>	50	150	400	1,000
Polyethylene (tons)	30 <sup>*/</sup>	40	130	350	1,000

<sup>\*/</sup> Estimated.

A plant with an annual capacity of 100 tons manufacturing two thirds moulded items and one third extruded articles has been proposed. The estimated cost of the project is \$320,000, including \$16,000 for buildings (reckoned at \$40 per m<sup>2</sup>).

#### VI.9 Caustic soda

Consumption of caustic soda is increasing steadily at rates of 7 per cent by quantity and 10 per cent in value. The future requirements of caustic soda for soap manufacture can be estimated at:

	1964	1965	1970	1975	1980
Quantity (tons)	200 <sup>*/</sup>	250	400	580	850

<sup>\*/</sup> Estimated.

The market is a small one. The question of production concerns the entire sub-region.

#### VI.10 Calcium carbide

The internal market for calcium carbide in Dahomey is very slender (210 tons in 1964, with a 13 per cent growth rate). If the same growth rate (7 per cent) is adopted as for the other countries, the consumption forecasts work out as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	210	Adjusted 7%	225	320	440	620

The market in Dahomey seems too small to justify setting up an industry, even allowing for the fact that the Onigblo limestone deposit represents the country's major mineral resource. Coke and cheap electricity would also be needed to make the product competitive on an export basis.

#### VI.11 Fertilizers

Fertilizers deserve special attention owing to the particularly high annual growth rates involved (124 per cent by quantity and 115 per cent by value), although these figures only relate to small quantities and are therefore inconclusive pointers to future trends.

In the light of the present trend in this sector in Dahomey, future requirements can be estimated at:

	1964	1965	1970	1975	1980
N (tons)	100	140	500	1,500	3,000
P <sub>2</sub> O <sub>5</sub> (tons)	100	160	500	1,500	3,000
K <sub>2</sub> O (tons)	200	300	1,000	3,000	6,000

The forecasts by F.W. Hauck<sup>1/</sup> for 1970 specify 500 tons of each nutrient. The question of production can only be considered from a sub-regional standpoint.

#### VI.12 Salt

Imports of salt are declining. A comparison between the present per capita consumption in Dahomey and that in other West African countries shows the former to occupy the lowest position in this respect. In the light of the general trend of the market in the other countries and taking into account Dahomey's fisheries development programme, it seems reasonable to adopt annual growth rates of 11 per cent by quantity and 9 per cent by value.

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	1,278	Adjusted 11%	1,420	2,400	4,000	6,800
Value (\$1000)	55	Adjusted 9%	60	90	140	220

The question of production will be dealt with from the point of view of the sub-region as a whole.

<sup>1/</sup> E/CN.14/INR/70 - F.W. Hauck, Soil Fertility and Fertilizers in West Africa.

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K. TOGO

I. GENERAL CHARACTERISTICS

I.1. Population

1,565,000 (1963);

Annual growth rate 1958-1963: 2.5 per cent

Population projection (in thousands):

1965 : 1640

1975 : 2060

1970 : 1820

1980 : 2370

I.2. Area

56,600 km<sup>2</sup>

I.3. Population density

28 per km<sup>2</sup> (1963)

I.4. Both in area and in population Togo is a small country. About 85 per cent of the population lives on the land. The soil is poor or friable, and may be classified thus:

Fertile but friable: 20 per cent of the total area

Mediocre and liable to constant impoverishment: 40 per cent

Poor: 40 per cent.

The chief basic food crops are manioc (cassava) (700,000 tons in 1963) and maize (66,000 tons in 1963) in the south, yams (400,000 tons in 1963) and millet in the centre and north (millet and sorghum crop in 1963: 118,000 tons). The growing production of rice (23,000 tons of paddy in 1963) deserves mention.

Togo's production of foodstuffs by and large satisfies the demand at present, but there is an ever-present threat of shortages in the overpopulated Kara and Savannah areas in exceptionally dry years.

Coffee and cocoa are the leading export crops of special importance to the country's economy.

Other export crops are palm kernels, coconuts, cotton, groundnuts and manioc.

Table 1 shows the position of agricultural commodities in the exports of Togo.

Table 1

## Exports from Togo

(Quantities in thousands of tons, values in thousands of dollars)

Commodity	Quantity				Value			
	1961	1962	1963	1964	1961	1962	1963	1964
Cocoa	11.5	11.1	10.3	13.5	5.22	4.79	4.76	6.61
Coffee	10.2	11.5	6.2	16.1	5.04	5.79	3.24	10.23
Palm products								
Kernels	11.1	10.4	12.7	14.5	1.25	1.15	1.60	1.80
Oil	0.9	0.3	0.2	0.1	0.19	0.06	0.03	0.03
Coconuts	4.8	1.9	3.0	3.8	0.73	0.28	0.48	0.60
Cotton (Fibre	2.4	1.9	2.8	1.3	1.26	1.02	1.43	0.67
(Seed	3.2	2.0	3.8	1.4	0.17	0.08	0.14	0.06
Groundnuts, shelled	3.6	1.8	2.8	2.6	0.65	0.30	0.48	0.45
Manioc Flour	3.5	0.6	0.4	0.1	0.51	0.12	0.08	0.02
Starch	4.9	2.9	4.6	5.7	0.48	0.30	0.49	0.54
Tapioca	1.2	0.4	0.7	0.7	0.17	0.06	0.10	0.09
Phosphates	57.2	184.7	441.4	801.5	0.63	1.98	4.33	7.89
Total above commodities	114.7	229.6	488.9	861.3	16.30	15.93	17.16	28.99
Grand total	123.1	235.9	495.6	867.3	18.70	17.17	18.27	30.17
Ratio (in %) of commodities listed to grand total	93 %	97 %	99 %	99.3 %	87 %	93 %	94 %	96.1 %

Source: Bulletin de statistique 1964, Ministère des finances et des affaires économiques, Service de la Statistique générale.

Aside from the phosphate deposit, Togo's industry is embryonic. A few aggregate figures (1965) from the Economic and Social Development Plan for 1964-1970 are worth noting:

Gross domestic product (calculated on the basis of the "economic accounts" for 1962) :

Breakdown by sector: (millions of dollars)

Primary: 74.8, or 50.4%

Secondary: 16.0, or 10.8%

Tertiary: 42.4, or 28.6%

Administration: 15.2, or 10.2%

Gross domestic product (GDP) per capita: \$87.6

Investments as per cent of GDP: 9%

Wages and salaries in public sector: about \$16 million

Wages and salaries in private sector: about \$14 million

Total: about \$30 million

Wage-earners (excluding agricultural labourers)

Public and para-public sector: 12,000 approx.

Private sector: 12,500 approx.

Total 24,500 approx.

On 17 July 1965 the National Assembly adopted the Five-Year Economic and Social Development Plan covering 1966 to 1970. The Five-Year Plan is part of a longer-term plan spread over twenty years (1966-1985).

General objectives of the 1966-1970 Plan:

To ensure national independence

To bring into being the development structures

To meet immediate requirements and to embark on long-term action to redress imbalances and ensure expansion.

The special objectives stated in the Plan are:

To try to balance the budget

To devote a given minimum of public funds to public investments

To ensure that imports are balanced by exports to the extent of 72 per cent in 1964, rising to 85 per cent in 1970.

To strengthen general economic research, applied research and experimental work; to establish a national research institute

To identify regional objectives and development resources and to begin to exploit the resources of these regions

To build up a complete national transport infrastructure opening the way to economic expansion at the lowest possible cost to the country

To promote rural development throughout the country.

The total gross fixed investment for the period 1966-1970 is to be about \$116 million, distributed as follows:

	Public funds	Private funds	Total
Transport and communications	33.2	8.5	41.7
Urban development, housing	7.0	11.3	18.3
Rural development	20.8	3.2	24.0
Industry, crafts, commerce	5.7	9.7	15.4
Education	5.4	1.2	6.6
Health	4.8	0.6	5.4
Other social and cultural development	0.7	-	0.7
Administrative organization and ministries	3.4	-	3.4
Total	81.0	34.5	115.5

Source: Plan de développement économique et social 1966-1970: Togolese Republic.

The estimated growth rate of the GDP is 31.5 per cent from 1965 to 1970, or 5.6 per cent annually.

## II. MINERAL RESOURCES

The only mineral exported at present is phosphates from the Compagnie togolaise des Mines du Bénin (COTOMIB). Two grades are produced:

	Production (in thousands of tons)			
	1961	1962	1963	1964
Calcium phosphates (80-82%)	98.5	117.5	490.5	757.0
Calcium phosphates (75%)	22.0	15.5	27.3	10.6

The deposit was discovered in 1952 at Mahatos, 22 km from the coast, in the Lake Togo area. It lies under a 25-metre overburden with a slight incline. The reserves are believed to amount to over 100 million tons (50 million proved and 70 million potential) combined with 25 to 40 per cent of clay, which should yield some 50 million tons of 81 per cent tricalcic concentrate.

The phosphates are treated by sluicing and then by washing; and the two grades are then sorted. The two concentration tracks, each with a capacity of 100 tons/hour, are equipped with drying ovens and a 60,000-ton storage plant; a rail track crosses a stretch of 22 km over the lagoon and ends at an open roadstead equipped with a conveyor capable of loading vessels at the rate of 2,000 tons per hour.

The installation uses its own electric plant equipped with four diesel engines generating 6,300 kW and its own 2,000 m<sup>3</sup>/hour seawater pumping station. (The phosphate is rinsed in fresh water before drying). The initial investment for a capacity of 750,000 tons/year was \$28 million. From 1966 on, the capacity should be 1 million tons/year.

The price for the phosphates is estimated at \$10.7 per ton in 1965, to reach \$11.7 in 1970.

The other known minerals are:

An iron deposit in the Bomgeli area, 400 km from the coast; estimated to contain 50 million tons of hematite with a 40 to 50 per cent metal content.

Traces of iron in the Shniga and Bodge areas.

Bauxite in the Agou mountains (1 million tons).

Chromite in the Ahito and Djeti mountains.

Traces of rutile and gold in the Sokodé area.

Potential salt extraction from the Anécho lagoons should also be mentioned. The investment of \$11 million has been estimated as required for a capacity of 20,000 tons/year. With an actual output of 16,000 tons/year, half of which would be exported, the price would be \$35 per ton for the domestic market and \$24 exported.

### III. ELECTRIC ENERGY, FUEL AND WATER

The CEET (Compagnie d'Energie Electrique du Togo) supplies Lomé and Palimé with electric power. In the other towns and villages the supply is provided by the municipalities or the Public Works Department.

Electric energy consumption was about 12 million kWh in 1964, excluding the phosphates mines.

Installed capacity on 31 December 1964 is shown in the following table:

	Power available (kW)		Energy generated (000 kWh)	
	Thermal	Hydraulic	Thermal	Hydraulic
CEET (Lomé)	2,100	-	7,559	-
Kpémé HP	-	1,600	-	3,269
COTOMIB at Kpémé	6,300	-	15,403	
Other	500	-	1,000	
Total	8,900	1,600	23,962	3,269
Grand total	10,500		27,231	

The development of electric power output in the near future depends on a number of contingencies: the feasibility of harnessing the Mono (in collaboration with Dahomey), the practicability of a Ghana-Togo-Dahomey interconnexion, increased productivity connected with putting into operation 3-mw groups at the Lomé plant.

Cost per kWh is about \$0.064 and might fall to \$0.048 in the future.

Togo produces neither coal nor hydrocarbons. The average price of fuel oil is about \$24 per ton and of diesel fuel \$40 per ton. Charges of \$15.26 and \$22.04 per ton respectively have been reported.

The price at present charged at Lomé for water concessions to private persons is \$0.12 per m<sup>3</sup>. When the Anécho distribution mains are put into operation, there will be a 50 per cent rise in rates, required in order to make the joint operation of the two mains economic.

Supply contracts on variable terms provide industries at a price that may range from about \$0.04 to \$0.1 per m<sup>3</sup>. These rates, too, will rise by 50 per cent when the Anécho network comes into service.

These costs are high; but industries can obtain their own supply almost anywhere in Togo by drilling wells, fairly deep (30 m) in some places, or by catchment and conveyance for varying distances if large quantities are required.

#### IV. EXISTING INDUSTRY IN TOGO

IV.1. Togo is hardly industrialized at all, for obvious reasons: lack of cheap sources of energy and raw materials, absence of a domestic market large enough to provide a processing industry of any size with adequate outlets.

The following condensed table brings out the weakness of the industrial sector in Togo in 1965 and shows its probable position in 1970:

	Added value (in millions of dollars) 1965	Added value 1970	% increase
Administrations (salaries)	15.9	21.0	32 %
Agricultural sectors			
Traditional sector	62.5	73.3	17 %
Export crops	9.5	11.9	25 %
Industrial fisheries	...	0.7	...
Food industries	0.3	0.5	57 %
Building and construction	3.2	4.9	54 %
COTOMIB	7.9	12.6	60 %
Other modern industries	1.1	2.3	104 %
Small traditional industries and handicrafts	4.8	5.9	24 %
New industries	-	4.9	...
Transport	7.0	8.9	27 %
Commerce	32.4	43.3	33 %
Services	6.0	7.7	28 %
(Adjustment for banks and insurance)	0.3	0.3	28 %
<b>GP</b>	<b>150.3</b>	<b>197.6</b>	<b>31 %</b>

Source: Plan de développement économique et social 1966-1970: Togolese Republic.

The value added by the industrial sector advances in general by 84 per cent, or by nearly 13 per cent per year. This added value (excluding phosphates) is low in 1965; a long stride forward in industrialization is expected under the Five-Year Plan.

IV.2. The main industries at present existing are related to the food crops:

The palm oil refinery at Alokouegbé in the oilpalm area near Tsevié. Under the active Togolese management, the refinery's output has risen for several years and amounted to 864 tons of oil in the 1963-1964 season. It is hoped to achieve an output close to full capacity (1,500 to 2,000 tons of oil per year).

The Ganavé starch works in the manioc area near Anécho. It increased its output by over 50 per cent in 1963, working at 90 per cent of capacity, produced over capacity in 1964, and is considering doubling its capacity before 1967, rising to 12,000 tons/year in continuous operation.

The possibility of producing starch derivatives (glucose) is worth considering; glucose is used mainly in the food industry (confectionery).

Four cotton ginning mills. The existing ginning shops have a capacity adequate to cope with the medium-term development of the output.

Three kapok ginning mills.

The rice-mill recently installed at Dapango.

La Solico, making aerated beverages, is the only fairly large undertaking working for the domestic market.

A single undertaking, the Société Chimique et Industrielle Africaine, at Lomé, makes bars of toilet soap from local palm oil; capacity 800 to 900 tons/year.

There is a small tyre retreading workshop at Lomé. It concentrates almost entirely on lorry tyres. The lack of outer covers sets limits to the firm's output.

One firm, CEBEVITO, is at present doing good business in concrete products, which include piping, up to 1 m 50 in diameter, building blocks, beams, wall and flooring tiles, curbstones, gutters and prefabricated fencing. They are machine-made in special forms by the concrete-vibrating process. Reinforced concrete is used for the largest structures. All the materials are imported. Brick-making is an important craft industry in Togo.

A stone quarry near Tsevié, 35 km north of Lomé, produces three grades of crushed stone.

Most furniture is made in small craftsmen's workshops.

Two printing works, the larger being EDITOGO.

A motor-cycle assembly plant.



#### IV.3. Industrial establishments under construction

Two large factories are at present under construction, the textile mill at Dadja and the brewery at Agouévé.

The mill at Dadja will comprise a spinning shop, a weaving shop and a finishing-shop (bleaching, dyeing, printing). The mill should go into production at the beginning of 1966. It will consume 840 tons of ginned cotton annually and will probably produce about 5 million metres of various qualities of fabrics and 50 tons of Nos. 20 to 40 (metric) yarn.

The brewery at Agouévé will brew several types of beer and produce soft beverages. The initial output level is to be 10,000 hl/year of light beers and 5,000 hl/year of non-alcoholic beers and other non-alcoholic beverages.

#### IV.4. Some projects are:

A saltern at Anécho,

A projected cement works, to produce 60,000 tons/year, working with imported clinker,

A distillery for alcohol derived from molasses (2,750 hl of alcohol per year),

A plastics-processing plant,

A ready-to-wear clothing factory,

An enamelware factory,

A brickworks,

A cigarette factory.

#### IV.5. Existing industries having a direct bearing on the chemical or parachemical industry

Except for the oil mills, soap manufacture, tyre retreading, salt extraction and the (projected) plastics processing plant, the only industry with a bearing on chemicals would be any phosphate fertilizer factory that might be set up.

#### V. THE PRESENT MARKET FOR CHEMICAL PRODUCTS

The customs statistics relate to the 1960-1964 period, but those for 1960, taken from other sources<sup>1/</sup>, are incomplete.

The items have been selected on the basis of an export in 1964 amounting to more than \$20,000, but some figures lower than this have been given in order to preserve comparability with other countries.

The growth rate has usually been calculated over a period of four years, but the period has been brought up to eight years where no figure is available for 1960 or where figures were not significant.

Table 2 gives imports in tons. Table 3 shows value in dollars. The code numbers are those of the Brussels Nomenclature.

<sup>1/</sup> Bulletin statistique de la République togolaise.

Table 2

Imports: chemical products and fertilizers (tonnage)

Code	Commodity	1960	1961	1962	1963	1964	Annual rate
25.01.08	Crude salt	4,990	4,890	5,396	5,765	5,853	6 %
25.01.03	Other salt		3,309	3,852	5,169	5,011	15 %
.....	.....	...	...	...	...	...	...
<u>Chapter 25</u>	Mineral products	?	8,234	9,249	10,934	10,864	9 %
27.11	Gaseous hydrocarbons	86	95	118	103	146	14 %
.....	.....	...	...	...	...	...	...
<u>Chapter 27</u>	Petroleum derivatives	?	126	146	117	151	6 %
28.17.08	Caustic soda	78	106	103	150	89	Variable
28.56	Carbides	54	72	104	99	96	15 %
.....	.....	..	..	...	...	...	...
<u>Chapter 28</u>	Inorganic chemicals	?	219	250	304	291	10 %
<u>Chapter 29</u>	Vitamins, alcaloids, antibiotics	?	1	1	-	n	Neglig.
30.02.01	Vaccines and sera, pharmacopoeial	?	1	6	1	1	Variable
30.01.01	Pharmac. medicaments, not put up	?	60	103	94	76	8 %
30.03.13	Pharmac. specialities put up for retail sale	?	87	113	90	106	7 %
30.03.15	Other products	?	12	13	13	31	37 %
30.04.01	Wadding	?	2	8	11	9	65 %
.....	.....	..	..	...	...	...	...
<u>Chapter 30</u>	Pharmaceut. products	167	178	260	246	204	5 %
31.02	Fertilizers, nitrogenous	?	30	22	38	36	Variable
31.03	Fertilizers, phosphatic	?	1	-	1	41	Variable
31.04	Fertilizers, potassic	?	88	83	5	?	Minus
.....	.....	...	...	...	...	...	.....
<u>Chapter 31</u>	Fertilizers	103	127	105	54	77	Minus

Table 2 (contd)

Code	Commodity	1960	1961	1962	1963	1964	Annual rate
32.09.20	Paints	157	203	150	198	326	20 %
.....	.....	...	...	...	...	...	...
<u>Chapter 32</u>	Paints and varnishes	?	211	154	204	329	16 %
36.02	Explosives	?	2	9	10	54	200 %
36.06	Matches	150	336	300	253	277	Variable
.....	.....	...	...	...	...	...	...
<u>Chapter 36</u>	Explosives and matches	?	338	309	263	331	Variable
38.11.08	Disinfectants, put up (1 kg)	?	17	20	24	21	7 %
38.11.10	Disinfectants, not put up	?	28	16	17	34	Variable
.....	.....	...	...	...	...	...	...
<u>Chapter 38</u>	Disinfectants and solvents	85	48	43	44	56	Variable
39.02	Polymerization and copolym. products	?	18	32	25	47	38 %
39.07.39	Other plastic articles	?	42	28	26	38	Minus
.....	.....	..	...	...	...	...	...
<u>Chapter 39</u>	Plastic materials	57	73	71	68	106	17 %
51.04.19	Man-made fibres -85%	?	n	3	1	7	Variable
.....	.....	..	..	..	..	..	...
<u>Chapter 51</u>	Man-made fibres	?	3	5	3	9	44 %

Table 3

Imports: chemical products and fertilizers (value)

(Thousands of dollars)

Code	Commodity	1960	1961	1962	1963	1964	Annual rate
25.01.08	Crude salt	144	144	156	176	180	7 %
25.01.03	Other salt		88	112	232	160	22 %
.....	.....	...	...	...	...	...	...
<u>Chapter 25</u>	Mineral products	?	232	268	408	340	13 %
27.11	Gaseous hydrocarbons	33	96	32	24	30	Minus
.....	.....	..	..	..	..	..	...
<u>Chapter 27</u>	Petroleum derivatives	?	44	49	31	32	Minus
28.17.08	Caustic soda	8	10	7	14	10	Variable
28.56	Carbides	10	13	18	16	16	12 %
.....	.....	..	..	...	...	...	...
<u>Chapter 28</u>	Inorganic chemicals	?	28	36	38	40	12 %
<u>Chapter 29</u>	Vitamins, alkaloids, antibiotics	?	2	5	-	-	Neglig.
30.02.01	Vaccines and sera, pharmacopoeial	?	26	46	13	43	13 %
30.03.01	Pharmac. medicaments, not put up	?	188	384	424	324	20 %
30.03.13	Pharmac. specialities put up for retail sale	?	284	316	268	320	4 %
30.03.15	Other products	?	18	11	16	25	11 %
30.04.01	Wadding	?	6	24	22	26	63 %
.....	.....	...	...	...	...	...	...
<u>Chapter 30</u>	Pharmaceut. products	512	558	802	779	791	12 %
31.02	Fertilizers, nitrogenous	?	3	1	2	15	Variable
31.03	Fertilizers, phosphatic	?	-	-	-	14	Variable
31.04	Fertilizers, potassic	?	6	5	1	?	Variable
.....	.....	...	...	...	...	..	....
<u>Chapter 31</u>	Fertilizers	7	10	7	3	29	43 %

Table 3 (contd)

Code	Commodity	1960	1961	1962	1963	1964	Annual rate
32.09.20	Paints	100	108	92	116	196	18 %
.....	.....	..	...	...	...	...	...
<u>Chapter 32</u>	Paints and varnishes	?	115	96	121	199	20 %
36.02	Explosives	?	2	8	10	35	157 %
36.06	Matches	100	228	156	172	172	15 %
.....	.....	...	...	...	...	?	...
<u>Chapter 36</u>	Explosives and matches	?	230	164	182	207	2
38.11.08	Disinfectants, put up (1 kg)	?	18	16	19	24	109
38.11.10	Disinfectants, not put up	?	29	8	6	22	Variable
<u>Chapter 38</u>	Disinfectants and solvents	56	49	29	27	46	Variable
39.02	Polymerization and copolym. products	?	18	28	24	46	37 %
39.07.39	Other plastic articles	?	49	43	48	66	10 %
.....	.....	...	..	..	..	..	...
<u>Chapter 39</u>	Plastic materials	88	156	94	94	134	15 %
51.04.19	Man-made fibres -85%	?	4	8	5	38	112 %
.....	.....	...	...	...	...	...	...
<u>Chapter 51</u>	Man-made fibres	?	21	15	18	48	32 %

## VI. PLANNING THE CHEMICAL INDUSTRY IN TOGO

The foregoing tables show imports only; the exports of salt and phosphates given below have to be deducted:

Code	Quantities (in tons)	1960	1961	1962	1963
25.01	Salt (common and other)	683	1,101	1,192	1,227
25.10.08	Calcium phosphate	-	57,161	184,723	441,434
Value (\$1,000)					
25.01.08	Common salt	27	40	39	44
25.10.08	Calcium phosphate	-	620	1,956	4,272

These are raw materials that can be used in the chemical industry; they have hitherto merely been processed. Togo, it will be noted, is both an importer and an exporter of salt, which may seem paradoxical.

### VI.1. Pharmaceutical products

The average rate, calculated for a four-year period (5 per cent by weight and 12 per cent by value), is reasonably close to the usual estimates. A rate of 10 per cent may be therefore retained as a valid basis:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	204	Adjusted 10 %	220	400	600	900
Value (\$1,000)	791	Adjusted 10 %	870	1,400	2,300	3,600

A pharmaceutical industry may begin as an ordinary processing industry.

### VI.2. Soap

Despite the local production (about 800 tons yearly), imports of soap are increasing from year to year (1,024 tons in 1964).

If a growth rate of 8 per cent is accepted, as it is for the other countries, the evolution of soap consumption in Togo would be:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	1,800	Adjusted 8 %	2,000	2,900	4,200	6,000
Value (\$1,000)	500 <sup>(x)</sup>	Adjusted 8 %	540	800	1,150	1,650

(x) Estimated.

Toilet soap is manufactured by one factory from local palm oil (45 per cent of the total raw materials) and imported tallow and caustic soda. The total investment amounts to about \$200,000. The factory is now operating at close on full capacity, 800 tons per year, equivalent to 1,500 bars of soap.

The factory produces little but common soap. Total sales are about \$200,000 annually. The management reports that the profit margin on sales is about 4 per cent.

The local soap meets with competition from foreign soaps. In the first place, owing to imports by SOTEXIM, particularly of Polish soap, under favourable conditions, a cheap product, most of it of better quality (fine ground soap) and preferred by many consumers, has invaded the market.

Secondly, the Togolese market also takes soap made in Ghana, which is cheap because of the fall in the exchange rate of the Ghanaian pound.

The management is trying to increase its share of the market by going over to the manufacture of fine toilet soap. To do so, it will have to reduce costs by installing automatic equipment for continuous saponification instead of the discontinuous process used at present, which is very slow. The equipment generally used for finishing ground toilet soap, including plodder, mixer, crusher, slubber, fitting table and pedal presses, would cost about \$20,000 installed in Togo.

#### VI.3. Surface-acting agents and washing preparations

In view of the general market trend for these products, which should rise very steeply in the future, Togolese consumption is likely to be:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	91	Adjusted 17.5 %	107	240	540	1,200
Value (\$1,000)	51	Adjusted 17.5 %	60	130	300	700

The domestic market probably makes it worth while to pack locally.

#### VI.4. Perfumes and cosmetics

Total demand for perfumery and cosmetics is likely to grow, thus:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	258	Adjusted 5 %	270	350	450	600

There is a prospective market for putting up and packaging on the spot to satisfy part of the demand.

#### VI.5. Pigments, paints, varnishes

Imports are increasing fairly steadily at annual rates of 16 per cent by weight and 20 per cent by value, but the quantities are still small.

Pending a more realistic adjusted growth rate comparable to those used for the other countries, an average estimate would give:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	330	Adjusted 9 %	360	550	850	1,300
Value (\$1,000)	200	Adjusted 9 %	220	340	520	800

Paint manufacture might be envisaged once the market has grown appreciably. This would entail prospects for a local packing plant.

#### VI.6. Disinfectants and solvents

After a steady fall in imports from 1960 to 1963, an upward turn took shape in 1964, probably due to the efforts to improve crops, especially cotton. Measures to improve yields are being investigated under the Five-Year Plan.

Future consumption is likely to grow, as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	56	70	140	280	560
Value (\$1,000)	46				
including:					
DDT (50%)	5 <sup>(x)</sup>	6	15	40	80
BHC (25%)	20 <sup>(x)</sup>	24	50	100	200

(x) Estimated.

A combined disinfectant and insecticide plant will warrant study when domestic demand has been stimulated by advances in sanitation and plant conservation; it is very slight at present.

#### VI.7. Explosives

The high growth rate of imports of explosives (200 per cent by weight, 157 per cent by value) is accounted for by domestic mining and by the small quantities imported in 1961, 1962 and 1963.



Estimates of future consumption are:

	1964	1965	1970	1975	1980
Quantity (tons)	54	59	100	150	250

The turnover is too small to warrant local production.

#### VI.8. Plastics

The market is growing by 17 per cent in weight and 15 per cent in value. In view of the general trend in the market for these products, it would be prudent to take a rate of 20 per cent for the present and 20 per cent after 1975; thus:

	1964	1965	1970	1975	1980
Quantity (tons)	106	132	400	1,200	3,000
including:					
PVC	30 <sup>(x)</sup>	40	150	400	900
Polyethylene	20 <sup>(x)</sup>	30	100	300	900

(x) Estimated.

The plastics factory to be established shortly in Togo intends to produce articles for general use manufactured by injection or extrusion.

The Togolese Government is to participate in its establishment.

It is announced that output will be 100 tons in the initial year of operation and may exceed 200 tons/year after some years of production; it is hoped that the factory will increase the demand appreciably if the articles it produces are sufficiently varied and reasonably priced.

#### VI.9. Caustic soda

The consumption of caustic soda fluctuates round 100 tons per year, depending on fluctuations in soap manufacture. Future requirements for caustic soda for soap-making may be estimated as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	80	100	290	420	600

The market is a narrow one. The problem of production is a concern of the sub-region as a whole. Local production of caustic soda will be feasible only when a large market has been found providing balanced outlets for soda and calcium chloride.

#### VI.10. Calcium carbide

The demand for calcium carbide is increasing steadily, but it remains low. Consumption estimates would be:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	96	Adjusted 7 %	110	150	210	300

As the production of calcium carbide locally demands a large market, the lack of local coal and coke would prevent remunerative manufacture.

This problem is to be considered in connexion with the sub-region as a whole.

#### VI.11. Fertilizers

As with pesticides, after a decline in consumption until 1963, there seem to be signs of a recovery in 1964, due probably to action by the authorities. The quantities involved are, however, very small and hardly provide a basis for estimates.

Under the Five-Year Plan, 3,000 to 3,700 hectares of cotton and 5,750 hectares of groundnuts are to be treated with fertilizer in 1970, which would call for 1,000 tons of fertilizer, particularly phosphates. If the breakdown is to be one-third sulphate of ammonia and two-thirds supersimple, as is likely, about 70 tons of N and 140 of  $P_2O_5$  would be required.

In the same lapse of time, some 100 tons of potash, i.e. 60 tons of  $K_2O$ , would be needed for the coconut palms.

The estimates for 1970 are, therefore:

Estimates 1970	Tons of N	Tons of $P_2O_5$	Tons of $K_2O$
Estimate according to the Plan	70	140	60
Estimate by J. Kellerman <sup>1/</sup>	200	200	?
Estimate by F. W. Hauck <sup>2/</sup>	500	500	500

<sup>1/</sup> J. Kellerman, La consommation des engrais en Côte-d'Ivoire, February 1963.

<sup>2/</sup> E/CN.14/INR/70, F. W. Hauck, Soil Fertility and Fertilizers in West Africa.

If P. W. Hauck's estimate for 1970 is valid, future requirements should be:

	1964	1965	1970	1975	1980
Tons of N	50	80	500	1,500	3,000
Tons of $P_2O_5$	50	80	500	1,500	3,000
Tons of $K_2O$	50	80	500	1,500	3,000

The preparation or mixing of fertilizer does not appear to be feasible in Togo for the time being on the scale of a single country. This problem arises in connexion with the sub-region as a whole.

#### VI.12. Salt

Salt imports into Togo are rising by 9 per cent in weight and 13 per cent in value.

Taking into consideration the demand for salt in the other countries, a growth rate of 5 per cent annually would seem to be right, leading to the following estimates:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	10,864	Adjusted 5 %	11,400	14,600	18,600	23,700
Value (\$1,000)	340	Adjusted 5 %	360	460	580	740

Salt production from sea water by solar evaporation in Togo has been studied at some length in recent years by Congolese, French, German and American interests. A suitable site, one of the few salterns in West Africa, has been marked out on the coast near Aného.

An installation capable of producing 10,000 tons per year has been envisaged, but an undertaking on such a small scale would not be economically practicable. An installation with a capacity of 50,000 tons would, however, perhaps be remunerative if an export market for that quantity of salt could be developed. The capacity of the initial installation would be smaller and it would be preceded by an experiment on a semi-industrial scale.

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L. LIBERIA

1. GENERAL CHARACTERISTICS

1.1 Population

1,030,000 in 1963 <sup>1/</sup>

Annual growth rate 1958-1963: 1.4 per cent

Population projection(in thousands)

1965	...	1050
1970	...	1110
1975	...	1170
1980	...	1240

1.2 Area

111,400 km<sup>2</sup>

1.3 Population density

9 per km<sup>2</sup> (1963)

1.4 Liberia's wealth lies mainly in mining and agriculture. Foreign exchange is earned chiefly by iron ore, diamonds and agricultural commodities (natural rubber, coffee, palm kernels, cacao, etc.). Their weight in the national economy is shown in the table below.

In addition, it should not be forgotten that the vast national domain (the forests which cover more than one-third of the country's total area) is still virtually untapped.

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<sup>1/</sup> Provisional data.

Table 1

Exports from Liberia: ores and agricultural commodities

(Value in millions of dollars)

Commodity	1960		1961		1962		1963	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Iron ore (millions of tons)	2.9	34.6	2.8	29.4	3.8	32.4	6.5	45.0
Diamonds (thousands of carats)	967	2.3	1.095	2.2	854	4.5	700	4.0
Natural rubber (thousands of tons)	48.4	39.1	41.2	25.5	45.4	25.7	43.5	25.0
Coffee (thousands of tons)	0.9	0.5	1.0	0.4	1.9	0.6	3.7	1.5
Palm kernels (thousands of tons)	15.2	2.0	12.9	1.1	8.6	0.8	8.7	0.7
Cocoa (thousands of tons)	1.0	0.5	0.7	0.2	0.8	0.2	1.0	0.4
Total Liberian exports		82.6		61.9		67.6		81.1

The industrial sector in Liberia (mining and quarrying, manufacturing, repairs, timber and timber processing, printing and publishing, engineering, vehicle maintenance tyre retreading and vulcanizing, dry cleaning and laundry) comprises some 800 establishments. Except for some 300 enterprises (4 mining companies, 17 lumbering and timber companies, 5 quarries and a few other units) all the industrial establishments are situated in the Monrovia area. Some of the main aggregate indicators for the industrial sector are given below<sup>1/</sup>:

Total number of persons employed	...	16,200
Annual wage bill	...	\$ 16,100,000
Annual value of imports	...	\$ 61,400,000
Annual value of exports	...	\$ 34,200,000
Annual value of production	...	\$ 50,300,000
Value of fixed assets	...	\$130,400,000 <sup>2/</sup>

<sup>1/</sup> Data for 1962. By 1964 the number of industrial establishments may have increased by some 5 per cent.

<sup>2/</sup> The value of fixed assets has increased considerably since 1962, owing to heavy investments in the iron ore enterprises.

The weight of the industrial sector in the national economy is increasing rapidly, owing mainly to the stepped up production of iron ore.

In 1962 some 90,000 persons were employed in the monetary sector of the economy. The industrial sector, as defined above, accounted for about 18 per cent of the total number of persons employed in the monetary sector.

The construction sector employed a number of persons about equal to that of industry (15,800). In 1964, employment in this sector decreased owing to the termination of major investment activities by LAMCO.

## II. MINERAL RESOURCES

### II.1. Iron

Total production of iron ore in 1959-1964 was (in thousands of tons):

1959 .....	2,689
1960 .....	3,051
1961 .....	3,251
1962 .....	3,607
1963 .....	6,557
1964 .....	12,500

Iron ore output is expected to increase to 20 million tons in the next five years. For some years iron ore has held the first place in Liberian exports.

Four companies work the iron ore deposits:

The Liberian Mining Company (LMC) produces 2 to 2.5 million tons annually from the mountain at Bomi Hills and conveys the ore direct to the port at Monvira on the railway constructed by it for the purpose;

The Liberian Company, American and Swedish (LAMCO) mines ore in the Soniquellie area at the foot of Mount Nimba. Yearly output at present is 7 to 8 million tons and should reach 12 million tons in 1970, when the mine will be working at full capacity. Reserves are estimated at 500 million tons, with an average content of 66.5 per cent Fe;

The National Iron Ore Company (NIOC) works the orebodies in the Mano River area. Yearly output was 3 million tons in 1964. Estimated reserves are 46 million tons, with an average content of 56 per cent Fe;

The German and Liberian Company (DELIMCO) mines the ore at Bong Hills, 80 km from Monrovia. Estimated reserves are 300 million tons. This ore is rather poor and in its natural state has a very high silica content. It will be enriched at the mine and it is hoped that a concentrate may be obtained grading 65 per cent Fe, 6.5 per cent silica, 0.03 per cent phosphorus and 0.02 per cent sulphur.

## II.2. Diamonds

Diamonds were discovered in Liberia in 1957. The natives abandoned the companies for which they worked because of "diamond fever". Normal conditions have, however, been restored and diamonds now rank third in Liberian exports, earning some \$4 million yearly for the country.

Diamond prospecting and mining is carried on in the Ouohn-Bopolu area, in Grand Cape County and at Sanokolo. It is hoped that rich diamond reserves in the Bopolu area will raise output to a value of \$60 million yearly.

Diamonds in Liberia are extracted by individual miners and prospectors or by family undertakings. There were 433 miners and 646 prospectors in 1962-1963.

The major companies which have received concessions for diamond prospecting in Liberia are St. Andrews Securities Ltd. (a subsidiary of the Diamond Corporation) and the Liberian-Swiss Mining Corporation (LISWIMCO).

So far the diamond mining companies have achieved only occasional experimental finds. Including the diamond prospecting enterprises, some 1,200 persons are employed in the diamond industry, with a total wage bill estimated at \$1,200,000 per year or some 7 per cent of total employment in industry and the wage bill represents the same proportion of the total wage bill in that sector.

## II.3. Gold

About 20,000 persons are employed in the industry in Liberia. Production is estimated as follows (in ounces):

1959 .....	1,401
1960 .....	1,036
1961 .....	2,088
1962 .....	2,184
1963 .....	2,100

## III. ELECTRIC ENERGY, FUEL AND WATER

### III.1. Electric energy

Electric energy is produced by some forty plants. With the exception of a small hydroelectric facility (composed of 4 units and totalling 4,000 kW) owned by Firestone at Harbel, the whole production is obtained at present from diesel and petrol units (over 330 throughout the country). Total installed capacity in 1962 amounted to some 33,000 kW. In 1964 installed power reached about 118,000 kW, a 257 per cent increase over two years. Sales of power are officially undertaken only by the Power Division of the Public Utilities Authority, which sponsors the production of power in the coastal towns.



The facilities administered in 1964 by the Power Authority were:

Bushrod	...	...	13,000 kW.
Krutown	...	...	7,180 kW.
Sinkor	...	...	1,120 kW.
Buchanan	...	...	373 kW.
Harper	...	...	475 kW.
Greenville	...	...	271 kW.
Robertsport	...	...	<u>271 kW.</u>
Total			22,690 kW.

In other towns in Liberia electricity is not yet supplied as a public utility and production for own consumption is based on very small privately-owned units.

At present most major industrial and agricultural users of electricity rely on their own generating facilities, at least for stand-by capacity.

The transmission facilities include 69 kV lines from Bushrod Island to Bomi Hills, Congotown, Kakata and Harbel. On most of the 63 kV lines there are 12.5 kV underbuilt. Other 12.5 kV lines are from Kakata to Totota and in Monrovia. The power system includes interconnexion with the LMC plants at the Freeport and at Bomi Hills and with Firestone at Robertsfield.

It is expected that in the near future the coastal towns of Monrovia, Buchanan and Robertsport will be interconnected.

With energy demand increasing at a tremendous pace (it has doubled in three years) the supply position has been uncertain. To remedy this situation, construction has been begun on a new dam at Mount Coffee, on the St. Paul River (a \$27 million project). Two 15,000 kW units are to be installed in 1966. As much as 34,000 kW will be generated in the rainy season, but the power will fall to 18,000 or 20,000 kW in the dry season, since the dam is on a head run. A possible remedy might lie in regulation of the waters. Relatively low further investments (\$3-\$5 million) will permit the addition of further 15,000 kW units. If, in future years, a reservoir upstream is constructed, a total installed capacity of 90,000 kW can be obtained.

There is a project for an interconnexion between Mount Coffee, Monrovia, Bong Hills and Buchanan.

The Power Authority at present employs some 380 persons.

Energy production in 1964 amounted to some 195 million kWh for the whole country. Production by the Power Authority amounted to 92 million kWh. The Authority's rates range between 3.5 and 5 cents per kWh for industrial consumers and are 9 cents for private consumers. The rate for large industrial uses, which is to be identical throughout the country, will be 0.9 to 1.1 cent per kWh.

### III.2. Fuel

Fuels, petroleum products in particular, are imported at present, but when the refinery near Monrovia comes into operation, the price for fuel oil should be halved, i.e. \$14 per ton instead of \$28.

An agreement between the Government and the Hunt Company, of Dallas, Texas, was signed in July 1961 for the establishment of a petroleum refinery. The capacity has been estimated at 400,000 tons yearly. The investment is \$6,150,000.

### III.3. Water

A chemical factory needs a great deal of water. The site chosen for the future installations will probably raise the problem of fresh water supplies. The tides force salt water fairly far back up the rivers, especially in the dry season when the water level is low and adequate water supplies are harder to obtain than usual.

If there is a river with a sufficient flow near by, a dam or lock-gate with traps must be installed to prevent the salt water from running up. Otherwise, the water must be drawn far enough from the sea if the required purity is to be obtained (as salinity is not the only defect). Both solutions are costly. Technical studies would have to be made on the spot to estimate correctly the outlay both in capital investment (water catchment, dam, channels, pumps, reservoirs, etc.) and annual expenditures (costs of pumping, maintenance). This could not be done within the limits of this paper. This question must be considered as part of the preliminary projects for each factory at the time when they are applied to the site selected.

## IV. EXISTING INDUSTRIES

IV.1. The structure of the industrial sector and the main indicators for this sector and its component divisions and sub-division are:

Table 2

Structure and main indicators of the industrial sector:

Classification	No. units	No. employees	Production		Fixed assets
			1961	1962	
			(in dollars)		
1. Iron ore mining	4	8,788	28,580,650	29,131,034	111,906,471
2. Diamond mining	3	1,200	2,200,000	4,600,000	1,000,000
3. Rock quarries	5	300	550,000	550,000	450,000
4. Production of electric power	7	380	1,300,000	1,375,000	7,807,000
5. Foodstuff manufacturing	65	577	924,186	1,471,977	3,552,276
<u>including</u>					
Bakeries	4	103	308,323	285,995	58,156
Coffee roasting establishments	2	6	15,400	15,400	10,150
Ice-cream plants	3	17	50,000	50,000	86,104
Reconstituted milk plants	1	32	-	120,000	82,857
Breweries	1	166	62,951	129,838	2,565,009
Distilleries	50	140	113,000	109,000	126,000
Non-alcoholic beverage plants	2	52	252,512	585,744	330,000
Palm oil refineries	1	20	80,000	80,000	80,000
Cold storage and ice-making plants	2	32	80,000	80,000	250,000
6. Plastic goods factories	1	3	33,000	33,000	10,000
7. Footwear and wearing apparel	22	133	219,750	228,500	23,792
<u>including</u>					
Shoe repair workshops	6	24	40,000	40,000	7,700
Tailoring workshops	15	80	90,000	90,000	8,000
Trousers and shirt factory	1	29	89,750	98,500	8,092
8. Lumbering and timber processing	65	2,609	2,410,421	2,363,505	2,337,253
<u>including</u>					
Lumbering and sawmills	16	2,237	1,870,421	1,823,505	1,927,253
Carpentry shops	23	215	330,000	330,000	245,000
Furniture workshops	26	157	210,000	210,000	165,000
9. Printing presses	13	200	1,320,000	1,320,000	500,000
10. Metal workshops	14	135	850,000	850,000	100,000
11. Drilling	39	750	5,300,000	5,300,000	860,000

Table 2 (continued)

Classification	No. units	No. employees	Production		Fixed assets
			1961	1962	
			(in dollars)		
12. Building materials factories	77	473	1,290,000	1,290,000	711,000
<u>including</u>					
Tile works	2	48	120,000	120,000	300,000
Cement block factories	67	345	1,000,000	1,000,000	260,000
Cement pipe factories	2	5	10,000	10,000	1,000
Cement tile factories	6	75	160,000	160,000	150,000
13. Commercial sections	5	31	250,150	239,000	340,000
<u>including</u>					
Oxygen and acetylene	1	8	166,000	166,000	150,000
Soap factories	4	23	84,150	73,000	190,000
14. Tyre retread and vulcanizing	2	42	23,798	281,428	360,000
15. Repair shops	21	475	700,000	700,000	180,000
<u>including</u>					
Electrical repair shops	18	450	520,000	520,000	150,000
Office machine repair shops	3	25	180,000	180,000	30,000
16. Dry cleaning and laundry	5	36	180,000	180,000	230,000
17. Goldsmiths and silversmiths	23	45	400,000	400,000	3,500
18. Ivory carving	4	12	30,000	30,000	600
Total (excluding construction)	375	16,189	46,561,579	50,344,098	130,372,202
19. Construction	70	14,800	40,000,000	42,000,000	4,607,000
TOTAL .....	445	30,989	86,561,579	92,344,098	134,979,202

The aggregate indicators have been calculated for 1962, where not otherwise stated. The value of production has had to be approximated. It was considered equal to the sum of local sales and export sales plus the difference between the stocks at the end and at the beginning of the year. Where such information was not available, the value of production was considered equal to gross income or to value of sales. Similarly, where the value of sales was not available, the value of production was considered equal to the value of sales (this assumes that the initial and final stock of finished goods do not differ appreciably). The value of fixed assets has been taken as the value remaining after depreciation. For newer establishments it has been assumed that the purchase cost of the asset is equal to this value remaining. In the case of small establishments, where the book value is not readily available, the value of the assets has been considered equivalent to its replacement cost.

IV.1.1. There are 4 large bakeries with modern equipment and 21 small bakeries, each usually operated by one woman. One of the four large bakeries also makes cakes and pastries. All the bakeries, except a unit worked by one person at Nyein, are at Monrovia. The total annual capacity of the modern bakeries is about 1,800 tons of bread, that of the artisanal units about 250 tons monthly. About 80 per cent of this capacity is used at present.

IV.1.2. Two undertakings at Monrovia roast coffee for local consumption, using Liberian and Guinean coffees. Only one of them is of any size, the second producing only about 16 per cent of the output of the other.

Daily capacity is about 800 kg, but only about 10 per cent of it is used.

IV.1.3. Three plants at Monrovia make ice-cream. Most sales are made in the dry season.

IV.1.4. Reconstituted milk was produced by one establishment connected with a cold storage plant. It was situated on Bushrod Island and used imported powdered milk with the addition of various other substances to make reconstituted milk, cocoa and yoghurt. Its equipment was modern. Its annual capacity was some 950,000 litres, but only about 35 per cent was used. The undertaking closed down recently, probably because of the insufficient market.

IV.1.5 Beer is brewed in a modern plant at Monrovia, which also produces a number of non-alcoholic beverages. Both are solely for local consumption.

The capacity of the brewery is 3.4 million to 3.8 million litres of beer per year. At the beginning of 1963, only a fraction of this capacity was used. However, after the introduction of a protective tariff in March 1963, which had the effect of doubling the price of imported beer, consumption of the local beer increased considerably, and at present the capacity is nearly fully utilized. Plans for the expansion of the brewery are now in process.

All raw materials, with the exception of water, are imported, as are the bottles, crown corks and cartons.

The rejects (about 360 tons/year) are sold for animal feed and fertilizer.

IV.1.6. Rum is produced in 50 distilleries. One unit of significant size, technically well equipped, is situated at Monrovia and uses imported brown sugar as fermentation raw material. The enterprise is also capable of producing liquors. It has an annual capacity of about 25,000 gals. of rum. Currently, about 60 per cent of this capacity is used.

The other distilleries, situated mainly round White Plains, Millsburg and Arthington, use locally grown sugar cane, which is crushed in small installations and the cane juice is then fermented and distilled. Approximately twenty of these enterprises use small diesel or petrol engines and employ on an average 5 workers. Another 30 enterprises approximately, use hand presses and employ on an average one worker each. Distillation is usually carried out in copper sheet stills manufactured in local workshops.

A certain amount of the production is custom processed. Farmers bring their sugar cane to be pressed, after which the cane juice is fermented and distilled. The distiller usually keeps about one third of the distilled rum as a processing fee.

The bagasse resulting from pressing sugar cane is not utilized. The annual capacity of the primitive stills outside Monrovia is some 80,000 gals. of rum of relatively low concentration. A modern distillery is now under construction at Monrovia and will start operating at the end of 1965.

IV.1.7. Non-alcoholic beverages are produced in six plants. Only two were in operation in 1962-1963.

All the plants producing soft drinks are at Monrovia and possess modern equipment. They produce for local consumption only.

At the beginning of 1963 annual production capacity was about 6,430,000 litres and at that time the capacity was used nearly to the full. At the beginning of 1965, the capacity was probably nearly 19 million litres per year, but hardly 50 per cent seems to be used.

IV.1.8. A relatively modern plant refines palm oil at Virginia, on the banks of the St. Paul. Palm oil is also produced in most parts of Liberia on a family or village basis, mainly by hot-skimming. Only the fruit of the wild palm is used at present.

The modern plant at Virginia is equipped with stock presses for extracting oil from palm fruit, but they have not been in use for several years, since it was found unprofitable to base the process on palm fruit. It now buys crude palm oil only from time to time from local producers and refines it by steam heating.

The plant can process about 1.5 tons of palm fruit daily. Eighty per cent of the capacity was used in 1962, but it was hardly used at all in 1964.

IV.1.9. Cold storage installations are used for preserving imported foodstuffs and fish caught by a large fishing enterprise. Two large cold storage plants are situated on Bushrod Island. The storage plant for foodstuffs also produces blocks of ice which are supplied to consumers in Monrovia. Its capacity is 300 tons; that of the fish storage plant 120 tons. The capacities of both are fully used. Total investment in the plants is some \$250,000.

IV.1.10. Trousers and shirts are made commercially by one factory manufacturing men's underwear, trousers and shirts, using 26 electric sewing machines. It can produce 125 pairs of trousers or 64 shirts per day. At present 25 per cent of this capacity is used.

IV.1.11. Tailors' workshops are mainly at Monrovia. There are about 15 workshops employing from 3 to 10 tailors. Some 285 more workshops operate on an artisanal basis using pedal sewing machines to make up trousers, shirts and ladies' dresses from materials provided by the customer. The largest workshop employs about 80 persons.

IV.1.12. Six workshops at Monrovia execute shoe repairs. The workmanship is usually of rather poor quality. The shops are equipped with fairly modern tools.

IV.1.13. Lumbering and sawmills are major industries involving large investments. There are 16 undertakings in Liberia, all owned by foreign capital. About 13,600 m<sup>3</sup> of a total stumpage of 730,000 m<sup>3</sup> cut between September 1963 and September 1964 was exported. About 60 per cent of production capacity is used; a number of sawmills lie idle for long periods. Employment in the lumbering undertakings represents over 14 per cent of

total employment in the industry. Besides the undertakings which have mechanized equipment for felling timber and processing lumber there are a number of lumberjacks and pitsawyers who produce between 9,000 and 13,600 m<sup>3</sup> of sawnwood yearly. The branches and trunks of inferior quality are sawn or cut down by axe for use as fuel wood.

IV.1.14. Some 28 undertakings manufacture furniture, 2 of them sections working exclusively for large concessions. The 26 enterprises producing for sale are at Monrovia. Fifteen of them currently employ from 1 to 4 men. One large enterprise on Bushrod Island employs some 160 workers. The list of manufactures includes wood and rattan furniture, polished and unpolished household furniture, cabinets and upholstered furniture.

The estimated total capacity of the furniture industry is between 1,530 and 2,300 m<sup>3</sup> of sawnwood annually. Between 50 and 60 per cent of this capacity is used.

IV.1.15. Carpentry workshops are often sections of construction undertakings. There are 23 carpentry workshops, 6 of which are attached to large mining and agricultural concessions. All the workshops, except those attached to foreign concessions, are in the Monrovia area, including Bushrod Island. They make doors, windows, door- and window-frames, shelves, superstructures for lorries, etc. The total capacity of these 17 undertakings is estimated at about 2,300 m<sup>3</sup> of processed sawnwood per year. About 75 per cent of this capacity is used.

IV.1.16. Printing is executed by 13 enterprises, 11 of which are at Monrovia. Four of the printing presses at Monrovia are large establishments printing newspapers and government publications; 7 are small units engaged mainly in printing visiting cards and letter-heads. Two small presses are situated outside Monrovia, one in Cape Mount County, the other at Zorzor. The capacity of the larger presses is satisfactorily used on the whole, but that of the smaller is not.

IV.1.17. Metals are worked up in 14 workshops at Monrovia. There are a number of workshops owned by the large mining and rubber companies operating in Liberia and situated outside Monrovia. There are also many blacksmiths' forges throughout the country which execute work for the villagers. Sixty such forges were found in the neighbourhood of Monrovia alone.

The workshops make metal door- and window-frames, stills, cisterns and water tanks, etc. One enterprise also carries out sanitary installations and drills wells. These workshops produce mainly for the markets of Monrovia and its neighbourhood, but distilling apparatus is sold to cane juice distillers throughout the country. The



capacity of the 5 larger enterprises is used satisfactorily. These shops employ at least 10 workers each. The other nine shops, employing from 1 to 4 workers, are less well equipped and so have smaller production lists and cannot use their capacity properly.

As yet, no foundry has been established in Liberia, although two of the major metal workshops have plans to install small units.

IV.1.18. Vehicle repairs are carried out by 39 garages working for a varied range of customers and ten shops which are annexes to construction and transport undertakings. All the shops working for third persons are at Monrovia. The garages' capacity has been estimated at about 200 repairs daily. It is considered that 75 to 100 per cent of this capacity is used.

IV.1.19. Repairs to electrical appliances, in particular refrigerators and air-conditioners, are carried out by 18 workshops at Monrovia. A large undertaking, employing about 275 persons, installs telephones. Good use is made of the electrical repairs shops.

IV.1.20. Office machine repairs are undertaken by three shops at Monrovia. Their estimated annual capacity is 6,000 repairs; this capacity is fairly fully used.

IV.1.21. There are 5 laundry and dry cleaning establishments. All the laundries and cleaners are at Monrovia. Their estimated annual capacity is 280 tons of washing, and 80 per cent of it is used.

IV.1.22. Twenty-three establishments at Monrovia are engaged in gold and silver smithing and four workshops produce ivory carvings. Most of the ivory used in carvings and jewellery is Liberian.

IV.1.23. The building materials industry comprises brickworks, cement block factories and water pipe factories. There are only two commercial brickworks in Liberia. One of them is at Monrovia on Bushrod Island, the other is an annex of the Firestone Company's construction division. The undertaking at Monrovia is owned by a construction firm, which also owned a carpentry section and a cement tiles plant. It produces full and hollow bricks of various sizes. The oven was installed in 1961 with an initial capacity of 6,000 bricks daily. The clay used by the enterprise is extracted from a quarry situated about three km north of Stockton Creek, as well as from quarries located in the neighbourhood of ELWA. The brick oven uses coconut husks from neighbouring plantations as fuel. The Firestone brickworks at Harbel produces some 600,000 bricks per year solely for its own construction programme.

Cement blocks are produced by some 67 plants, most of them at Monrovia. About 60 of these establishments employ 10 persons each, the remainder 10 to 20 persons. In most of the establishments the cement blocks are made by hand. Two large units, employing 40 workers and equipped with electrical vibration machines, satisfy about 30 per cent of the total market. The cement block factories are situated all over the Monrovia area, including the centre, Bushrod Island, Sinkos and Congo Town. The total capacity of the factories is estimated at about 10 million blocks per year. In 1964, business was adversely affected by the slump in construction activity.

Cement pipes are manufactured by two establishments at Monrovia. Their capacity is estimated at 6,800 m/year. Only about 40 per cent of this capacity is used. Cement tiles are made by 6 enterprises on Bushrod Island and UN Drive, except for one unit at Congo Town. Total capacity is 2,500,000 to 3 million tiles yearly. About 60 per cent of this capacity is used.

Some 77 undertakings in the construction industry employ about 470 persons, or 3 per cent of all persons employed in industry. The value of annual production is about \$1,300,000 and the total capital investment about \$200,000.

#### IV.2. The chemical industry in Liberia

The establishment on any large scale of a chemical industry in Liberia has not proved feasible as yet, owing to the paucity of mineral resources and the inadequate domestic market. It is represented only by one oxygen and acetylene plant, three soap works and one establishment producing cosmetics.

##### Oxygen and acetylene

Oxygen and acetylene are produced by an enterprise owned by a Liberian concern which also engages in fishing, building and the manufacture of building materials and soap. Oxygen is produced by compressing and rectifying air, acetylene from imported carbide. The plant employs 8 persons, two of whom are non-Africans. The oxygen and acetylene is of satisfactory quality and meet the requirements of Liberian consumers. The plant has recently imported equipment for the manufacture of nitrogen. The capacity of the oxygen plant is about 184,000 m<sup>3</sup> annually (26,000 to 27,000 cylinders).

About 80 per cent of the capacity is used and annual sales range from \$130,000 to \$140,000 a year. Capacity is to be doubled this year with new imported equipment. The capacity of the acetylene plant is about 2,100,000 cu.ft. per year. Some 80 per cent of this capacity is likewise used and the annual value of the output is from \$30,000 to \$40,000.

Soap is made by three concerns and is at the moment limited to blue mottled soap. One establishment, at Harbel, is owned by the Firestone Company and produces blue mottled soap for its own employees.

A new enterprise at Monrovia equipped with modern machinery is not working at this moment, but is capable of producing both toilet and laundry soap. This factory is Liberian-owned.

A third enterprise, also at Monrovia, manufactures only mottled soap, and is probably the largest manufacturer of this product in Liberia.

A Spanish-owned soap plant ceased production in 1963. It was rudimentarily equipped and produced only blue mottled soap.

The quality of the blue mottled soap produced in Liberia is poor. Blue soap is sold to all types of customer and is by far the most widely consumed soap product.

The total capacity of the existing enterprises is in the range of 800 to 1,000 tons/year. At present only about 50 per cent of this capacity is used and the value of production is about \$150,000.

The soap industry employs about 35 persons, three of whom are foreigners.

#### Pharmaceutical products and cosmetics

A single undertaking makes pharmaceutical products and cosmetics. It is on Bushrod Island and covers about two acres. It makes some antiseptics and cosmetics. Several attempts in recent years to stimulate output have not been very successful.

#### Tyre retreading

Two undertakings retread tyres, one of them owned by the USTC, a Firestone subsidiary. Both are at Monrovia and have modern equipment. They do not compete,

since one services mainly private cars, the other specializes in lorry and tractor tyres. The quality of the work is good; the customers are the taxi companies and builders. The cost of a retread is about half that of a new tyre.

Annual capacity ~~is~~ about 37,000 private car tyres, 19,000 lorry tyres and 3,500 tractor tyres, and ~~about~~ 40 per cent of it is used at present. Total business is some \$600,000 yearly, but this figure is steadily rising owing to the good workmanship and cheapness of the retreads. The retread plants employ 42 persons, including 5 non-Africans.

#### Plastics

An undertaking in the industrial park at Monrovia makes shoes. It has modern equipment and makes rubber-soled canvas shoes and plastic sandals for the domestic market. It started production in 1964, and employs 100 persons, four of whom are expatriates. The total capacity for the different kinds of footwear is:

Rubber-soled shoes	...	...	360,000	pairs/year
Leather sandals	...	...	50,000	" "
Plastic sandals	...	...	650,000	" "
Rubber boots	...	...	50,000	" "

At present 30 to 50 per cent of the capacity is used and the value produced annually is about \$300,000/year.

Plastic goods are not produced at present in Liberia, except for the above-mentioned plastic sandals.

However, in 1962 a small unit owned by a German firm produced plastic pressed goods, mainly combs, in a rudimentary workshop. This unit employed three persons and the total annual production amounted to some \$30,000.

A modern unit for pressed plastic goods is now under construction and will start production before the end of 1965. It is connected with a Nigeria-based enterprise.

## V. THE PRESENT MARKET FOR CHEMICAL PRODUCTS

The customs statistics for 1960, 1962 and 1963 (the 1961 statistics are not available and those for 1964 have not yet been published) enable an estimate to be made of the evolution of the domestic market only for certain products, articles and substances.

The rate of increase is, in general, calculated on a three-year basis (except where a figure is lacking or is not significant).

The value of exports and re-exports of chemicals is also shown in the following tables (table 5) as also the share of chemical imports in the country's total imports (table 6).

Table 3

Imports: chemical and related products (tonnage)

(Tons)

Classification	1960	1962	1963	Annual rate
Group 271. Fertilizers, crude				
- 271.1 Natural fertilizers of animal or vegetable origin, not chemically treated	0.3	0.05	100.7	Variable
Group 276. Other crude minerals				
- 276.3 Salt .....	1,542.0	3,414.0	6,790.0	64%
Sect.5. Chemicals				
Group 512. Organic chemicals				
- 512.2. Alcohols, phenols, glycerine *	138.0	* 147.0	* 259.0	23%
- 512.5. Acids and their derivatives *	29.0	* 19.0	* 135.0	67%
- 512.9. Other organic chemicals *	947.0	* 43.0	-	Variable
Group 513. Inorganic chemicals				
- 513.3. Inorganic acids .....	7.0	10.0	33.0	67%
- 513.6(2) Caustic soda (sodium hydroxide)	52.0	60.0	83.0	17%
Group 514. Others inorganic chemicals				
- 514.2(4) Sulphates and alums	0.1	1.5	0.01	Variable
- 514.2(8) Neutral sodium carbonate (soda ash)	15.0	41.0	30.0	26%
- 514.9(4) Calcium carbide	102.0	272.0	-	Variable
- 514.9(9) Other inorganic compounds	56.0	127.0	162.0	42%

Table 3 (continued)

Imports: chemical and related products (tonnage)

(Tons)

Classification	1960	1962	1963	Annual rate
Group 521. Mineral tar and crude chemicals from coal, petroleum and natural gas				
- 521.1. Mineral tar .....	* 0.6	* 0.1	* 42.0	312%
- 521.4. Oils and other products of the distillation of coal tar .....	* 160.0	* 553.0	* 53.0	Variable
Group 531. Synthetic organic dyestuffs, natural indigo and colour lakes				
- 531.0(1) Synthetic organic dyestuffs and natural indigo.....	*1,056.0	*3,971.0	* 122.0	Variable
Group 532. Dyeing and tanning extracts, and synthetic tanning materials				
- 532.1. Dyeing extracts (vegetable and animal) .....	1.3	1.3	0.9	Negligible
- 532.4. Tanning extracts of vegetable origin .....	0.2	-	-	?
Group 533. Pigments, paints, varnishes and related materials				
- 533.1. Colouring materials, n.e.s.	53.0	66.0	58.0	3%
- 533.2. Printing inks	3.0	8.0	1.0	Variable
- 533.3(1) Prepared pigments, opacifiers, enamels, glazes, lustres, etc.	*1,512.0	*4,382.0	* 3,500.0	32%
- 533.3(5) Putty and painters' fillings	19.0	24.0	-	12%
Group 541. Medicinal and pharmaceutical products				
- 541.1 Vitamins and provitamins	2.4	0.8	0.7	Negative
- 541.3 Penicillin, streptomycin, tyrocidine and other antibiotics	-	-	-	-

Table 3 (continued)

Imports: chemical and related products (tonnage)

(Tons)

Classification	1960	1962	1963	Annual rate
- 541.4. Opium alkaloids, cocaine, caffen, quinine and other vegetable alkaloids, their salts and other derivatives	0.8	0.3	0.3	Negative
- 541.6(3) Bacterial products, sera, vaccines .....	-	-	-	-
- 541.7. Medicaments .....	-	-	-	-
- 541.9(1) Bandages, etc., impregnated or coated with pharmaceutical products or put up for retail sale	33.0	56.0	-	30%
Group 551. Essential oils, perfume and flavour materials				
- 551.1. Essential oils and resinoids ...	-	-	-	-
- 551.2. Synthetic perfume and flavour materials and concentrates, and enfleurage greases and mixtures of alcohol and essential oils	-	-	-	-
Group 553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)				
- 553.0. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)	-	-	-	-
Group 554. Soaps, cleansing and polishing preparations				
- 554.1(1) Toilet soap.....	208.0	682.0	-	81%
- 554.1(2) Common soap.....	634.0	2,339.0	-	92%
- 554.2. Surface-acting agents and washing preparations .....	-	-	-	-
- 554.3. Polishes, pastes, powder and similar preparations for polishing and preserving leather, wood, metal, glass and other materials .....	-	-	-	-

Table 3 (continued)

Imports: chemical and related products (tonnage)

(Tons)

Classification	1960	1962	1963	Annual rate
Group 561. Fertilizers, manufactured				
- 561.1(9) Nitrogenous fertilizers .....	-	-	196.0	?
- 561.2. Phosphate fertilizers and phosphatic fertilizer materials (other than natural)(including super-phosphates and basic dephosphorization slag) ...	64.0	3.0	49.0	Variable
- 561.3. Potassic fertilizers and potassic fertilizer materials (other than crude natural potassic salts).....	0.4	-	26.0	Variable
- 561.9. Fertilizers, n.e.s.....	17.0	11.0	570.0	222%
Group 571. Explosives and pyrotechnic products				
- 571.1. Propellant powders and other prepared explosives .....	-	-	-	-
- 571.2. Fuses, primers and detonators.....	-	-	-	-
- 571.3 Pyrotechnical articles.....	-	-	8.0	?
Group 581. Plastic materials, regenerated cellulose and artificial resins				
- 581. Plastic materials.....	24.0	264.0	86.0	Variable
Group 599. Chemical materials and products, n.e.s.				
- 599.2. Insecticides, fungicides, disinfectants .....	-	-	-	-
- 599.5. Starches, inulin, gluten; albuminoidal substances; glues .....	-	-	-	-
- 599.9 Chemical products and preparations, n.e.s. ....	-	-	-	-



Table 4

Imports: chemical and related products

(value in thousands of dollars)

Classification	1960	1962	1963	Annual rate
Group 271. Fertilizers, crude				
- 271.1 Natural fertilizers of animal or vegetable origin, not chemically treated	0.03	0.19	4.35	425%
Group 276. Other crude minerals				
- 276.3. Salt .....	79.6	335.7	164.2	27%
Sect.5. Chemicals				
Group 512. Organic chemicals				
- 512.2. Alcohols, phenols, glycerine	31.7	30.6	69.7	30%
- 512.5. Acids and their derivatives	6.3	3.4	24.2	56%
- 512.9. Other organic chemicals	214.7	8.9	35.8	Negative
Group 513. Inorganic chemicals				
- 513.3 Inorganic acids	36.4	78.5	15.4	Negative
- 513.6(2) Caustic soda (sodium hydroxide)	26.4	27.3	17.6	Negative
Group 514. Other inorganic chemicals				
- 514.2(4) Sulphates and alums	0.3	4.3	-	Variable
- 514.2(8) Neutral sodium carbonate (soda ash)	4.9	12.8	8.7	21%
- 514.9(4) Calcium carbide	28.2	68.7	-	Variable
- 514.9(9) Other inorganic compounds	161.4	303.6	390.0	34%
Group 521. Mineral tar and crude chemicals from coal, petroleum and natural gas				
- 521.1. Mineral tar .....	0.11	0.03	6.95	298%
- 521.4. Oils and other products of the distillation of coal tar .....	14.8	41.6	4.0	Negative
Group 531. Synthetic organic dyestuffs, natural indigo and colour lakes				
- 531.0(1) Synthetic organic dyestuffs, and natural indigo .....	33.8	148.5	7.1	Negative

Table 4 (continued)

Imports: chemical and related products (tonnage)

(Tons)

Classification	1960	1962	1963	Annual rate
Group 532. Dyeing and tanning extracts, and synthetic tanning materials				
- 532.1. Dyeing extracts (vegetable and animal) .....	0.64	0.60	1.06	18%
- 532.4. Tanning extracts of vegetable origin .....	0.18	-	0.03	Negative
Group 533. Pigments, paints, varnishes and related materials	399.3	1,041.5	788.2	
- 533.1. Colouring materials, n.e.s.	38.7	47.8	22.0	Negative
- 533.2. Printing inks	1.5	4.3	2.8	23%
- 533.3(1) Prepared pigments, opacifiers, enamels, glazes, lustres, etc.	341.0	963.6	763.4	31%
- 533.3(5) Putty and painters' fillings	18.1	25.8	-	Variable
Group 541. Medicinal and pharmaceutical products	882.6	1,453.5	1,006.2	4.5%
- 541.1. Vitamins and provitamins	3.2	1.4	3.6	4%
- 541.3. Penicillin, streptomycin, tyrocidine and other antibiotics	30.4	7.8	20.7	Negative
- 541.4. Opium alkaloids, cocaine, caffeine, quinine and other vegetable alkaloids, their salts and other derivatives .....	3.7	1.6	1.4	Negative
- 541.6(3) Bacterial products, sera, vaccines .....	11.3	37.1	6.3	Negative
- 541.7. Medicaments .....	199.6	131.6	91.0	approx. Negative
- 541.9(1) Bandages, etc., impregnated or coated with pharmaceutical products or put up for retail sale .....	36.5	67.4	47.0	approx. 9%
- 541.9(9) Other pharmaceutical goods.....	597.9	1,206.6	836.2	" 12%
Group 551. Essential oils, perfume and flavour materials				
- 551.1. Essential oils and resinoids ...	-	0.12	1.34	Variable

Table 4 (continued)

Imports: chemical and related products (tonnage)

(Tons)

Classification	1960	1962	1963	Annual rate
- 551.2. Synthetic perfume and flavour materials and concentrates, and enfleurage greases and mixtures of alcohol and essential oils ..	-	0.23	0.65	Variable
Group 553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)				
- 553.0. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)	341.9	354.1	381.7	4%
Group 554. Soaps, cleansing and polishing preparations				
- 554.1(1) Toilet soap .....	90.1	148.0	135.0	approx. 15%
- 554.1(2) Common soap .....	262.5	635.3	577.5	approx. 30%
- 554.2. Surface-acting agents and washing preparations .....	110.3	133.7	121.3	approx. 3%
- 554.3. Polishes, pastes, powder and similar preparations for polishing and preserving leather, wood, metal, glass and other materials .....	102.2	70.0	79.4	Negative
Group 561. Fertilizers, manufactured				
- 561.1(9) Nitrogenous fertilizers .....	2.8	8.2	12.5	64%
- 561.2. Phosphate fertilizers and phosphatic fertilizer materials (other than natural)(including super-phosphates and basic dephosphorization slag) ...	8.4	9.1	13.2	16%
- 561.3. Potassic fertilizers and potassic fertilizer materials (other than crude natural potassic salts).....	0.5	-	6.5	Variable
- 561.9. Fertilizers, n.e.s.....	25.9	6.9	31.3	6%
Group 571. Explosives and pyrotechnic products.....	752.4	816.4	732.2	
- 571.1. Propellant powders and other prepared explosives .....	706.4	704.5	603.4	Negative
- 571.2. Fuses, primers and detonators .....	24.4	75.0	106.7	63%
- 571.3. Pyrotechnical articles.....	21.6	36.9	22.1	Negligible

Table 4 (continued)

Imports: chemical and related products (tonnage)

		(Tons)			Annual rate
Classification		1960	1962	1963	
Group 581.	Plastic materials, regenerated cellulose and artificial resins				
- 581.	Plastic materials.....	14.5	186.5	102.8	92%
Group 599.	Chemical materials and products, n.e.s.				
- 599.2.	Insecticides, fungicides, disinfectants .....	1,133.8	175.5	220.7	Negative
- 599.5.	Starches, inulin, gluten; albuminoidal substances; glues..	23.4	26.0	118.6	72%
- 599.9.	Chemical products and preparations, n.e.s. ....	4.7	2.7	27.4	80%
Section 5 - TOTAL .....		4,715	5,797	4,937	

Table 5

Imports, exports and re-exports of chemical products (value) (thousands of dollars)

Classification	1960			1961			1962			1963		
	Imports	Exports	Re-exports	Imports	Exports	Re-exports	Imports	Exports	Re-exports	Imports	Exports	Re-exports
Div.51. Chemical elements and compounds .....	510.4	-	0.01	380.0	-	-	538.2	-	-	561.3	-	-
Div.52. Mineral tar and crude chemicals from coal, petroleum and natural gas	14.9	-	-	-	-	-	41.6	-	-	11.0	-	-
Div.53. Dyeing, tanning and colouring materials	433.8	-	0.03	512.0	-	-	1,190.6	-	-	796.5	-	-
Div.54. Medicinal and pharmaceutical products	882.6	-	6.40	1,177.0	-	-	1,453.6	-	1.47	1,006.2	-	-
Div.55. Essential oils and perfume materials, toilet, polishing and cleaning preparations	907.0	-	1.01	945.0	-	-	1,341.5	-	-	1,296.8	-	-
Div.56. Fertilizers, manufactured.....	37.6	-	-	-	-	-	24.3	-	-	63.5	-	-
Div.57. Explosives and pyrotechnic products.....	752.4	-	0.25	885.0	-	-	816.4	-	-	732.2	-	-
Div. 58. Plastic materials .....	14.5	-	-	-	-	-	186.5	-	-	102.8	-	-
Div. 59. Chemical materials and products, n.e.s.	1,161.9	-	-	374.0	-	-	204.2	-	0.02	366.7	-	-
Total .....	4,715	-	7.7	4,273	-	-	5,797	-	1.5	4,937	-	-

Table 6

Chemical products as a component of Liberia's foreign trade

(thousands of dollars)

Year	Imports (c.i.f.)		Exports (f.o.b.)		Re.exports (f.o.b.)	
	Totals	Chemical products	Totals	Chemical products	Totals	Chemical products
1960 .....	69,190	4,715	82,164	-	445	7.7
	100%	6.9%			100%	1.7%
1961 .....	90,700	4,273	61,907	-	-	-
	100%	4.7%				
1962 .....	131,609	5,797	64,584	-	3,051	1.5
	100%	4.4%			100%	0.05%
1963 .....	107,976	4,937	81,100	-	-	-
	100%	4.5%				

## VI. PLANNING THE CHEMICAL INDUSTRY IN LIBERIA

The foregoing tables show that exports and re-exports related to the chemical industry are negligible.

The table of imports provides an estimate of:

- (a) the relative value of present demand for chemical products
- (b) the market trend.

### VI.1. Pharmaceutical products

No figures of use for forecasts can be derived from the foreign trade statistics owing to the variety of pharmaceutical products involved. The growth rates of 5 per cent for average annual values are not high and seem normal enough.

In the preliminary study of the subject<sup>1/</sup> an average annual rate of 10 per cent is taken for pharmaceutical products, which would give:

	1963	Annual rate	1965	1970	1975	1980
Value in \$000	1,000	10%	1,250	2,000	3,200	5,100

If the figures are rounded out and a more realistic growth rate, comparable to those taken for the other countries, is applied, an average estimate would be:

	1963	Annual rate	1965	1970	1975	1980
Quantity (tons)	350 <sup>x/</sup>	Adjusted 6%	370	500	700	900
Value (\$ 000)	1,010	Adjusted 6%	1,200	1,600	2,100	2,900

<sup>x/</sup> Estimated

According to estimates by the Liberian Health Service, 60 per cent of pharmaceutical products are used in the hospitals and 40 per cent sold to the public.

<sup>1/</sup> Liberian Development Corporation: Potential Market for a Pharmaceutical Plant in Liberia, December 1964.

Table 7

Cost of pharmaceutical products used in hospitals

Year	State hospitals		Private hospitals		Total	
	number of beds	Cost of pharmaceutical products	number of beds	Cost of pharmaceutical products	number of beds	Cost of pharmaceutical products
1960	542	266	450	188	992	454
1961	692	288	600	250	1,292	538
1962	763	318	700	292	1,463	610
1963	799	333	764	319	1,563	652

Source: Liberian Development Corporation: Potential Market for a Pharmaceutical Plant in Liberia -- December 1964.

To judge from experience in Liberia and the other West African countries, current expenditure by hospitals for pharmaceutical products varies from \$400 to \$500 per bed per year.

The estimates for Liberia are not too high, as appears from comparing per capita expenditure for pharmaceutical products in various countries<sup>1/</sup>:

Liberia (1963) about \$1.0

Liberia (1980) \$2.34

Czechoslovakia (1958) \$17.6

Israel (1960) \$6.6

Sweden (1956) \$7.4

United States of America (1958) \$21.9

The Israel TEVA consortium has tendered a project to manufacture some 70 pharmaceutical specialities in Liberia and to convert semi-processed imports in order to produce nearly 100 finished products.

The factory's capacity would be \$250,000 yearly, with an investment of \$190,000. Plans are for an increase in output to \$560,000 yearly, with an additional investment of \$90,000. The earning capacity of this factory may be estimated as follows:

<sup>1/</sup> E/CN.14/INR/91. Prospects of the Pharmaceutical Industry in East Africa.



Year	Annual sales (in \$000)	Annual profit before tax (in \$00)	total capital investment (in \$000)	Income from annual sales (%)	Total yield from total investment (inclu. working capital) (%)
1966	239	32	190	13%	17%
1967	316	60	190	17%	28%
1968	402	72	280	18%	26%
1969	483	97	280	20%	35%
1970	560	114	280	20%	41%

## VI.2. Soap

The period 1960-1962 is too short to show up a definite upward trend in consumption. Taking the value of imports, existing production (about 500 tons and \$150,000 yearly), the current very large per capita consumption and the general evolution of the market for soap, which should slow down in the future, a conservative estimate of a rate of 2.5 per cent seems indicated, i.e.:

	1964	Annual Rate	1965	1970	1975	1980
Quantity (Tonnage)	3,300 <sup>x/</sup>	adjusted 2.5%	3,400	3,800	4,300	4,900
Value (\$ 000)	860 <sup>x/</sup>	adjusted 2.5%	880	1,000	1,100	1,300

<sup>x/</sup> Estimated

It is planned to modernize the existing soap works. The market is large enough to warrant the establishment of new works.

## VI.3. Perfumery, cosmetics

Requirements are increasing by 4 per cent annually. Applying this rate, which seems reasonable enough, the estimates would be:

	1963	Annual rate	1965	1970	1975	1980
Value (in \$000)	382	4%	420	500	600	700

Undertakings for putting up and packaging may be envisaged, to meet 50 to 75 per cent of domestic requirements.

#### VI.4. Explosives

Imports of these goods are falling, probably owing to local enterprise. If an annual rate of 7 per cent is accepted, the estimates would be adjusted as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	400 <sup>x/</sup>	Adjusted 7%	430	600	840	1,210

<sup>x/</sup> Estimated

The Liberian domestic market is not, seemingly, large enough to justify establishing an industry. This is a problem for the whole sub-region. All that can be done is to expand the existing plant for making up and packing explosives.

#### VI.5. Paints and varnishes

Taking 1960 as a base date, the annual growth rate of imports would be 32 per cent by weight and 31 per cent by value. The period 1960-1963 is too short to show up a definite upward trend in consumption and the rates seem too high for the future. Taking the present very large per caput consumption (the largest in the West African countries and nearly 5 times higher than that in the Ivory Coast), a more conservative rate would be 3 per cent, giving the following estimates:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	3,800 <sup>x/</sup>	Adjusted 3%	3,920	4,500	5,200	6,100
Value (\$ 1,000)	860 <sup>x/</sup>	Adjusted 3%	890	1,030	1,200	1,400

<sup>x/</sup> Estimated.

The market is large enough to justify local production.

#### VI.6. Disinfectants and solvents

There was an appreciable revival of imports in 1963 after a recession lasting from 1960 to 1962.

Taking 1964 as a basis and an average rate of 15 per cent, which takes account of present trends in Liberia, the following estimates emerge:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	60 <sup>x/</sup>	15%	70	140	280	560
including:						
50% DDT	5 <sup>x/</sup>	18%	6	13	31	70
25% BHC	20 <sup>x/</sup>	15%	23	50	100	200

<sup>x/</sup> Estimated

The turnover is too small for the raw materials to be produced locally. A putting up and packaging plant is all that is worth contemplating.

#### VI.7. Plastics

The fluctuations in imports make it impossible to give exact estimates.

If the general market trend for plastics and the small quantities consumed at present are taken as a basis for calculation, a rate of 20 per cent would be prudent; thus:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	100 <sup>x/</sup>	20%	120	300	700	1,800
including:						
PVC	10 <sup>x/</sup>	28%	15	40	150	500
Polyethylene	60 <sup>x/</sup>	16%	70	150	300	650

<sup>x/</sup> Estimated

The market is too small to warrant local production. There is a project to establish a small plastic goods plant using raw materials with a PVC and polyethylene basis; capacity 200 tons/year.

#### VI.8. Fertilizers

Since the main fertilizers imported are ammonium sulphate, supersimple and potash, the consumption of fertilizer materials in 1964 was probably 300 tons of nitrogen, 500 tons of  $P_2O_5$  and 300 tons of  $K_2$ .

If the growth rate is computed on the basis of the other West African countries, future consumption would be:

Fertilizer materials	1964	1965	1970	1975	1980
Tons of N	300 <sup>x/</sup>	600	1,000	2,000	4,000
Tons of P <sub>2</sub> O <sub>5</sub>	500 <sup>x/</sup>	600	1,000	2,000	4,000
Tons of K <sub>2</sub>	300 <sup>x/</sup>	500	1,000	2,000	4,000

<sup>x/</sup> Estimated.

The market is growing, but the quantities involved are still too small to warrant contemplating local manufacture. The problem arises only in the context of the sub-region as a whole.

#### VI.9. Caustic soda

Caustic soda is used mainly in soap making. With an expansion of local soap production a large increase in the demand for caustic soda may be anticipated. An additional increase will result from the establishment of a petroleum refinery.

Taking only the demand for caustic soda for soap, future requirements may be calculated as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	50 <sup>x/</sup>	70	380	430	490

<sup>x/</sup> Estimated.

#### VI.10. Calcium carbide

Calcium carbide is used mainly for making acetylene for oxy-acetylene welding. The figures for imports have no precise bearing on the future. As the figures for 1963 are not given, the figures given refer only to the 1960-1962 period, and so no accurate conclusion can be drawn. Once again, the estimates must be made by means of comparison with other countries.

If the 7 per cent rate taken for the other countries is applied, the estimates would be:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	150 <sup>x/</sup>	Adjusted 7%	160	230	320	440

<sup>x/</sup> Estimated.

The market is not large enough if only a single country is involved.

VI.11. Neutral sodium carbonate (soda ash)

Local requirements (30 tons in 1963, with a growth rate of 26 per cent by weight and 21 per cent by value) are negligible.

VI.12. Surface-acting agents and washing preparations

The quantities imported are not shown. By comparing with the other countries, the estimates are adjusted to the following quantities and values:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	400 <sup>x/</sup>	Adjusted 9%	436	670	1,030	1,600
Value (\$1,000)	150 <sup>x/</sup>	Adjusted 9%	164	250	390	600

<sup>x/</sup> Estimated

The domestic market seems large enough to justify local production.

VI.13. Salt

Salt consumption is increasing at a rate of 64 per cent by quantity and 27 per cent by value. The period 1960-1963 is too short to show a definite upward trend in consumption and the rates seem too high for the future. Taking into consideration the present very large per capita consumption, it is more prudent to take a rate of 3 per cent, producing the following estimates:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	7,000 <sup>x/</sup>	Adjusted 3%	7,200	8,350	9,700	11,200
Value (\$1,000)	169 <sup>x/</sup>	Adjusted 3%	174	200	230	270

<sup>x/</sup> Estimated

This problem is to be viewed within the sub-region as a whole.

VII. OTHER PROJECTS (EXCLUDING CHEMICALS)

Some other projects (excluding chemicals) should be noted:

A cement works

Oil mills

A cigarette factory

A match factory

A sugar refinery

A small paper mill.

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## M. MAURITANIA

### I. GENERAL CHARACTERISTICS

#### I.1. Population

720,000 inhabitants (1963)

Annual growth rate: 2.3 per cent

Population projection (in thousands)

1965: 740

1975: 820

1970: 765

1980: 890

#### I.2. Area

1,201,600 km<sup>2</sup>

#### I.3. Population density

0.6 per km<sup>2</sup> (1963)

I.4. The Islamic Republic of Mauritania has been an independent republic since 28 November 1960. The total active population is estimated at about 400,000, including 18,500 wage-earners. Two-thirds (11,500) of the wage-earners are employed in the private sector; the public sector accounts for 7,000, excluding the armed forces. Ninety per cent of the entire population, and 95 per cent of the active population, is in the rural sector. Ninety-eight per cent of the wage-earners are assembled in the three towns, Port-Etienne, Zouerate and Nouakchott.

Most of the country is desert. Lack of water is a very serious problem. No agriculture is feasible anywhere in the country except in the river area bordering Senegal for 700 km, where the flooding of the Senegal River provides the requisite humidity and water. Less than 1 per cent of the total area is arable land and only 0.5 per cent of it is farmed.

Crops are very scanty: millet (about 90,000 tons), maize (about 6,000 tons), niebes (about 6,000 tons), sweet potatoes (about 2,000 tons), beref (about 2,000 tons), groundnuts (about 1,500 tons), dates (about 15,000 tons) and gum arabic (about 3,500 tons).

Livestock rearing is the main economic activity and supplies almost all earnings from agricultural exports. The livestock provides for almost all the nomads' needs: food (meat, milk), means of transport, a variety of articles (tents, carpets, cushions, saddlery, guerbas, etc.)

The number of head of livestock is estimated at:

1.5 million cattle

8 million sheep and goats

500,000 camels

200,000 asses and 10,000 horses.

Mineral production was limited until recently to the salterns in the interior, with which exports from Senegal are now competing. However, the economy is changing with the opening-up of the iron ore field at Fort Gouraud in 1963 and the prospect of copper extraction at Akjoujt. Occurrences found elsewhere may open up further prospects.

Almost the sole industry in Mauritania is food packing. Apart from mining, the major projects are:

Canned fish from the coastal fisheries

Canned meat.

The Four-Year Economic and Social Development Plan (1963-1966) is the first national plan drawn up in Mauritania. An interim plan, it aims at identifying essential basic data on the mechanism of the national economy, eliminating bottlenecks at strategic points, redressing certain imbalances and putting into practical effect some of the potentialities of the human and financial resources. It sets two basic objectives: to reduce dependence on external resources both of foreign capital and of foreign cadres and technicians, and to establish the foundations of a full economic and social development, from which the entire country may benefit, from 1967 on.

The plan is to attract and allocate investments, as follows (millions of dollars):



Nature of investment		Amount of investments	% of public investments	% of private investments	% of total investments under the Plan
General surveys	public	2.35	4.3%	-	5.7%
	private	4.05	-	7.0%	
Mining	public	3.24	5.9%	-	
	private	34.76	-	60.5%	33.8%
Agriculture	public	9.53	17.4%	-	
	private	0.19	-	0.3%	8.6%
Fisheries and fish industry	public	3.89	7.1%	-	
	private	3.85	-	6.7%	6.9%
Economic infrastructure	public	25.25	45.9%	-	
	private	9.76	-	17.0%	31.2%
Social infrastructure	public	6.86	12.4%	-	
	private	-	-	0.0%	6.1%
Administrative infrastructure	public	3.84	7.0%	-	
	private	4.86	-	8.5%	7.7%
Total	public	54.96	100.0%	-	
	private	57.47	-	100.0%	100.0%

Source: Plan quadriennal de développement économique et social (1963-1966):  
Islamic Republic of Mauritania.

This allocation highlights the very large amount earmarked for directly productive investments.

Estimated evolution of GDP (in million dollars)

Sector	1962		1966		Index of growth (1962-100)	Average annual growth rate
	% of GDP		% of GDP			
<hr/>						
<u>Primary sector</u>						
(rural production)	<u>44.6</u>	<u>52%</u>	<u>47.8</u>	38%	<u>108.2</u>	<u>2.0%</u>
<u>Secondary sector</u>	<u>32.0</u>	<u>38%</u>	<u>63.6</u>	<u>51%</u>	<u>200.0</u>	<u>19.1%</u>
- Mines	2.4		38.5		1600.0	100.1%
- Food industries	0.8		2.8		350.0	32.0%
- Building and construction	28.0		21.1		75.3	5.8%
- Miscellaneous	0.8		1.2		150.0	10.7%
<u>Tertiary sector</u>	<u>8.5</u>	<u>10%</u>	<u>13.4</u>	<u>11%</u>	<u>157.2</u>	<u>11.9%</u>
<hr/>						
Gross domestic production	85.1		124.8		147.1	10.1%
Administration (salaries)	13.8		15.4		111.5	2.7%
<hr/>						
Gross domestic product	98.9		140.2		142.2	9.2%

Source: Plan quadriennal de développement économique et social (1963-1966):  
Islamic Republic of Mauritania.

## II. MINERAL RESOURCES

Common salt: the main salterns are at Trarza and in the Adar. Production reached 5,000 tons before 1960. It is falling considerably because of competition from the Kaolack salterns.

Treatment of the Akjoujt copper might make this deposit profitable once more, as a consumption of 20,000 tons/year would be needed to do so.

Iron: the Fort Gouraud (MIFERMA) orebody is thought to hold 125 million tons, mostly of hematite with a 65 per cent Fe content and very little sulphur (0.025 per cent). Much of it can be mined by open-pit methods.

The investments spread over the period from 1963 to 1966 amount to \$20 million, but it is planned to increase this by \$36 million by 1969. Production began in 1963 (1.7 million tons), rose to 4.6 million tons in 1964, and should reach 6 million tons in 1966/1967. There are also reserves of quartzites with a 30 to 40 per cent Fe content.

Copper: the Akjoujt deposit, 270 km from Nouakchott, is believed to contain the following reserves:

9 million tons of oxide ores assaying 2 to 2.5 per cent Cu with 3 g Au/ton;

18 million tons of sulphide ores assaying 1.5 per cent Cu with 1 g Au/ton.

The orebody can be worked by open-pit methods, as can undetermined quantities of ores assaying 0.8 per cent Cu. There are also 4 to 5 million tons assaying 1.5 per cent Cu which can be extracted by underground mining, bringing up the total to 500,000 tons of metal with 21 tons of gold, only 13 tons of which are recoverable.

The investment was originally estimated at \$18 million, but the project encountered setbacks (lack of capital, difficulties in treating the ore, lack of transport facilities and water supply, fall in copper prices, etc.). An American company (Northfield) finally made an agreement with the Government and the shareholders and resumed operation with a new treatment process. It hopes to produce the equivalent of 15,000 tons in the form of 65 per cent copper concentrate with 56 g of gold per ton from the oxides and 27,000 tons of 27 per cent copper concentrate with 11 g of gold per ton from the sulphides. The annual production of gold is expected to be 1.5 tons. This project has been deferred.

Gypsum: the quarries near Nouakchott (with an 85 to 92 per cent gypsum content) have supplied that town with plaster. A study of other potential uses is in process.

Titanium: five million tons of titanium-bearing sand, equivalent to 250,000 tons of 52 per cent ilmenite, have been discovered on the coast. Exploration is proceeding.

Gold: traces have been found outside Fort Gouraud.

Tungsten: traces have been reported near Akjoujt.

Other ores: chromium, nickel, beryllium, molybdenum and tin have been discovered in the course of recent exploration.

Phosphates: a number of small phosphatic deposits, not large enough to warrant any hope of exploitation for the world market, occur on the Mauritanian bank of the Senegal River valley between Matam and Boghé.

Mauritania could use the domestic production, if exploited, at a low cost, since

(a) The deposits can be worked easily

(b) They have a readily available outlet, as they are practically on the Senegal River.

The main deposit is that at Civié; a preliminary survey suggests that it could be mined by hand. The possible yield is estimated at 20 million tons. The content is generally about 50 to 70 per cent tricalcic calcium phosphate.

Line: There are large deposits of shells throughout the coastal area at Nouakchott. A large deposit of limestone underlies the gypsum bed at Sebkhah de Nouakchott (about 60 km from Nouakchott).

### III. ELECTRIC ENERGY, FUEL AND WATER

There are no sources of energy in Mauritania at this time, as the country produces no hydraulic energy, hydrocarbons or coal. Wood and charcoal are used for cooking.

Only six towns in Mauritania have electricity: Nouakchott, Port Etienne, Consade, Zouerate, Atar and Rosso. All electric power plants in the country are equipped with diesel power groups.

Installed capacity at the end of 1964:

Locality		Diesel power groups in kw	Total capacity in kw
1.	Nouakchott	2 x 510 + 2 x 220	1,460
2.	Port-Etienne	8 x 1,000	8,000
3.	Consado	Supplied from Port Etienne by overhead line	15 kv
4.	Zouerate	2 x 1100 + 4 x 2200	11,000
5.	Atar	5 x 50	250
6.	Rosso	1 x 40 + 1 120	160
Total			20,870

At Idini, some 60 km from Nouakchott, there is a small diesel power group, of unknown capacity, for pumping water to Nouakchott.

Consumers pay an average of \$0.152 per kWh.

At Port-Etienne MIFERMA supplies SAFELEC with electricity at \$0.06 per kWh. A rebate is given for loads between 500 and 1,000 kW. SAFELEC's low-voltage consumers pay the basic tariff of \$0.154 per kWh. The tariff for high-voltage current is \$0.108 per kWh.

Fuel prices per ton at Nouakchott are:

Heavy fuel	\$28
Diesel oil	\$80
Gas oil	\$160

These (uncontrolled) prices need to be checked; and there may be reductions in special circumstances.

Water supply is already a problem at the Akjoujt mine, which has to bring its water from over 100 km away. Hydrogeological surveys are under way, as water is of vital necessity to the country. Nouakchott obtains its water supply at present from pumping underground water at Idini, the water being carried through pipes for some 60 km; it costs \$0.48 per m<sup>3</sup>, at the rate of 1,650 m<sup>3</sup> daily.

#### IV. EXISTING INDUSTRY

There are hardly any processing industries in Mauritania.

At present there are:

3 fish curing plants (Sigip, Cosema, Ega)

2 canning factories (Coprama, Somaupeco in course of installation)

An abattoir at Kaedi

The Four-Year Plan provides for:

The equipment of the port at Port-Etienne: tide chamber, unloading dock;

The installation of a 9,000-ton freezing plant, with a capacity for processing 16,000 tons annually;

The installation of the freezing plant at Guelfi, with a capacity for processing 10,000 tons annually, a key factor in the fishing industry;

The erection of canning factories.

These projects as a whole, some of them already under construction, should ultimately make up an industrial complex capable of processing 100,000 tons of fish yearly.

There is no chemical industry in Mauritania at present.

## V. THE PRESENT MARKET FOR CHEMICAL PRODUCTS

As the customs statistics were grouped with those for Mali and Senegal until 1960, the following tables relate only to the period 1961-1963; the figures for 1964 have not yet been published.

As the population is so small, total imports in 1963 did not amount to \$10,000 the minimum figure accepted for entry by those countries. Some imports of less than that amount have, however, been entered in order to keep items of interest already referred to in the tables. It should be noted, however, that some headings do not appear (chapter 29, phosphatic fertilizers, potassic fertilizers). The reason is simply that there were no imports recorded in the period.

The growth rate is calculated for a two-year period, except where a figure is not available or is not significant.

Table 1 gives quantities imported (in tons). Table 2 shows their value in dollars. The code numbers are those of the Brussels Nomenclature.

Table 1

Imports into Mauritania - Chemical products and fertilizers (tonnage)  
(in tons)

Code	Commodity	1961	1962	1963	Annual rate
<u>Chapter 25</u>	Mineral products	19	23	14	Variable
27.11	Crude hydrocarbons	96	125	227	53%
<u>Chapter 27</u>	Petroleum derivatives	97	125	227	53%
28.17.08	Caustic soda	1	5	3	Variable
28.36	Carbides	1	1	-	Neglig.
<u>Chapter 28</u>	Inorganic chemicals	3	9	4	Variable

Table 1 (continued)

Code	Commodity	1961	1962	1963	Annual rate
30.03.02	Other pharmacopoeial medic	n	-	12	Variable
30.03.13	Pharmaceutical specialities	6	8	4	Variable
.....					
<u>Chapter 30</u>	Pharmaceutical products	7	9	18	60%
.....					
31.02	Fertilizers, nitrogenous	n	299	1,306	337%
.....					
<u>Chapter 31</u>	Fertilizers	n	299	1,306	337%
.....					
32.09.20	Paints	1,301	248	171	Minus
.....					
<u>Chapter 32</u>	Paints and varnishes	1,302	250	183	Minus
.....					
36.02.01	Inorganic compound explosives	98	59	51	Minus
36.02.08	and 10: other organ. explosives	80	98	92	Variable
36.02.21	and 31: percussion caps and other	318	60	-	Minus
.....					
36.0.6	Matches	2	n	153	Variable
<u>Chapter 36</u>	Explosives and matches	498	217	296	Variable
.....					
38.11.08	Disinfectants, put up (1 kg)	7	15	8	Variable
38.11.10	Disinfectants, unpacked	4	12	34	19%
.....					
<u>Chapter 38</u>	Disinfectants and solvents	12	28	45	94%
.....					
39.02	Polymerization and copolymer products	54	91	28	Variable
39.07.39	Other plastic articles	105	89	50	Minus
.....					
<u>Chapter 39</u>	Plastic materials	162	188	80	Variable
.....					
<u>Chapter 51</u>	Man-made fibres	n	n	n	Neglig.

Table 2

Imports: Chemical products and fertilizers (value)

(Thousands of dollars)

Code	Commodity	1961	1962	1963	Annual rate
Chapter 25	Mineral products	2	2	2	-
27.11	Gaseous hydrocarbons	19	25	42	49%
Chapter 27	Petroleum derivatives	19	25	42	49%
28.17.08	Caustic soda	n	n	n	Neglig.
28.26	Carbides	n	2	-	Neglig.
Chapter 28	Inorganic chemicals	1	3	1	Neglig.
30.03.02	Other pharmacopoeial medic	n	-	47	Variable
30.03.13	Pharmaceutical specialities	24	38	17	Variable
Chapter 30	Pharmaceutical products	28	40	72	64%
31.02	Fertilizers, nitrogenous	n	38	132	248%
Chapter 31	Fertilizers	n	38	132	248%
32.09.20	Paints	60	136	108	Variable
Chapter 32	Paints and varnishes	61	137	117	Variable
36.02.01	Inorganic compound explosives	60	31	26	Minus
36.02.08	and 10: other organ. explosives	47	56	55	Variable
36.02.21	and 31: percussion caps and other	184	35	-	Minus
36.06	Matches	1	n	104	Variable
Chapter 36	Explosives and matches	292	120	185	Variable
38.11.08	Disinfectants, put up (1 kg)	8	21	9	Variable
38.11.10	Disinfectants, unpacked	4	24	24	145%
Chapter 38	Disinfectants and solvents	12	45	35	Variable
39.02	Polymerization and copolymer products	60	56	20	Minus
39.07.39	Other plastic articles	64	58	64	-
Chapter 39	Plastic materials	128	128	89	Minus
Chapter 51	Man-made fibres	n	1	1	Neglig.



## VI. PLANNING THE CHEMICAL INDUSTRY IN MAURITANIA

The foregoing tables deal only with imports, for the volume of exports of chemical products is negligible. Very few growth rates could be calculated, as most of the figures do not provide a basis for identifying any reliable trend; the rates that have been calculated are themselves very dubious owing to the brevity of the reference period. Estimates will once again have to be made by comparison with the other countries.

### VI.1. Pharmaceutical products

The rates derived from the statistics (60 per cent for quantity and 64 per cent for value) are too high for the future. If a 12 per cent rate is applied, the estimates would be:

	1963	Annual rate	1965	1970	1975	1980
Quantity (tons)	18	Adjusted 12%	24	40	70	130
Value (\$1000)	93	Adjusted 12%	104	180	320	570

The market is very small.

### VI.2. Soap

The imports recorded in the Customs statistics are very small (about 11 tons in 1964). The estimate for future consumption, comparable with that of the other countries, would be:

	1964	1965	1970	1975	1980
Quantity (tons)	11	20	100	400	900
Value, (\$1000)	4	7	36	144	324

There are prospects for a future market. Present consumption is too limited to warrant production locally.

### VI.3 Surface-acting agents and washing preparations

Present consumption is some 35 tons per year. In view of the general market trend for these products, which is likely to rise very steeply in future years, consumption in Mauritania may be expected to be:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	35	Adjusted 16%	41	85	180	370
Value, (\$1000)	20	Adjusted 16%	23	50	100	210

There are two few outlets for a study of local manufacture to be justified at present.

### VI.4. Perfumes and cosmetics

Present consumption is apparently about \$20,000 annually. This is a very low figure. Total requirements should, it is estimated, rise as follows:

	1964	Annual rate	1965	1970	1975	1980
Value, (\$1000)	20 <sup>x/</sup>	Adjusted 7%	22	30	42	60

<sup>x/</sup> Estimated

The turnover is too small for local production.

### VI.5 Pigments, paints, varnishes

Imports have fluctuated during the reference period. Taking a growth rate of 7 per cent comparable to those taken for the other countries, an average estimate would give:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	200 <sup>x/</sup>	Adjusted 7%	220	300	400	550
Value, (\$1000)	120 <sup>x/</sup>	Adjusted 7%	130	180	250	350

<sup>x/</sup> Estimated

The market is very poor and has not become stabilized.

## VI.6 Disinfectants and solvents

The remarkably high rate for disinfectants is explained by the Government's "cochineal eradication" operation and pest control campaign (\$100,000 and \$36,000 respectively are allocated in the Plan (1963-1966)). The total amount in this section, however, remains small. Future requirements are estimated to be:

	1963	1965	1970	1975	1980
Quantity (tons)	45	60	120	240	480
including					
DDT (50%)	3 <sup>x/</sup>	5	12	30	60
BHC (25%)	18 <sup>x/</sup>	23	45	90	150

x/ Estimated

The production problem is of concern to the sub-region as a whole.

## VI.7 Explosives

The size of this section, which heads chemicals imports is probably to be explained by the extent of minerals exploration and the start of mining operations. Unfortunately, the figures vary too much to infer valid estimates from them and there is no precedent to serve as a basis for comparison.

It is estimated that future requirements should rise as follows:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	300	Adjusted 7%	320	450	630	890

This question will be taken up again in connexion with the sub-region as a whole.

## VI.8 Plastics

Imports have fallen in quantity and value during the reference years.

In view of the general trend in the market for plastics, a 15 per cent rate would seem conservative, thus:

	1964	1965	1970	1975	1980
Quantity (tons)	100 <sup>x/</sup>	115	230	460	900
including					
PVC	30 <sup>x/</sup>	35	70	140	270
Polyethylene	20 <sup>x/</sup>	23	60	120	270

x/ Estimated

It seems unlikely that a plastics industry will be established in Mauritania in the near future.

#### VI.9. Caustic soda

Caustic soda is connected with soap-making. Future requirements for this purpose may be estimated as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	-	-	-	40	90

This problem is to be considered in the context of the sub-region as a whole.

#### VI.10 Calcium carbide

Imports in this section are negligible. Forecasts should be:

	1964	1965	1970	1975	1980
Quantity (tons)	1	2	10	25	50

The quantities are very small.

#### VI.11 Fertilizers

The consumption of nitrogenous fertilizers is in itself large enough to rank this item second in the list of imports. On the other hand, imports of phosphatic fertilizers (only 10 kg in 1961) are virtually nil and are not even shown in the statistics.

For lack of adequate reference data, the same rate as that accepted for the neighbouring countries will have to be taken, with 1963 as the reference year for nitrogenous fertilizers (about 350 tons of N) and the consumption (100 tons) of  $P_2O_5$  and  $K_2O$  in 1970, as given by F.W. Hauck<sup>1/</sup>; thus:

	1964	1965	1970	1975	1980
Tons of N	350	420	750	1,500	3,000
Tons of $P_2O_5$	-	30	100	300	900
Tons of $K_2O$	-	30	100	300	900

This problem arises only in the context of the sub-region as a whole.

<sup>1/</sup> F.W. Hauck, Soil Fertility and Fertilizers in West Africa (E/CN.14/INR/70).

## VI.12. Salt

Taking only local consumption and the requirements of the fisheries into account, the demand for salt may be established as:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	520	Adjusted 9%	570	870	1,340	2,100
Value, (\$100)	17 <sup>x/</sup>	Adjusted 9%	19	30	45	70

<sup>x/</sup> Estimated

As has already been noted, the treatment of the Akjoujt copper might well make the salt deposits at Trarza and in the Adar profitable once more as a consumption of 20,000 tons/year would be needed to do so. This is a problem that concerns the sub-region as a whole.

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## N. GAMBIA

### I. GENERAL CHARACTERISTICS

#### 1.1 Population

315,000 inhabitants (1963)

Annual growth rate 1958-1963: 2.5 per cent

Population projection (in thousands)

1965:	324	1975:	425
1970:	370	1980:	490

#### 1.2 Area

10,400 km<sup>2</sup>

#### 1.3 Population density

30 per km<sup>2</sup> (1963)

1.4 Gambia is a former British colony enjoying internal self-government since 1963. Most of the population (95 per cent) is agricultural. There are few wage-earners (about 10,000), the administration being the largest employer. The climate as a whole is tropical. During the dry season the heat is tempered by the ocean. The country has 3,800 km<sup>2</sup> of arable land, 1,200 km<sup>2</sup> of which are not used.

The entire economy rests on groundnuts (production 1961/62: 118,000 tons in shell, 58,250 tons of which were shelled and exported). Groundnuts account for 90 per cent of the country's exports by weight and value. The main food crops, all of them consumed domestically, are sorghum, millet and rice. A little palm oil and groundnut oil is also produced; 1,835 tons of palm kernels were exported in 1962 and 4,454 tons of groundnut oil in 1963. Gambia has hardly any industry.

The main development policy is to give the country a better infrastructure than it has at present. Under a new programme for 1964-1967, \$12.3 million was to be invested, including \$3.7 million in transport, \$2.6 million in agriculture, \$1.3 million in education, \$0.7 million in health, \$0.5 million in electric energy, \$0.6 million in water and 0.7 million in administration construction.

### II. MINERAL RESOURCES

The subsoil of Gambia is still almost entirely unexplored. Exploration for petroleum is under way. A little ilmenite (titanium ore) has been found on the coastal strip, but in very small quantities. This ore was worked in 1956 and some 50,000 tons of ore were exported in 1959. The undertaking suspended work at the end of 1959, as extraction proved unprofitable.

### III. ELECTRIC ENERGY, FUEL AND WATER

Gambia has no source of hydraulic energy. A steam plant with an output capacity of 2,250 kWh supplies Bathurst with electricity. Georgetown is the only other town with a continuous electricity supply. Output in 1963 was 6,355,000 kWh.

### IV. EXISTING INDUSTRY

Gambia, like Mauritania, has hardly any industry.

The only industrial undertakings are some small boat yards at Bathurst, each employing a few workers.

There are also a few groundnut shelling plants (6 in 1962) and two small artisanal oil mills.

### V. THE PRESENT MARKET FOR CHEMICAL PRODUCTS

The tables appended relate to the customs statistics for 1960-1964.

The growth rate is mostly calculated for a four-year period, except where a figure is lacking or is not significant. Table 1 gives tonnage imported. Table 2 shows the value in dollars. Table 3 shows the share of chemicals in Gambia's foreign trade.



Table 1

Imports into Gambia: Chemical and related products (tonnage)

(Tons)

Classification	1960	1961	1962	1963	1964	annual rate
Group 271: Fertilizers, crude						
271.1. Natural fertilizers of animal or vegetable origin, not chemically treated	...	...	...	1	...	?
271.4. Natural potassic salts, crude	...	...	...	...	1	?
Group 276: Other crude minerals						
276.3. Salt	334	410	330	96	258	minus
Section 5: Chemicals						
Group 512: Organic chemicals						
512.2. Alcohols, phenols, glycerine - m <sup>3</sup>	2	6	1	3	4	19%
512.5. Acids and their derivatives	...	...	1	2	2	?
512.9. Other organic chemicals	...	...	...	...	...	-
Group 513: Inorganic chemicals						
513.3. Inorganic acids and oxygen compounds of metalloids	13	10	15	8	9	minus
513.6 (2). Caustic soda (sodium hydroxide)	16	23	45	38	18	3%
Group 514. Other inorganic chemicals						
514.9 (9) Other inorganic compounds, n.e.s.	...	...	...	...	...	-
Group 521. Mineral tar and crude chemicals from coal, petroleum and natural gas						
521.1. Mineral tar	22	7	1	3	4	minus
521.4. Oils and other products of the distillation of coal tar	1	1	2	10	1	?
Group 531. Synthetic organic dyestuffs, natural indigo and colour lakes						
Group 532. Dyeing and tanning extracts, and synthetic tanning materials						

Table 1 (continued)

Classification	1960	1961	1962	1963	1964	annual rate
532.1. Dyeing extracts	...	...	...	...	...	-
Group 533. Pigments, paints, varnishes and related materials						
533.1. Colouring materials, n.e.s.	31	34	46	39	50	13%
533.2. Printing inks	...	...	...	...	...	-
533.3 (1) Prepared pigments, opacifiers, enamels, glazes, lustres, etc.	67	58	74	139	91	8%
Group 541. Medicinal and pharmaceutical products						
541.1. Vitamins and provitamins	...	...	...	...	...	...
541.3. Penicillin, streptomycin, tyrocidine and other antibiotics	...	...	...	...	...	-
541.4. Opium alkaloids, cocaine, caffeine, quinine and other vegetable alkaloids, their salts and other derivatives	...	...	...	...	...	-
541.6.(3) Bacterial products, sera, vaccines	...	...	...	...	...	-
541.7.(2) Ointments, liniments	...	...	...	...	...	-
541.9.(1) Bandages, etc., impregnated or coated with pharmaceutical products or put up for retail sale	...	...	...	...	...	-
541.9.(9) Other pharmaceutical goods	...	...	...	...	...	-
Group 551. Essential oils, perfume and flavour materials						
551.1. Essential oils and resinoids	2	2	4	2	3	11%
Group 553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)						
553.1. Perfumery (m <sup>3</sup> )	2	2	3	1	2	?
553.2. Dentifrices	2	2	2	2	3	11%
553.3. Talcum and powders	4	9	6	9	13	34%
553.4. Pomades	7	4	9	12	6	minus
553.9. Other perfumery, cosmetics and toilet preparations	...	...	...	...	...	-

continued)

Classification	1960	1961	1962	1963	1964	annual rate
54. Soaps, cleansing washing preparations						
(1) Toilet soap	12	14	10	18	18	11%
(2) Common soap	707	597	550	588	486	minus
2. Surface-acting agents washing preparations	6	8	33	54	46	66%
3. Polishes, pastes, powder and similar preparations for polishing and preserving leather, wood, metal, glass and other materials	15	17	13	21	15	?
Group 561. Fertilizers, manufactured						
561.2.(1) Super-phosphates	...	...)		7	...	?
561.2.(2) Other phosphatic fertilizers	...	...)	308	...	...	?
561.9. Fertilizers, n.e.s.	1	102	56	78	...	?
Group 571. Explosives and pyrotechnic products						
571.1. (1) Propellant powders	...	17	60	17	15	minus
571.1. (2) Other prepared explosives	...	1	...	...	...	-
571.2. Fuses, primers and detonators	1	...	...	1	1	-
571.3. Pyrotechnical articles	...	...	...	...	...	-
571.4. Hunting and sporting ammunition	...	...	...	...	...	-
Group 581. Plastic materials, regenerated cellulose and artificial resins						
581.9. Artificial plastic materials.	...	...	...	1	2	?
Group 599. Chemical materials and products, n.e.s.						
599.2.(1) Disinfectants	2	9	13	2	2	?
599.2.(2) Insecticides and fungicides...	...	...	...	...	...	-
599.9. Chemical products and preparations, n.e.s.	...	...	...	...	...	-

Source: The Gambia Customs Department Reports 1960-1964.

Table 2

Imports: chemical and related products (value)

(thousands of d

Classification	1960	1961	1962	1963	1964	
Group 271: Fertilizers, crude						
271.1. Natural fertilizers of animal or vegetable origin, not chemically treated	...	...	...	0.1	0.1	
271.4. Natural potassic salts, crude	...	...	...	...	...	-
Group 276: Other crude minerals						
276.3. Salt	8.3	15.0	10.2	2.7	8.3	-
Section 5: Chemicals						
Group 512: Organic chemicals						
512.2. Alcohols, phenols, glycerine - m <sup>3</sup>	0.6	0.7	0.2	0.9	1.4	23%
512.5. Acids and their derivatives	0.5	0.4	1.0	1.2	1.0	19%
512.9. Other organic chemicals	1.9	1.3	1.8	1.4	1.0	minus
Group 513: Inorganic chemicals						
513.3. Inorganic acids and oxygen compounds of metalloids	4.0	3.6	4.0	3.8	2.8	minus
513.6. (2). Caustic soda (sodium hydroxide)	3.6	5.1	10.9	9.9	3.6	-
Group 514. Other inorganic chemicals						
514.9. (9) Other inorganic compounds, n.e.s.	14.6	16.7	18.0	23.9	21.6	10%
Group 521. Mineral tar and crude chemicals from coal, petroleum and natural gas						
521.1. Mineral tar	1.9	0.7	0.1	0.5	0.4	minus
521.4. Oils and other products of the distillation of coal tar	0.1	0.2	0.1	1.0	1.0	78%
Group 531. Synthetic organic dyestuffs, natural indigo and colour lakes						

Table 2 (continued)

Classification	1960	1961	1962	1963	1964	annual rate
531.0. Synthetic organic dyestuffs natural indigo and colour lakes	0.9	6.3	4.9	10.1	6.4	63%
Group 532. Dyeing and tanning extracts, and synthetic tanning materials						
532.1. Dyeing extracts	...	...	0.1	0.7	0.1	-
Group 533. Pigments, paints varnishes and related materials						
533.1. Colouring materials, n.e.s.	23.6	26.8	30.7	34.7	31.6	7%
533.2. Printing inks	0.5	0.3	0.1	0.2	0.3	minus
533.3 (1) Prepared pigments, opacifiers, enamels, glazes, lustres, etc.	46.8	56.3	44.2	90.3	63.9	8%
Group 541. Medicinal and pharmaceutical products	233.7	302.4	330.6	420.3	324.1	9%
541.1. Vitamins and provitamins	1.4	...	...	0.3	0.2	minus
541.3. Penicillin, streptomycin, tyrocidine and other antibiotics	0.7	1.3	1.5	2.7	1.9	28%
541.4. Opium alkaloids, cocaine, caffeine, quinine and other vegetable alkaloids, their salts and other derivatives	0.8	0.8	1.8	0.4	2.3	30%
541.6.(3) Bacterial products, sera, vaccines	4.0	2.5	2.2	4.8	1.9	minus
541.7.(2) Ointments, liniments	96.2	133.8	120.5	147.8	106.3	2%
541.9.(1) Bandages, etc., impregnated or coated with pharmaceutical products or put up for retail sale	4.0	8.6	9.8	16.2	17.2	44%
541.9.(9) Other pharmaceutical goods	126.6	155.4	194.8	248.1	194.3	11%
Group 551. Essential oils, perfume and flavour materials						
555.1. Essential oils and resinoids	4.0	5.0	6.8	5.0	5.2	7%
Group 553. Perfumery and cosmetics, dentifrices and other toilet preparations (except soap)	55.4	78.9	99.0	75.8	88.6	
553.1 Perfumery (m <sup>3</sup> )	7.6	9.9	20.2	6.0	11.0	9%
553.2. Dentifrices	4.6	3.3	4.2	4.1	5.8	6%

Table 2 (continued)

Classification	1960	1961	1962	1963	1964	annual rate
553.3. Talcum and powders	6.7	18.1	15.1	16.3	23.4	37%
553.4. Pomades	5.5	9.8	8.0	7.7	4.7	minus
553.9. Other perfumery, cosmetics and toilet preparations	31.0	37.8	51.5	41.7	43.7	9%
Group 554. Soaps, cleansing and polishing preparations						
554.1.(1) Toilet soap	7.5	8.7	7.8	11.6	10.4	8%
554.1.(2) Common soap	139.0	109.4	106.7	101.7	89.3	minus
554.2. Surface-acting agents and washing preparations	3.5	4.1	17.2	24.9	25.2	64%
554.3. Polishes, pastes, powder and similar preparations for polishing and preserving leather, wood, metal, glass and other materials	7.7	8.2	5.8	9.9	8.0	1%
Group 561. Fertilizers, manufactured						
561.2.(1) Super-phosphates	) 0.1	) ...	) 22.2	0.6	...	-
561.2.(2) Other phosphatic fertilizers	)	)	)	...	...	-
561.9. Fertilizers, n.e.s.	0.3	7.5	12.3	6.2	...	?
Group 571. Explosives and pyro- technic products						
571.1. (1) Propellant powders	...	17.2	15.4	17.2	16.3	minus
571.1. (2) Other prepared explosives	0.7	4.6	4.5	1.2	...	?
571.2. Fuses, primers and detonators	5.0	1.6	2.3	3.6	4.8	minus
571.3. Pyrotechnical articles	0.8	1.1	0.3	...	...	?
571.4. Hunting and sporting ammunition	23.4	25.9	20.2	24.8	23.2	-

Table 2 (continued)

Classification	1960	1961	1962	1963	1964	annual rate
Group 581. Plastic materials regenerated cellulose and artificial resins						
581.9. Artificial plastic materials	...	0.1	...	1.7	2.6	?
Group 599. Chemical materials and products, n.e.s.						
599.2. (1) Disinfectants	2.5	4.7	5.1	2.5	1.2	minus
599.2. (2) Insecticides and fungicides	26.2	28.0	56.5	24.8	64.1	25%
599.9. Chemical products and préparations, n.e.s.	6.1	6.3	5.6	11.4	4.5	minus
Section 5 total	633.3	732.1	834.4	921.8	802.6	

Source: The Gambia Customs Department Reports 1960-1964.

Table 3

Chemicals as a component of Gambia's foreign trade

(Value in \$1000)

Year	Imports (c.i.f.)		Exports (f.o.b.)		Re-exports (f.o.b.)	
	Totals	Chemicals	Totals	Chemicals	Totals	Chemicals
1960	9,022	633	7,045	...	742	3.4
	100%	7.0%	100%	...	100%	0.5%
1961	12,802	732	9,050	...	398	0.8
	100%	5.7%	100%	...	100%	0.2%
1962	12,547	834	9,738	...	255	0.2
	100%	6.6%	100%	...	100%	0.1%
1963	11,844	922	8,355	...	314	0.6
	100%	7.8%	100%	...	100%	0.2%
1964	12,141	803	8,879	...	...	...
	100%	6.6%	100%	...	...	...

Source: The Gambia Customs Department Reports 1960-1964



## VI. PLANNING THE CHEMICAL INDUSTRY IN GAMBIA

For estimates only the foregoing tables relating to imports can be used, as the volume of exports and re-exports relating to the chemical industries is insignificant.

### VI.1. Pharmaceutical products

A rate derived from the statistics (9 per cent per year by value) seems quite normal. A comparison of present per capita consumption in Gambia with that in other West African countries suggest that it would be prudent to take a rate of 7 per cent in future; thus:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	100 <sup>x</sup>	Adjusted 7%	110	150	200	300
Value (\$1000)	324	Adjusted 7%	350	500	700	1,000
(x) Estimated						

There is a prospective market. The pharmaceutical industry might begin as an ordinary processing industry.

### VI.2. Soap

Present annual consumption is 500 tons. Future requirements may be estimated thus:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	500	Adjusted 7%	540	750	1,100	1,500
Value (\$1000)	100	Adjusted 7%	110	150	200	300

The market is expanding and is large enough to justify considering local manufacture.

### VI.3. Surface-acting agents and washing preparations

Present consumption is very small. The rate is, however, rising very fast (66 per cent annually by weight and 64 per cent by value). Taking a more realistic growth rate, the estimates would become:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	46	Adjusted 14%	52	100	200	370
Value (\$1000)	25	Adjusted 14%	29	55	105	200

The market is not large enough to justify considering local manufacture at present.

#### VI.4. Perfume and cosmetics

The demand is growing steadily. Present annual consumption is about \$89,000. Per capita consumption is very high. If the same annual rate (4 per cent) as that for the other countries is applied, an average estimate would be:

	1964	Annual rate	1965	1970	1975	1980
Value (\$1000)	89	Adjusted 4%	92	110	140	170

The market is growing, but the quantities are still very small.

#### VI.5. Pigments, paints, varnishes

The consumption of these products has risen steadily, but it is still quite small (141 tons in 1963).

Estimates of future consumption are:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	140	Adjusted 8%	150	220	330	500
Value (\$1000)	96	Adjusted 8%	100	150	220	330

The turnover is too small to warrant local production.

#### VI.6. Disinfectants and solvents

The quantities imported are negligible: however, the growth rate of imports of insecticides and fungicides by value is relatively high (25 per cent per year).

The estimates for consumption are:

	1963	1965	1970	1975	1980
Quantity (tons <u>including</u>	2	3	20	50	120
DDT (50%)	-	-	2	5	10
BHC (25%)	1	1	5	15	40

This problem is of concern to the sub-region as a whole.

#### VI.7. Explosives

Explosives are little used (16 tons in 1964), chiefly for large construction jobs, as there is no mining in Gambia.

Future requirements should develop as follows:

	1964	1965	1970	1975	1980
Quantity (tons)	16	20	40	80	160

This problem is to be considered in the context of the sub-region as a whole.

#### VI.8. Plastics

Imports are negligible. The projections would be:

	1964	1965	1970	1975	1980
Quantity (tons)	2	4	50	200	500
<u>including</u>					
PVC	-	-	20	70	150
Polyethylene	-	-	10	50	150

This matter will be raised again in connexion with the sub-region as a whole.

#### VI.9. Caustic soda

Future requirements for caustic soda for soap-making may be estimated thus:

	1964	1965	1970	1975	1980
Quantity (tons)	-	-	75	110	150

The problem is of concern to the sub-region as a whole.

#### VI.10. Calcium carbide

Figures for imports of this substance are not given in the customs statistics.

Estimates of future consumption are:

	1964	1965	1970	1975	1980
Quantity (tons)	-	1	5	15	30

The quantity is negligible.

# VI.11. Fertilizer

Imports fluctuated in the reference period. Taking the present situation in Gambia into consideration, projections for the future would be:

	1964	1965	1970	1975	1980
Tons of N	20	40	300	600	1,200
Tons of P <sub>2</sub> O <sub>5</sub>	-	30	300	600	1,200
Tons of K <sub>2</sub> O	-	30	300	600	1,200

This problem arises in the context of the sub-region as a whole.

# VI.12. Salt

The demand for salt can be established as:

	1964	Annual rate	1965	1970	1975	1980
Quantity (tons)	258	Adjusted 11%	290	480	800	1,400
Value (\$1000)	8	Adjusted 11%	9	15	25	40

This question will be taken up in connexion with the sub-region as a whole.

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