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PHOSPHATES MINING IN THE NORTH AFRICAN SUB-REGION

DEVELOPMENT STUDY, 1965-1980

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CHAPTER I

INTRODUCTION

1. The phosphates mining industry of the North African sub-region has great importance even by world standards. Four countries produce these minerals. They are: Morocco, Tunisia, Algeria and the United Arab Republic. Their production is shown in the following table :

Table 1		(in 1,000 long tons)			
Country	1950	1955	1960	1965	
Morocco	3,811	5,245	7,374	9,669	
Tunisia	1,500	2,166	2,063	2,992	
Algeria	666	740	554	85	
United Arab Republic	391	636	557	584	
Total	6,368	8,787	10,548	13,330	
World	22,520	29,600	41,000	64,000	
Share in world production in per cent	28.27	29.68	25.72	20.82	

2. The main part of this production is exported. The largest producers, countries like the United States and the USSR, use most of their production domestically. The role of exports from North Africa is much greater, however, and its share of world trade was 54 per cent in 1960 and 45 per cent in 1965. Production shows an increase of 110 per cent during the 15 year period 1950-1965. The world production during this period increased 185 per cent.

3. It is important to note that the geological reserves and the good quality of this mineral should result in further production increases.

World production and trade

4. Tables 2 and 3 show world production, the shares of the largest producing countries, and export and import quantities.
5. The largest producers are: United States, Morocco, USSR, Tunisia and Nauru Island. The largest exporters are: United States, Morocco, USSR, Tunisia and Nauru Island. The largest importers are: Japan, France, Germany (Federal Republic), Italy, United Kingdom, Australia and Canada. The other European countries also import large quantities of phosphates. North African countries are the natural suppliers of phosphates to all European countries because the transport routes are shortest.
6. Export prices did not show big differences between 1960 and 1965, but there was some tendency to increase in 1964 and 1965.
7. UAR prices decreased after the devaluation of currency in 1962.

Country	1960	1964	1965
Morocco	10.88	11.32	11.44
Tunisia	8.59	7.33	9.56
United Arab Republic	10.54	9.45	9.96

Note: Prices are in US\$. They are taken from Foreign Trade Statistics.

Table 2 : Phosphates (including apatite) : World production and trade

Country	Production 1,000 long tons					Exports (1,000 long tons)		
	1950	1955	1960	1964	1965	1960	1964	1965
World	22,520	29,600	41,000	58,000	64,000			
United States	11,114	12,265	17,516	22,960	26,440	4,250	5,653	6,673
Morocco	3,811	5,245	7,374	9,938	9,669	7,464	9,917	9,397
USSR - Apatite		3,445	4,630	7,870	9,300	119	63	80
USSR - Phosphate	2,500	1,425	2,260	4,920	5,900	1,777	2,942	3,437
Tunisia	1,500	2,166	2,063	2,707	2,992	1,604	2,180	2,225
Nauru Island	1,053	1,401	1,351	1,820	1,457	1,351	1,820	1,457
Brazil - Apatite			200	192	189	---	not available	---
Brazil - Phosphate			666	50	85	---	not available	---
China - Apatite (estimate)			600	800	900	---	not available	---
UAR	391	636	557	604	584	296	323	368
Algeria	666	740	554	71	85	462	--	56
Christmas Island	315	390	503	775	740	503	775	740
Jordan			106	666	854	58	623	755
South Africa			263	570	600	..	11	..
Togo			--	755	958	--	789	800
North Vietnam (estimate)			480	980	980			

Table 3 : Phosphates imports

(in 1,000 long tons)

Country	1960	1964	1965
Japan	2,013	2,279	2,380
France	1,708	2,383	2,734
Germany (Federal Republic)	1,616	2,254	2,481
Italy	1,445	1,684	1,629
United Kingdom	1,430	1,485	1,668
Australia	1,322	1,989	2,517
Canada	841	1,273	1,514
Spain	926	1,084	1,104
Netherlands	720	798	771
New Zealand	608	722	925

CHAPTER II

Tunisia : General situation

8. There are five phosphates mines in Tunisia. These are situated in two parts of the country. Four of them are located near Gafsa in the south and one, Kalaa Djerda, is in the central western part near the Algerian border. They are organized in three companies:

1. La Compagnie des phosphates et du chemin de fer de Gafsa with the mines of Metlaoui Moulares and Redeyef, which exploits the western part of the basin of Gafsa.
2. La Compagnie nouvelle des phosphates du Djebel M'Dilla which owns M'Dilla mine and which exploits the southern part of the same basin.
3. La Société tunisienne d'exploitations phosphatières which exploits the mine of Kalaa Djerda in the basin of the same name.

9. Phosphates from the first two companies are transported by rail road to Sfax, a distance of 250 km. The phosphates of the last one are transported by rail to the port, La Goulette, near Tunis (a distance of 270 km).

10. These companies are subordinate to the Office des Mines and to the Ministry of Trade and Industry.

Geological reserves and research

11. Geological reserves are given in table 4. Geologic exploration is recorded in table 5. Exploration activity during 1960-1965 was limited but it has been increasing and is expected to increase further.

Gross output in quantities and values

12. The quantities and values of the production of phosphates are given in table 6.

13. Exports of phosphates are noted in table 7. No phosphates have been imported.

Table 4 : Geological reserves of phosphates

Deposits	Reserves (in mln. tons)			
	Certain	Probable	Possible	Total
<u>Existing mines</u>				
Metlaoui	9.0	--	4.4	13.4
Moulares	4.5	5.0	7.0	16.5
Recleyof	8.0	4.0	4.0	16.0
M'Dilla	6.8	2.4	14.1	23.3
Kalaa Djerda	1.5	--	--	1.5
Sub-total	29.8	11.4	29.5	70.7
<u>Projects</u>				
Djellabia	35.0	60.0	22.0	117.0
Sector 100	4.0	5.0	9.0	18.0
M'Rata	3.5	7.0	12.5	23.0
Dressants Sud	--	--	20.0	20.0
Kef ed Dour	60.0	20.0	10.0	90.0
Sehib	26.0	49.0	--	75.0
Sra El Ouartane	16.0	60.0	100.0	176.0
Extensions of Kalaa Djerda	--	9.0	--	9.0
Kalaat Es Snam	--	--	30.0	30.0
Sub-total	144.5	210.0	203.5	558.0
TOTAL	174.3	221.4	233.0	628.7

Table 5 : Geological research

<u>Description</u>	<u>Ditches & shafts</u>	<u>Galleries</u>	<u>Borings</u>
<u>1960-1965</u>			
1. Compagnie des phosphates et du chemin de fer Gafsa	1,700	--	1,600
2. Compagnie nouvelle des phosphates du Djebel M'Dilla	400	500	--
<u>1965-1975</u>			
1. Compagnie des Phosphates et du Chemin de Fer Gafsa	1,300	4,180	10,850
2. Compagnie nouvelle de phosphates du Djebel M'Dilla	1,000	1,300	5,815
3. Société tunisienne d'explo- itation phosphatière	150	--	4,700
Total	4,550	5,980	22,965

Table 6 : Production of phosphates in Tunisia

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Table 7 : Exports of phosphates from Tunisia

Mines	Units	1960	1961	1962	1963	1964	1965	1966
Phosphates rock	1,000 tons	1,630	1,627	1,834	1,966	2,215	2,261	.
Phosphates rock	1,000 Tunisian dinars	5,884	5,909	6,571	7,011	8,539	11,357	.
Phosphates ground	1,000 tons	58	64	36	74	111	116	.
Phosphates ground	1,000 Tunisian dinars	442	533	303	604	858	1,137	.
Total	1,000 tons	1,688	1,691	1,870	2,040	2,326	2,377	2,975
Total	1,000 Tunisian dinars	6,326	6,442	6,874	7,615	9,397	12,494	13,951

Source: Foreign Service Dispatches of Tunisia, 1966. Information from the Office des Mines de la Tunisie.

Note: Values are f.o.b. prices. Value of 1 ton of produced phosphate like the production statistics have been, in 1964 2.86 Tunisian dinars. The total value of exported phosphates in 1964 like this price is 6,666,000 Tunisian dinars. This value will be used for net demand counting.

Net demand in 1964 was:

$$D = P - E$$

$$(2,637 - 2,326) \times 1,000 =$$

$$= 311,000 \text{ tons with a value of } (7,538 - 6,666) \times 1,000 \text{ Tunisian}$$

$$\text{dinars} = 872,000 \text{ Tunisian dinars.}$$

Net demand in 1965 based on the same prices was:

$$(3,040 - 2,377) \times 1,000 \text{ tons} = 663,000 \text{ tons with a value of:}$$

$$663,000 \times 2.85 \text{ Tunisian dinars} = 1,890,000 \text{ Tunisian dinars.}$$

Employment

14. Employment for the years 1963-1966 is given in the following table:

Table 8 : Employment : Phosphates of Tunisia

Category	1963	1964	1965	1966
Senior technicians	65	54	59	76
Junior technicians	388	396	380	519
Officials	220	214	254	217
Workers	7,243	8,044	9,165	9,711
Total	7,916	8,708	9,858	10,523

Source: Information from the Office des Mines de la Tunisie.

Input requirements and value added

15. There is some information on these matters in the "Statistiques industrielles I.C.I." of Tunisia. One can obtain salaries and intermediate output from these. The latter is divided into electricity and energy products, explosives, wood and others. It is necessary to use the input coefficients from Morocco to prepare those estimates. Table 9 gives input data prepared in this manner.

Table 9 : Input structure of phosphates industry - 1964 (in 1,000 Tunisian dinars)

		Absolute Value		Input coefficients	
		1	2	3	4
		Total	of which im- ported		2 as % of 1
0	Agriculture, etc.	---	---	---	---
1	Mining and quarrying	---	---	---	---
20	Food manufacturing ind.	---	---	---	---
21	Beverage ind.	---	---	---	---
22	Tobacco ind.	---	---	---	---
23	Textile ind.	---	---	---	---
24	Footwear, wearing apparel	4	---	0.0005	---
25	Wood ind.	18	---	0.0025	---
26	Furniture	---	---	---	---
27	Pulp, paper ind.	4	---	0.0005	---
28	Printing, publishing ind.	---	---	---	---
29	Leather ind.	2	---	0.0002	---
30	Rubber ind.	180	---	0.0238	---
31	Chemical ind.	530	---	0.0703	---
32	Petroleum, coal prod.	602	---	0.0800	---
33	Non-metallic mineral products	20	---	0.0026	---
34	Basic metal ind.	14	---	0.0018	---
35	Metal products	350	---	0.0465	---
36/37	Machinery				
38	Transport equipment	60	---	0.0080	---
39	Miscellaneous ind.	---	---	---	---
4	Construction ind.	---	---	---	---
5	Electricity, gas, water	200	---	0.0266	---
61	Wholesale and retail trade	---	---	---	---
62/63	Banking, insurance, etc.	---	---	---	---
64	Real estate	5	---	0.0006	---
7	Transport, communications	1,100	---	0.1459	---
8/9	All other services	20	---	0.0026	---
Total intermediate inputs		3,109	---	0.4124	---
Salaries and wages		3,712	---	0.4924	---
Rest		717	---	0.0952	---
Total gross output		7,538	---	1.0000	---

16. The main quantities are as follows:

Total gross output :	7,538,000	Tunisian dinars	
Intermediate inputs:	3,109,000	"	"
Salaries and wages :	3,712,000	"	"
Rest	717,000	"	"
<hr/>			
Value added	4,429,000	"	"

Investments

17. Investments in mines, based on information from the "Office des mines de la Tunisie" are as follows:

<u>1962-1964</u>	<u>1965-1966</u>	<u>1967</u>	<u>1968-1969</u>
4,142	3,465	1,720	4,000

Other

18. Production costs are not available because the Ministry of Trade and Industry of Tunisia considers the information of a confidential nature.

Production

19. Estimates of future production will be divided into production forecasts of existing mines, of companies, and of individual projects. Production estimates for 1970 are based on the capacity of existing mines, since no new mine will be ready in operation before then. Information from the "Office des mines de la Tunisie" forecasts production of 3.9 million tons, or an increase of 0.9 million tons when compared with 1965. Existing reserves also allow for a large increase in the future. World production of phosphates increased 56 per cent during the period 1960-1965. One can assume that this trend will continue or will increase because the needs for agricultural production are so great.

20. Information on nine deposits is available. This can be used for tentative production estimates, but detailed studies are needed. Capital availability is assumed. Almost all need further geological exploration and preparation of detailed projects. The percentage of P_2O_5 is 60-75 per cent.

21. The mineral is found in one or two seams of 2-25, or at times 5 metres. The reserves were stated earlier. Table 10 gives capacities, total investments and investments needed for 100,000 tons of yearly capacities (I/C).

Table 10: Phosphates projects

Title	Capacity (in mln. tons)	Investment (in mln. \$)	I/C
Djellabia	1.0	12.0	1.2
Sector 100	0.3	3.0	1.0
Kef Ed Dour	1.0	7.0	0.7
Mrata	1.0	4.0	0.4
Dressants Sud	0.5	8.0	1.6
Schib	2.0	30.0	1.5
Sra El Quartane	1.0	20.0	2.0
Kalaa Djerda	0.35	2.0	0.57
Kalaat Es Snam	0.3	6.0	2.0

22. Creation of new mines on some of these deposits will be proposed. Taking into account the coefficients of investment to capacity and geographical location, it would seem profitable to develop each of three regions. The following table gives details.

Table 11 : Production of phosphates (in million tons)

Mines	1961	1965	1970	1975	1980
<u>Existing mines</u>					
Gafsa	1.45	2.1	2.6	2.8	2.9
Ciphos	0.35	0.54	1.0	1.0	1.1
Stephos	0.20	0.35	0.3	0.4	0.4
Subtotal	2.0	3.0	3.9	4.2	4.4
<u>Projects</u>					
Sector 100	--	--	--	0.3	0.3
Mrata	--	--	--	1.0	1.0
Kalaa Djerda	--	--	--	0.3	0.3
Kef Ed Dour	--	--	--	0.5	1.0
Sra El Ouartane	--	--	--	--	1.0
Sehib	--	--	--	--	2.0
Sub-total	--	--	--	2.1	5.6
Total	2.0	3.0	3.9	6.3	10.0

Table 12 :

Title	Unit	1961-65	1966-70	1971-75	1970-80	1968-80
<u>Middle variant</u>						
Quantities	1,000 tons	11,800	17,250	25,500	38,000	80,750
Values	1,000 Tunisian dinars	31,837	49,335	72,930	108,680	230,945
<u>Low variant</u>						
Quantities	1,000 tons	11,800	17,000	24,500	33,000	74,500
Values	1,000 Tunisian dinars	31,837	48,620	70,070	94,380	213,070
<u>High variant</u>						
Quantities	1,000 tons	11,800	17,500	26,000	43,000	86,500
Values	1,000 Tunisian dinars	31,837	50,050	74,360	122,980	247,390

23. Development of the Djellabia deposit has been postponed because it is very near to Sehib, situated in the south. Sra El Quartane, situated in Central Tunisia has been chosen instead even though its investment coefficient is higher. All these proposals have a very approximate value only.

24. This will be the middle variant. For the low variant the Sra El Quartane and Sehib mines will be postponed. The production in 1980, then, will be 7 million tons. For the high variant one can add the Djillabia mine with 1 million tons and Dressant Sud with 0.5 million tons of production. So the total production in 1980 would be 11.5 million tons.

25. Table 12 gives the quantities and values of production for five year periods. The values are based on 1964 prices (2.86 Tunisian dinars per ton).

Investments

26. Investments estimated in the manner described above are given in Table 13 for three variants. The results are as follows:

Low variant

Investments

1966-1980	49,200,000 Tunisian dinars		
Production value	213,070,000	"	"
Relation	18.87 per cent		

Middle variant

Investments	62,700,000	"	"
Production value	230,950,000	"	"
Relation	27.14 per cent		

High variant

Investments	73,200,000	"	"
Production value	247,400,000	"	"
Relation	29.58 per cent		

Table 13 : Investment: Phosphates Industry in Tunisia

	<u>Low variant</u>						<u>Middle variant</u>						<u>High variant</u>					
	1961- 65	1966-70	1971-75	1976-80	1976-80	1966-80	1971-75	1976-80	1976-80	1966-70	1971-75	1976-80	1966-70	1971-75	1976-80	1966-70	1971-75	1976-80
Mines																		
Existing mines(in 1,000 Tunisian dinars)	5,800	8,000	8,500	9,000	25,500	9,000	9,000	9,000	27,000	9,000	9,000	9,000	27,000	9,000	9,000	27,000	9,000	27,000
Mines in projection in <u>1,000 US\$</u>																		
Sector 100	--	1,000	2,000	--	3,000	1,000	2,000	--	3,000	1,000	2,000	--	3,000	1,000	2,000	--	3,000	3,000
Mrata	--	--	4,000	--	4,000	--	4,000	--	4,000	--	4,000	--	4,000	--	4,000	--	4,000	4,000
Kalaa Djerda	--	--	2,000	--	2,000	--	2,000	--	2,000	--	2,000	--	2,000	--	2,000	--	2,000	2,000
Kef Ed Dour	--	--	5,000	2,000	7,000	--	5,000	2,000	7,000	--	5,000	2,000	7,000	--	5,000	2,000	7,000	7,000
Sra El Quartane	--	--	--	4,000	4,000	--	1,000	19,000	20,000	--	1,000	19,000	20,000	--	1,000	19,000	20,000	20,000
Sehib	--	--	--	8,000	8,000	--	6,000	24,000	30,000	--	6,000	24,000	30,000	--	6,000	24,000	30,000	30,000
Djellabia	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4,000	8,000	12,000	12,000
Dressant Sud	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8,000	8,000	8,000
Beginning of investments of other mines	--	--	--	--	--	--	--	2,000	2,000	--	--	--	2,000	--	--	2,000	2,000	2,000
Sub-total of mines of projection (in 1,000 US\$)	--	1,000	13,000	14,000	28,000	1,000	20,000	47,000	68,000	1,000	24,000	63,000	88,000	1,000	24,000	63,000	88,000	88,000
The same in (1,000 Tunisian dinars)	--	526	6,824	7,350	14,700	526	10,498	24,671	35,695	526	12,598	33,070	46,194	526	12,598	33,070	46,194	46,194
Total in (1,000 Tunisian dinars)	5,800	8,526	15,324	16,350	40,200	9,526	19,498	33,671	62,695	9,526	21,598	42,070	73,194	9,526	21,598	42,070	73,194	73,194

Table 14 : Phosphates industry: middle variant - Production, demand, employment and investments 1960-1980

	Units	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971/ 75	1975	1976/ 80	1980
1. Capacity																
2. Gross output																
a. value	1,000 dinars	4810	5499	5296	7538	8694						11164	72930	18018	108680	28600
b. quantity	1,000 tons	1763	2110	2266	2637	3040	3146					3900	25500	6300	38000	10000
3. Value added	1,000 dinars				4429	5109						6560		10587		16805
4. Exports																
a. value	1,000 dinars				4773	6666	6804									
b. quantity	1,000 tons	1691	1870	2040	2326	2377										
5. Imports																
a. value		--	--	--	--	--	--					--	--	--	--	--
b. quantity		--	--	--	--	--	--					--	--	--	--	--
6. Domestic demand (= 2 + 5 - 4)																
a. value	1,000 dinars				523	872	1890									
b. quantity	1,000 tons				222	311	663									
7. Employment total, of which					7916	8708	9858	10523				11380		18390		29180
Sr. technicians					65	54	59	76				67		110		175
Jr. technicians					388	396	380	519				478		708		1123
Officials					220	214	254	217				255		472		742
Workers					7243	8044	9165	9711				10580		17100		27140
8. Fixed capital formation	1,000 dinars				4142		1806							9526	19500	33671

27. It seems that it will be too difficult to concentrate on large investments in the 1976-1980 year period, as it is in the high variant. Even investments in the middle variant will be difficult for this period. The middle variant, however, is preferable.

Final statement

28. The main data are gathered in Table 14. This is form no. 1 of the terms of reference. One can see from this table that a large increase of production, from 3 million tons in 1965 to 10 million tons in 1980, is proposed. The value of this production will rise from 8.7 million dinars in 1965 to 28.6 million dinars in 1980.

29. Employment will rise from 9,858 persons in 1965 to 29,180 persons in 1980. This increase requires investment estimated at 62.7 million dinars during the period. The largest part of this production will be exported and will bring foreign currency to the country.

6000	6001	6002	6003	6004	6005	6006
6007	6008	6009	6010	6011	6012	6013

~~CONFIDENTIAL~~

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CHAPTER III

AlgeriaGeneral situation

30. There is one mine now in production which will soon be depleted. It is Kouif, and current production is very small now.

31. Development of the Djebel Omk mine, situated near the Tunisian border and 370 km south of the Mediterranean seacoast, is continued. Only this deposit of phosphates is known at the present time. The Djebel Omk deposit consists of a main layer 30 metres thick and free from intrusion of gangue. The estimated reserves are 500 million tons.

Gross output in quantities and values

32. Phosphate production has declined since 1951, when it was 773,000 tons. The Kouif deposit is exhausted and the middle-size M'Zaita mine was closed in 1957. The quantities are given in Table 15.

Table 15 : Production of phosphates in Algeria

1955	1960	1961	1962	1963	1964	1965
751,818	563,047	425,652	389,866	348,141	72,877	89,987

The values of the production were:

1960	-	3,497 million francs
1964	-	1,912,217 Algerian dinars

Source: Rapport annuel sur l'industrie minière en Algérie pour 1965
and Industrie algérienne en 1964.

Exports

33. A large part of production is exported. Quantities and values are given below.

Table 16 : Exports of phosphates from Algeria

Article	Unit	1961	1962	1963	1964
Phosphate rock	tons	368,210	..	232,461	21,282
Phosphate ground	"	10,945	..	5,502	—
Phosphate rock	1000 dinars	15,852	11,494	18,162	862
Phosphate ground	1000 dinars	472	—	299	—

There is no import of phosphates to Algeria.

34. Net demand in 1964 was:

$$D = P - E$$

(72,877 - 21,282) tons = 51,595 tons with a value of 51,595 x 26.2 Algerian dinars = 1,352,000 Algerian dinars. This quantity includes total consumption of 38,770 tons and increase of stocks.

Employment

1961	..	..	..	1,307 workers
1962	..	..	..	1,044 "
1963	..	..	..	985 "
1964	..	..	..	285 "
1965	..	..	..	292 "

35. In 1965, in addition to employment of 292 workers shown in Table 16, there were two senior technicians, 6 junior ones and 8 officials. The total, therefore, was 308. The salaries and social charges for personnel were 1,320,000 Algerian dinars in 1965.

Input requirements and value added

36. As there is no direct information on these matters from Algeria, information on the Moroccan phosphates industry for 1964 is used as the basis for estimation. This is shown in Table 17.

37. The main quantities are as follows:

Total gross output	:	1,912,000	Algerian dinars
Intermediate inputs	:	459,000	" "
Salaries and wages	:	1,302,000	" "
Rest	:	151,000	" "

Investments

38. Exact information on total investment in recent years is not available. It is known to have been concentrated in the Djebel Onk mine, however. This unit will begin production in the near future.

39. A private company, associated with the Algerian government and with capital of 60,000,000 francs (12,000,000 US\$), has been founded and will run the mine. Capacity will be 900,000 tons yearly and it will be opencast mining. The ore in its natural state has 53-61 per cent phosphate of lime. It will be transported by train to Bir El Ater (Department of Annaba) at the seashore where it will be concentrated. The ore will then be crushed, ground, deslimed, calcinated, washed and dried. After this the product will contain about 75 per cent of phosphate. The ore will be exported through the port of Annaba (formerly Bône).

40. This information is taken from the publication of the "Société du Djebel Onk" with its office in Paris.

Other

41. Information on costs from the statistic "Industrie Algérienne en 1964" could not be used because the phosphates industry is included there with other units.

Table 17 : Input structure of Phosphates industry - 1964 (in 1,000 Algerian dinars)

		Absolute values		Input coefficients	
		1	2	3	4
		Total	of which im- ported		2 as % of 1
0	Agriculture, etc.	—	—	—	—
1	Mining and quarrying	—	—	—	—
20	Food manufacturing industries	—	—	—	—
21	Beverages industries	—	—	—	—
22	Tobacco industries	—	—	—	—
23	Textile industries	—	—	—	—
24	Footwear, wearing apparel	—	—	0.0003	—
25	Wood industries	2	—	0.0010	—
26	Furniture	—	—	—	—
27	Pulp, paper industries	—	—	0.0003	—
28	Printing publishing industries	—	—	—	—
29	Leather industries	—	—	0.0001	—
30	Rubber industries	24	—	0.0126	—
31	Chemical industries	8	—	0.0041	—
32	Petroleum, coal products	105	—	0.0548	—
33	Non-metallic mineral products	3	—	0.0016	—
34	Basic metal industries	2	—	0.0010	—
35	Metal products)	53	—	0.0276	—
36/37	Machinery)	—	—	—	—
38	Transport equipment	9	—	0.0045	—
39	Miscellaneous industries	—	—	—	—
4	Construction industries	—	—	—	—
5	Electricity, gas, water	32	—	0.0169	—
61	Wholesale and retail trade	—	—	—	—
62/63	Banking, insurance, etc.	—	—	—	—
64	Real estate	1	—	0.0005	—
7	Transport, communications	216	—	0.1128	—
8/9	All other services	4	—	0.0019	—
	Total intermediate inputs	459	—	0.2400	—
	Salaries and wages	1302	—	0.6809	—
	Rest	151	—	0.0791	—
	Total gross output	1912	—	1.0000	—

Projections for the futureProduction

42. Estimates of future production can only be based on the Djebel Ork deposit. The erection of this mine is in the final stages. No detailed information is available, but to remain conservative it is estimated that 25 per cent of its capacity will be reached in 1970 and that full capacity will be reached in 1975. However, a much larger annual production than 0.9 million tons can be secured from a deposit of 500 million tons. It is proposed, therefore, that this mine be enlarged to the capacity of at least 2 million tons yearly by 1980. The additional investments should be much smaller than for the first stage. Investment need not be higher than for Tunisian mines, that is about US\$20 million for the additional 1 million tons annual capacity. Estimated production will be:

1965	..	..	..	90,000 tons
1970	..	..	..	200,000 "
1975	..	..	..	900,000 "
1980	..	..	..	2,000,000 "

43. Production may be 20 per cent more or 20 per cent less, but the goal of enlarging the Djebel Ork mine should remain. This deposit can produce in the future much more than 2 million tons yearly. Even the production of 5-10 million tons yearly is possible.

44. The quantities and values of production for three variants are given in the table below. 1964 prices are taken for purposes of valuation (i.e. 23.07 Algerian dinars per ton).

Table 18 : Quantities and values of phosphates production in Algeria

Variant	Unit	1961/65	1966/70	1971/75	1976/80	1986/80
Low	1000 tons	1,890	600	2,200	5,200	8,000
Low	1000 dinars	..	13,842	50,754	119,964	184,560
Middle	1000 tons	1,890	650	2,750	6,500	9,900
Middle	1000 tons	..	14,995	63,442	149,955	228,392
High	1000 tons	1,890	700	3,300	7,800	11,800
High	1000 dinars	..	16,149	76,131	179,946	272,226

Investments

45. Estimates for investment are the following:

Table 19

Variant	(in 1,000 Algerian dinars)				
	1961-65	1966-70	1971-75	1976-80	1966-80
Low	100,000	100,000	50,000	50,000	200,000
Middle	100,000	100,000	60,000	60,000	220,000
High	100,000	100,000	70,000	70,000	240,000

46. The results of these three variants are the following:

Low variant

Investments 1966-1980	..	200.0 million Algerian dinars
Production value 1966-1980	..	184.5 million Algerian dinars
Relation	..	108.4 per cent

Middle variant

Investments 1966-1980	..	220.0 million Algerian dinars
Production value 1966-1980	..	228.4 million Algerian dinars
Relation	..	96.3 per cent

High variant

Investments 1966-1980	..	240.0 million Algerian dinars
Production value 1966-1980	..	272.2 million Algerian dinars
Relation	..	88.2 per cent

47. These relations are very high. They may be explained by the fact that all production is from a new mine whose capacity is reached in the last years of the five year period. The investment costs of this mine are

Investment

Investments 1966-1980	..	240.0 million Algerian dinars
Production value 1966-1980	..	272.2 million Algerian dinars
Relation	..	88.2 per cent

Middle variant

high but the production costs in such natural conditions (huge layer taken in overcast mining) may be very low. A detailed viability study is, of course, necessary.

Final statement

48. The main data are gathered in Table 20, which is form 1 of the terms of reference.

49. The employment estimate is similar to Tunisia's, that is 292 persons for 100,000 tons of yearly production.

50. The structure is also taken from there. The structure of employment in Algeria in 1964 and 1965 was abnormal. Many more technicians will be necessary in a highly mechanized opencast mine. Also the number of officials is too small.

51. It is proposed to raise the production to 2 million tons yearly with preparation for a further increase later in the new Djebel Onk mine.

52. Investment needs are estimated at 220 million Algerian dinars during the period 1966-1980.

53. A larger increase in production has to be considered.

Table 20 : Phosphates industry: Middle variant - Production, demand, employment and investments 1960-1980

	Units	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971/ 75	1975	1976/ 80	1980
1. Capacity																
2. Gross output	Fr mln	2497										4614		20763		46140
a. value	1000 dinars					1912						200		900		2000
b. quantity	1000 tons	563	426	390	348	73	90					3507		15780		35066
3. Value added	1000 dinars					1453										
4. Exports	1000 dinars					484										
a. value	1000 tons	471	379	405	238	21	57									
b. quantity																
5. Imports	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
a. value	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
b. quantity	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6. Domestic demand (= 2 + 5 - 4)						1428										
a. value	1000					52										
b. quantity	1000 tons	92	47	-15	110	52	33									
7. Employment, total, of which	persons					301	308					584		2630		5840
Senior technicians	"					2	2					4		16		35
Junior technicians	"					6	6					25		110		245
Officials	"					8	8					12		64		140
Workers	"					285	292					543		2440		5420
8. Fixed capital formation						100,000	100,000					100,000		60,000		60,000

CHAPTER IV

United Arab Republic

General situation

54. Phosphates in the United Arab Republic are mined in two regions:

1. Red Sea District near the ports of Koser and Safaya.
2. Nile Valley area at Sibaiya near Luxor.

The phosphates in the second of these lie 500 metres below the surface. The product, after washing and calcination, contains about 64 per cent phosphate. As the distance from the ports is only 20-25 km; it is exported. The phosphates deposit in the Nile Valley is shallow and is extracted mainly as open cast. It is sent to the fertilizer factory without washing. The production of these two regions is almost equal.

55. Geological reserves of phosphates are estimated at 200 million tons. No further details on these reserves are available.

Gross output in quantities and values

56. The quantities of production are as follows (in 1,000 tons):

<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>
570	627	562	612	613	594

(Source: Statistical Handbook UAR, 1952-1965).

57. The quantities and values obtained from the Industrial Organization by accounting years beginning 1 July are as follows:

	<u>1960-61</u>	<u>1964-65</u>	<u>1965-66</u>
Quantities in 1000 tons	382	514	623
Values in 1000 Egyptian £	1,582	1,714	2,146
Values of 1 ton in Egyptian £	4.14	3.33	3.44

58. The information on the costs of the production, from the same source, states that these are US\$9.5-11, that is £E4.13-4.78. We shall take £E4.50 for the value accounting for the years 1963-65. So the values will be:

1963	..	..	£E2,754
1964	..	..	£E2,758
1965	..	..	£E2,673

Exports

59. The quantities and values of exports are given below:

Table 22 : Exports of phosphates from UAR

	1961	1962	1963	1964	1965	1966
Quantities in tons	421,109	180,082	420,192	327,737	373,496	370,575
Values in £E	1,547,695	843,148	1,743,642	1,311,108	1,513,684	1,604,983

Net demand

$$D = P - E$$

D = Net demand

P = Production

E = Export

Import is nought.

$$D_{63} = 612 - 420 = 192 \text{ thousand tons and} \\ 192 \times 4.5 = 864 \text{ thousand } \text{£E}$$

$$D_{64} = 613 - 328 = 285 \text{ thousand tons and} \\ 285 \times 4.5 = 1,282 \text{ thousand } \text{£E}$$

$$D_{65} = 594 - 373 = 221 \text{ thousand tons and} \\ 221 \times 4.5 = 994 \text{ thousand } \text{£E}$$

These quantities include local consumption and stock changes.

Employment

60. The number of workers and their wages are known from the information of the Industrial Organization. One estimates that the number of technicians and administrative personnel is 10 per cent of the number of workers and that the salary per person is three times as high as the salary of a worker. So, the number of employees and their salaries are as follows:

Table 22 :

Year	Workers		Technicians (officials)			Total
	No.	Wages	No.	Salaries	No.	Salaries & Wages
1960/61	4,388	751,000	440	225,000	4,828	976,000
1964/65	6,826	1,481,000	683	444,000	7,509	1,925,000
1965/66	7,763	1,503,000	777	451,000	8,540	1,954,000

Input requirements and value added

61. As there is no direct information on these matters from UAR, information on the Moroccan phosphates industry of 1964 will be used in estimates. Table 23 gives data for 1964, derived in this manner. The main quantities are as follows:

Total gross output	E£ 2,758,000
Intermediate inputs	E£ 662,000
Salaries and wages	E£ 1,925,000
Rest	E£ 171,000

Investments and other

62. No information on investment in the phosphates industry is available. The costs of production are given as US\$9.5-11 per ton, that is E£4.13-4.78 per ton.

Projections for the future

Production

63. The large geological reserves, 200 million tons, warrant the investment required to increase production. Information on new projects is shown in Table 24. The last three projects are in Red Sea District.

I are investments in US\$1,000 for 100,000 tons of yearly capacity.

C

Table 23 : Input structure of phosphates industry - 1964 (in 1000 E£)

		Absolute values		Input Coefficients	
		1 Total	2 of which imported	3	4 2 as % of 1
0	Agriculture, etc.	---	---	---	---
1	Mining and quarrying	---	---	---	---
20	Food manufacturing industries	---	---	---	---
21	Beverage industries	---	---	---	---
22	Tobacco industries	---	---	---	---
23	Textile industries	---	---	---	---
24	Footwear, wearing apparel	1	---	0.0003	---
25	Wood industries	2	---	0.0010	---
26	Furniture	---	---	---	---
27	Pulp, paper industries	1	---	0.0003	---
28	Printing, publishing industries	---	---	---	---
29	Leather industries	---	---	0.0001	---
30	Rubber industries	35	---	0.0126	---
31	Chemical industries	11	---	0.0041	---
32	Petroleum, coal products	152	---	0.0548	---
33	Non-metallic mineral products	4	---	0.0016	---
34	Basic metal industries	8	---	0.0010	---
35	Metal products)	---	---	---	---
36/37	Machinery)	76	---	0.0276	---
38	Transport equipment	12	---	0.0045	---
39	Miscellaneous industries	---	---	---	---
4	Construction industries	---	---	---	---
5	Electricity, gas, water	48	---	0.0169	---
61	Wholesale and retail trade	---	---	---	---
62/63	Banking, insurance, etc.	---	---	---	---
64	Real estate	1	---	0.0005	---
7	Transport, communications	312	---	0.1128	---
8/9	All other services	5	---	0.0019	---
Total intermediate inputs		662	---	0.2400	---
Salaries and wages		1,925	---	0.6979	---
Rest		171	---	0.0621	---
Total gross output		2,758	---	1.0000	---

Table 24

	Capacity in 1,000 yearly tons	Investments in £E 1,000	Investments in US\$ 1,000	$\frac{I}{C}$
Wadi Nile	1,000	766	1,762	176
Kesseir	800	5,816	13,377	1,672
Hamrawein	600	4,227	9,722	1,620
Saphaga	600	4,187	9,630	1,605
Total	3,000	14,996	34,491	1,150

64. The Wadi Nile projects have very good investment coefficients. If evaluation is correct, this project should be undertaken first. The other three projects have very similar coefficients. They are also similar to Tunisian projects of the second range and can be considered as suitable for implementation.

65. Given these considerations, production increase is proposed. Production up to 1970 cannot be increased importantly because there is not enough time for erection of a new mine.

66. The Wadi Nile mine will be erected first with a production of 750,000 tons in 1975. One of the three other projects with a capacity of 600,000 tons in 1980 will be the second one. The production will be as follows:

Table 25

Mine	(in 1000 tons)			
	1965	1970	1975	1980
Existing mines	594	600	650	700
Wadi Nile	--	--	750	1,000
Saphaga or Hamrawein	--	--	--	600
Total	594	600	1,400	2,300

67. This is the middle variant. By the low variant, productions of the new mines would be 20-30 per cent lower. By the high variant a third mine will be erected with 50 per cent of its final capacity available in 1980.

68. Table 28 gives the quantities and values of production for five year periods. The values are based on 1964 prices (£E4.50 per 1 ton).

Table 26 : Low variant

Mine	1965	1970	1975	1980
Existing mines	594	600	600	600
Wadi Nile	---	---	500	900
Saphaga or Hamrawein	---	---	---	300
Total	594	600	1,100	1,800

Table 27 : High variant

Mine	1965	1970	1975	1980
Existing mines	594	600	700	800
Wadi Nile	---	---	750	1,000
Saphaga	---	---	---	600
Hamrawein	---	---	---	300
Total	594	600	1,450	2,700

Table 28

Title	Unit	1961-65	1966-70	1971-75	1976-80	1966-80
<u>Middle variant</u>						
Quantities	1,000 tons	3,008	3,000	5,000	9,250	17,250
Values	£E 1,000	13,536	13,500	22,500	41,625	77,625
<u>Low variant</u>						
Quantities	1,000 tons	3,008	3,000	4,250	7,250	14,500
Values	£E 1,000	13,536	13,500	19,125	32,625	65,250
<u>High variant</u>						
Quantities	1,000 tons	3,008	3,000	5,100	10,400	18,500
Values	£E 1,000	13,536	13,500	22,950	46,800	83,250

Investments

69. Investment estimates for existing mines and for new projects are given in Table 29 for three variants. The results are as follows:

Low variant

Investments 1966-80	£E 9,920,000
Production value	£E65,250,000
Relation	15.20 per cent

Middle variant

Investments 1966-80	£E12,720,000
Production value	£E77,625,000
Relation	16.39 per cent

High variant

Investments 1966-80	£E15,170,000
Production value	£E83,250,000
Relation	18.22 per cent

The relation of the investments to the production values are favourable.

Final statement

70. The main data are gathered in Table 30 which is form 1 of the terms of reference. One can see from this table that an increase of production, from 0.6 million tons in 1965 to 2.3 million tons in 1980, is proposed. The value of this production will rise from £E2.0 million in 1965 to £E7.8 million in 1980.

71. Employment will rise from 8,540 persons in 1965 to 13,530 in 1980. The employment in new mines is based on experience with Tunisian mines. The necessary investment is estimated to be £E12.7 million. The main part of the production will be exported.

Table 29 : Investments : Phosphates Industry in UAR (in£ 1,000)

Mines	Low variant				Middle variant				High variant			
	1966/70	1971/75	1976/80	1966/80	1966/70	1971/75	1976/80	1966/80	1966/70	1971/75	1976/80	1966/80
Existing mines	1,300	1,300	1,300	3,900	1,300	1,350	1,400	4,050	1,300	1,400	1,500	4,200
Wadi Nile	--	--	770	770	270	500	--	770	--	270	500	770
I Red Sea District Mine	--	--	3,000	3,000	--	1,500	2,700	4,200	--	1,500	2,700	4,200
II Red Sea District Mine	--	--	--	--	--	--	1,000	1,000	--	--	3,000	3,000
Regearches	500	750	1,000	2,250	600	900	1,200	2,700	700	1,000	1,300	3,000
Total	1,800	2,050	6,070	9,920	2,170	4,250	6,300	12,720	2,000	4,170	9,000	15,170

[illegible]

CHAPTER V

Morocco

General situation

72. Morocco is one of the largest producers and exporters of phosphates in the world. It produces about 10 million tons of phosphates yearly, (16 per cent of the world production in 1965). Almost all production is exported. The value of such exports, 578 million dirhams in 1965, represented a quarter of all exports from the country.

73. Production is concentrated in the mining centres of Khouribga and Youssoufia. Khouribga is situated on a high plateau 125 km. southeast of Casablanca and is connected with this port by railroad. The centre was set up in 1921. Its capacity is now about 40,000 tons of raw rock daily. This is transformed into 25,000 tons of marketable phosphate at a grade of 75 per cent of tricalcic phosphate and 3,000 tons at the grade of 72 per cent. It is equal to 8.5 million tons of phosphates yearly. A special grade of phosphates, called "podzolized phosphate" is treated in a washing plant with 1 million tons annual capacity. The product contains 81 per cent tricalcium phosphate.

74. The Youssoufia centre, opened for production in 1931, is situated 70km east of the port of Safi. Its capacity is $2\frac{1}{2}$ million tons a year. The product contains 70 per cent of phosphate. About half a million tons of this is processed by the chemical plant at Safi. The rest is exported.

Geological situation

75. The phosphate deposits of Morocco extend over vast areas north and south of the Middle Atlas. The deposits around Khouribga and Youssoufia are so rich, exploration for new ones is currently unnecessary. The Khouribga deposit alone exceeds one thousand million tons.

76. This sedimentary type deposit was formed in the Eocene era. It is made up mainly of 4 continuous phosphate bearing layers, separated by interpolations of marble, limestone or silica. It now operates at layer no. 1, some 40 metres below the surface. It is 1.3 - 2.2 metres thick and contains about 75 per cent of phosphate after drying in sand form. Some parts are only 15 metres under the surface.

77. The Yousseoufia deposit has similar natural conditions, but it is smaller.

Production methods

78. Phosphate is extracted mainly by underground operations. The layer is reached by incline and horizontal galleries. Phosphate is extracted by the so-called pillow system. It is cut with compressed-air drift-hammers, stripped and loaded by shovel on to conveyor belts. Through successive conveyors, the phosphate reaches the loading station where it is checked and shipped for treatment.

79. Strip mining is applied in parts where the burden is less than 15 metres. Here vertical holes are drilled and explosives are used to blast the over-burden. It is stripped by large draglines. The ore is removed by similar but smaller draglines and sent through belt conveyors and by railway cars for processing.

80. In Khouribga, there is a central treating plant where the ore is screened and dried. Then, it is stored or sent directly by railway to Casablanca, the largest phosphate port in the world. Part of the phosphate is calcined at 930°C so as to break down calcium carbonate and organic matter.

81. There is also another plant with a capacity of 1 million tons yearly for a special kind of phosphate where one gets a product with 80/82 per cent of phosphate. The processing in Yousseoufia is similar but on a smaller scale.

Table 31

Title	Unit	1960	1961	1962	1963	1964	1965	1966
Quantities	1,000 tons	7,472	7,950	8,162	8,548	10,097	9,824	9,425
Values	1,000 dirhams	408,800	432,800	431,600	463,200	564,900	580,400	
Value of 1 ton	dirhams	54.68	54.44	52.89	54.17	55.94	59.08	
Value of 1 ton	US\$	10.80	10.76	10.45	10.70	11.05	11.67	

Source: Yearly statistics of Morocco.

Table 32 : Exports of phosphates from Morocco

Title	Unit	1960	1961	1962	1963	1964	1965
Quantities	1,000 tons	7,853	7,662	8,128	8,521	10,076	9,548
Values	1,000 dirhams	433.3	410.5	435.5	460.5	577.8	552.9
Value of 1 ton	dirhams	55.14	53.59	53.58	54.04	57.34	57.91
Value of 1 ton	US\$	10.89	10.59	10.59	10.68	11.33	11.44

Source: Official statistics of foreign trade of Morocco.

Gross output in quantities and values

82. The quantities of production and their values are as indicated in Table 31. Production in 1967 was 10,200,000 tons, as reported by the "Office cherifien des phosphates".

Exports

83. The quantities and values of exports are as indicated in Table 32.

Net demand

$$D = P - E$$

Import is nought.

$$D_{63} = 8,548 - 8,521 = 27,000 \text{ tons and} \\ 27 \times 54.17 = 1,463,000 \text{ dirhams.}$$

$$D_{64} = 10,097 - 10,076 = 21 \text{ thousand tons and} \\ 21 \times 55.94 = 1,175,000 \text{ dirhams.}$$

$$D_{65} = 9,824 - 9,548 = 276 \text{ thousand tons and} \\ 276 \times 59.08 = 16,306,000 \text{ dirhams.}$$

These quantities include local consumption and stock changes.

Employment

84. Employment in 1964 was 12,785 persons and salaries totalled 107,450,000 dirhams. The division of this employment into groups is not known. The above statements are quoted from the industrial enquiry for 1964.

Input requirements and value added

85. An enquiry was prepared on this matter in Morocco in 1964.

Information from this enquiry is shown in Table 32.

The main quantities are:

		<u>%</u>
Total gross output	564,890,000 dirhams	100.00
Intermediate inputs	135,600,000 "	24.00
Salaries & wages	149,790,000 "	26.52
Rest	279,500,000 "	49.48
Value added	429,290,000 "	76.00

Table 33 : Input structure of the phosphates industry 1964
(in 10,000 dirhams)

		Absolute values		Input coefficients	
		1	2	3	4
		Total	of which imported		2 as % of 1
0	Agriculture, etc.	—			
1	Mining and quarrying	—			
20	Food manufacturing ind.	—			
21	Beverage ind.	—			
22	Tobacco ind.	—			
23	Textile ind.	—			
24	Footwear, wearing apparel	16		0.0003	
25	Wood ind.	60		0.0010	
26	Furniture				
27	Pulp, paper ind.	20		0.0003	
28	Printing, publishing ind.				
29	Leather ind.	3		0.0001	
30	Rubber ind.	714		0.0126	
31	Chemical ind.	234		0.0041	
32	Petroleum, coal products	3,092		0.0548	
33	Non-metallic mineral products	90		0.0016	
34	Basic metal industries	57		0.0010	
35	Metal products }	1,561		0.0276	
36/37	Machinery }				
38	Transport equipment	256		0.0045	
39	Miscellaneous industries				
4	Construction ind.				
5	Electricity, gas, water	955		0.0169	
61	Wholesale and retail trade				
62/63	Banking, insurance, etc.				
64	Real estate	26		0.0005	
7	Transport, communications	6,366		0.1128	
8/9	All other services	110		0.0019	
	Total intermediate inputs	13,560		0.2400	
	Salaries and wages	14,979		0.2652	
	Rest	27,950		0.4948	
	Total gross output	56,489		1.0000	

Investments

86. Only this information is available:

1963	140,000,000 dirhams
1964	98,760,000 "

Investments in 1964 can be divided into:

Construction	31,190,000 dirhams
Machinery, materials	5,980,000 "
Vehicles	1,650,000 "
Other	57,940,000 "

The information on 1963 is from the Ministry of Industry and the information on 1964 is from the industrial enquiry.

Projections for the future

Production

87. The production forecast in the "Three Year Plan 1965-1967" for 1967 was 13 million tons. Actual production in this year was 10.2 million tons. One supposes now that the target of the "Three Year Plan" will be reached in 1970 and that the production will rise subsequently at the rate of 5 million tons during each five years. So, production in 1975 will be 18 million tons and in 1980, 23 million tons. The existing reserves and the demand permit such increases. This will be the middle variant. The production in the low variant will be 2 million tons less and in the high variant 2 million tons more in each year.

88. The Office Cherifien des Phosphates does not give any information on projects and needed investment. Therefore, the estimates can only be very rough. The quantities and values of the production are given in Table 34. The values are based on the prices in 1964 (55.94 dirhams).

Investments

89. Investment costs will be estimated using the indices from the Tunisian phosphates industry. In dirhams they will be:

	(yearly capacities)
Maintaining index	3 million dirhams/1 million tons
New mine index	70 million dirhams/1 million tons

90. The investment estimates are given in Table 35. The general results are as follows:

Low variant

Investments 1966-80	1,545,000,000 dirhams
Production value	12,173,942,000 "
Relation	12.70 per cent

Middle variant

Investments 1966-80	1,755,000,000 "
Production value	13,424,232,000 "
Relation	13.07 per cent

High variant

Investments 1966-80	1,965,000,000 "
Production value	14,747,182,000 "
Relation	13.32 per cent

All these relations are very profitable.

Table 34 : Quantities and values of production of phosphates in Morocco

Title	Unit	1961-65	1966-70	1971-75	1976-80	1966-80
<u>Middle variant</u>						
Quantities	1,000 tons	44,581	55,625	80,000	105,000	240,625
Values	1,000 dirhams	2,472,900	3,111,662	4,475,200	5,837,370	13,424,232
<u>Low variant</u>						
Quantities	1,000 tons	44,581	52,625	70,000	95,000	217,625
Values	1,000 dirhams	2,472,900	2,943,842	3,915,800	5,314,300	12,173,942
<u>High variant</u>						
Quantities	1,000 tons	44,581	58,625	90,000	115,000	263,625
Values	1,000 dirhams	2,472,900	3,279,482	5,034,600	6,433,100	14,747,182

Table 35 : Investment estimations for phosphates industry in Morocco (in million dirhams)

	1966-70	1971-75	1976-80	1966-80
<u>Middle variant</u>				
Maintaining	167	240	315	722
New capacities	333	350	350	1,033
Total	500	590	665	1,755
<u>Low variant</u>				
Maintaining	157	210	285	652
New capacities	193	350	350	893
Total	350	560	635	1,545
<u>High variant</u>				
Maintaining	177	270	345	792
New capacities	473	350	350	1,173
Total	650	620	695	1,965

Table 36 : Phosphates industry: Production, demand, employment and investments 1960-1980, Morocco

Units	1960	1961	1962	1963	1964	1965
Gross output						
a. value	1000 dirhams 408,500	432,800	431,600	463,200	564,900	580,400
b. quantity	1000 tons 7,472	7,950	8,162	8,548	10,097	9,824
Value added	1000 dirhams				429,000	440,755
Exports						
a. value	1000 dirhams			461,737	563,725	564,094
b. quantity	1000 tons 7,853	7,662	8,128	8,521	10,076	9,548
Imports						
a. value	--	--	--	--	--	--
b. quantity	--	--	--	--	--	--
Domestic demand (= 2 + 5 - 4)						
a. value				1,463	1,175	16,306
b. quantity	1000 dirhams	288	34	27	21	276
Employment, total, of which	1000 tons -381				12,785	12,600 ^{a/}
Fixed capital formation	1000 dirhams			140,000	99,760	100,000 ^{a/}

^{a/} Estimations.

Table 36 (continued)

Units	1966	1967	1968	1969	1970	1971/75	1975	1976/80	1980
Gross output									
a. value					727,220 ^{b/}		1,000,692 ^{b/}		1,286,620 ^{b/}
b. quantity		9,425	10,200		13,000		18,000		23,000
Value added					552,250		759,925		977,059
Exports									
a. value									
b. quantity									
Imports									
a. value									
b. quantity									
Domestic demand (= 2 + 5 - 4)									
a. value									
b. quantity									
Employment, total, of which					15,000		18,700		21,500
Fixed capital formation				500,000 ^{a/}			590,000	665,000	

^{b/} At prices of 1964.

Final statement

91. The main data are gathered in Table 36, which is form 1 of the terms of reference.

92. One can see from this table that production will rise from 10.2 million tons in 1965 to 23 million in 1980. Employment will rise from 12,600 in 1965 to 21,500 persons in 1980. Investment requirements are estimated at 1,755 million dirhams.

93. The quantities of the net demand are given in the chemical report (now under preparation). The rest will be exported. One must stress once more that because no information on reserves and projects was available, the estimations of investments are very rough.

CHAPTER VI

Summary

94. All of the information and projections are gathered in tables 37-43, covering the whole North African region. Tables 37-42 are detail and Table 43 gives the summary. It is Table 1 of the terms of reference.
95. One can see from the latter that proposed production will rise from 9 million tons in 1961 and 13.5 million tons in 1965, to 37.3 million tons in 1980.
96. The main part of it will be exported immediately or after refining by the chemical industry. The division of production into export and home use will be prepared when the chemical study is ready. The value of production based on 1964 prices will rise from US\$106 million in 1961 to US\$341.9 million in 1980. The investments are very roughly estimated at US\$540 million, for 1966 to 1980. It is unfortunate that because no information was available on investment and projects from the main producer country (Morocco), this part of estimation especially is not very sure. Employment will rise from 29.3 thousand in 1964 to 70 thousand in 1980.
97. Tables 44-47 give the distribution of output for each country in 1964. Table 48 gives the export distribution required in the countries. It is the supply/demand balance and trade matrix of the terms of reference.
98. These quantities represent the middle variant, or the most probable development forecast. Data for low and high variants for each country are also given.
99. It is appropriate to stress at the end of this study, that the forecasts for mining depend on imperfectly known conditions and may therefore, be in error. Too, a lot of other necessary information was

not available for the study. There is one consoling element, however. The demand for phosphates is steadily rising and one can be almost sure that all production can be sold at profitable prices. The protection of the States, especially by erection of new mines and education of engineers and technicians will be necessary of course.

Table 37 : Gross output of phosphates

Countries	In 1,000 tons					Values in US\$ 1,000						
	1961	1964	1965	1970	1975	1980	1961	1964	1965	1970	1975	1980
Morocco	7950	10097	9824	13000	18000	23000	85521	111624	114687	143699	197737	254236
Algeria	426	73	90	200	900	2000	2261	387	477	935	4206	9348
Tunisia	1999	2637	3040	3900	6300	10000	11453	14360	16562	21267	34324	54483
Maghreb	8376	12807		17100	25200	35000	99535	126371	131726	165901	236267	318067
UAR	627	613	594	600	1400	2300	6489	6343	6148	6210	14490	23805
Total	9003	13420	13548	17700	26600	37300	106024	132714	137874	172111	250757	341872

Table 38 : Value added (in US\$ 1,000)

Countries	1964	1965	1970	1975	1980
Morocco	84,770	87,093	109,125	150,161	193,067
Algeria	294	362	711	3,197	7,104
Tunisia	8,437	9,733	12,497	20,168	32,014
Maghreb	93,501	97,188	122,333	173,526	232,185
UAR	4,821	4,671	4,720	11,012	18,092
Total	98,322	101,859	127,053	184,538	250,277

Table 39 : Export values at domestic prices (in US\$ 1000)

Countries	1964	1965
Morocco	111,392	111,465
Algeria	98	266
Tunisia	12,699	12,962
Maghreb	124,189	124,693
UAR	3,395	3,862
TOTAL	127,584	128,555

Table 40 : Domestic demand (in US\$ 1000)

Countries	1964	1965
Morocco	232	3,222
Algeria	289	211
Tunisia	1,661	3,600
Maghreb	2,182	7,033
UAR	2,948	2,286
TOTAL	5,130	9,319

Table 41 : Employment (in persons)

Countries	1964	1965	1970	1975	1980
Morocco	12,785	12,600	15,000	18,700	21,500
Algeria	301	308	584	2,630	5,840
Tunisia	8,708	9,858	11,380	18,390	29,180
Maghreb	21,794	22,766	26,964	39,720	56,520
UAR	7,509	8,540	8,470	10,840	13,530
TOTAL	29,303	31,306	35,434	50,560	70,050

Table 42 : Fixed capital formation (in US\$ 1,000)

Countries	1961-65	1966-70	1971-75	1976-80	1966-80
Morocco	100,000	98,800	116,584	131,404	346,788
Algeria	20,260	20,260	12,156	12,156	44,572
Tunisia	11,331	18,147	37,147	64,143	119,437
Maghreb	131,591	137,207	165,887	207,703	510,797
U.A.R.	n.a.	4,839	9,775	14,490	29,104
Total		142,046	175,662	222,193	539,901

Table 43 : Phosphates industry: Production, demand, employment and investments 1960-1980

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971-1975	1976-1980
Capacity													
Gross output													
a. value					132714	137874					172111	250757	341872
b. quantity					13420	13548					17700	26600	37300
Value added					98322	101859					127053	184538	250277
Exports													
a. value					127584	128555							
b. quantity					12751	12355							
Imports													
a. value					--	--					--	--	--
b. quantity					--	--					--	--	--
Domestic demand													
(= 2 + 5 - 4)													
a. value					5130	9319							
b. quantity													
Employment, total, of which					29303	31306					35434/	50560	70050
Fixed capital formation					131591 ^{a/}				142046		175662		222193

^{a/} Without U.A.R.

Table 44 : Tunisia : Distribution of gross output of phosphates industry - 1964 (value in 1000 dinars)

Final destination, total	7,538
Consumption : a. private)	
b. public)	872
Fixed capital formation	--
Changes in stocks (+ or -)	--
Exports	6,666
Total gross output	7,538
No imports	

Table 45 : Algeria : Distribution of gross output of phosphates industry - 1964 (value in 1,000 dinars)

(value in 1,000 dinars)

Final destination, total	1,912
Consumption : a. private)	
b. public)	1,428
Fixed capital formation	--
Changes in stocks (+ or -)	--
Exports	484
Total gross output	1,912
No imports	

Table 46 : UAR : Distribution of gross output of phosphates industry
1964 (value in £E1,000)

<u>Final destination, total</u>	1,948
Consumption : a. private)	
b. public)	472
Fixed capital formation	--
Changes in stocks (+ or -)	--
Exports	1,476
<u>Intermediate destination, total</u>	810
Ind. 31 Chemical industries	810 (180,000 tons)
Total gross output	2,758

No imports

Table 47 : Morocco : Distribution of gross output of phosphates industry
1964 (value in 1,000 dirhams)

<u>Final destination, total</u>	564,900
Consumption : a. private)	
b. public)	1,175
Fixed capital formation	--
Changes in stocks (+ or --)	--
Exports	563,725
<u>Intermediate destination, total</u>	--
Total gross output	564,900

No imports

Table 48 : Supply/demand balance and trade matrix : North Africa^{a/} (in US\$ 1,000)

Importing country	France	Italy	W. Germany	Netherlands	Belgium/Lux	USA	Total exports
Morocco	19,335	3,347	9,269	6,621	10,443	85	114,157
Algeria			no information available				175
Tunisia	4,474	3,555	1,302	621	--	--	
Maghreb	23,809	6,902	10,571	7,242	10,443	85	130,599
UAR	--	--	--	--	--	--	3,084
Total	23,809	6,902	10,571	7,242	10,443	85	133,683

^{a/} By foreign trade prices.