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Second International Fertilizer Symposium

Kiev, USSR, 21 September - 1 October 1971
New Delhi, India, 2 - 13 October 1971

Agenda item XI/6

SUMMARY

PRESENT STATUS AND FUTURE DEVELOPMENT OF THE FERTILIZER INDUSTRY IN SELECTED COUNTRIES OF THE MIDDLE EAST

by

United Nations Economic and Social Office in Beirut
Beirut Lebanon

Part I of the paper examines fertilizer consumption and production in a multinational perspective. The total fertilizer consumption, in 1968/1969, of a number of countries in the Middle East region namely Iraq, Jordan, Lebanon, Saudi Arabia and Syria was about 70,000 tons, of which about 45,000 were nitrogenous fertilizers, about 20,000 tons phosphate fertilizers and about 5,000 tons potash fertilizers. If the average annual rate of growth prevailing during the period 1964/1965 to 1968/1969 continues to prevail up to the year 1974/1975 the consumption of nitrogenous fertilizers in the latter year will be about 131,000 tons.

In 1971, there were four fertilizer producing plants in operation in two countries in the region: two in Lebanon and on in Kuwait and one in Saudi Arabia. The plant in Kuwait is being greatly expanded. Three other fertilizer plants are presently under construction, one each in Iraq, Qatar and Syria. All three plants are expected to be at or near full operation by the end of 1972. By that date, the region's total annual production capacity of ammonia will reach 1,276,000 tons and of urea 1,358,000 tons. Other products will include nitric acid, ammonium nitrate, sulphuric and phosphoric acids, single and triple superphosphates, and complex fertilizers.

Intra-regional trade in fertilizers is still limited.

The Industrial Development Center for Arab States published a study in August 1970

on the status of the fertilizers and petrochemicals industries in 12 Arab countries and one emirate in the Middle East and North Africa, with special reference to potentialities for co-operation and co-ordination. The study forecast that by 1975 the Arab countries may be exporting as much as one million tons of nitrogenous fertilizers and have available for export some 750,000 tons of phosphate fertilizers. In 1968, only Kuwait and Lebanon, in the Middle East, were producing nitrogenous fertilizers and only Lebanon was producing phosphate fertilizers. The study recommended close co-operation between Arab countries by entering into long-term agreements and joint ventures for the development of fertilizer industries. It was also recommended that potash in Jordan be exploited, that an Arab Union of fertilizer producers be established, and that a specialized Arab institute for the fertilizers industry be urgently established.

Part II of the paper briefly reviews availability of fertilizer raw materials and fuel, and present and future fertilizer consumption and production in Iraq, Jordan, Kuwait, Lebanon, Qatar, Saudi Arabia, and Syria.

Part III of the paper reviews the experience of some producing countries in the region in the development of their fertilizer industries, and the role of UNESOB in their future development.

By and large, joint ventures have resulted in more efficient implementation and operation of fertilizer plants in the region. Although a considerable proportion of fertiliser production of the region is intended for export, marketing difficulties are being faced and some producers have concluded long-term marketing agreements with international firms.

Perhaps the area where there is greatest need for assistance is that of training nationals at all levels in the efficient operation and management fertiliser production facilities. UNESOB, in co-operation with UNIDO and other UN bodies, could assist in the organization of regional or national training seminars and programmes in the various technical and economic disciplines of efficient operation and management. UNESOB could also assist in the formulation and/or evaluation of plans for multi-national co-operation and co-ordination in the development of the fertiliser and linked industries.

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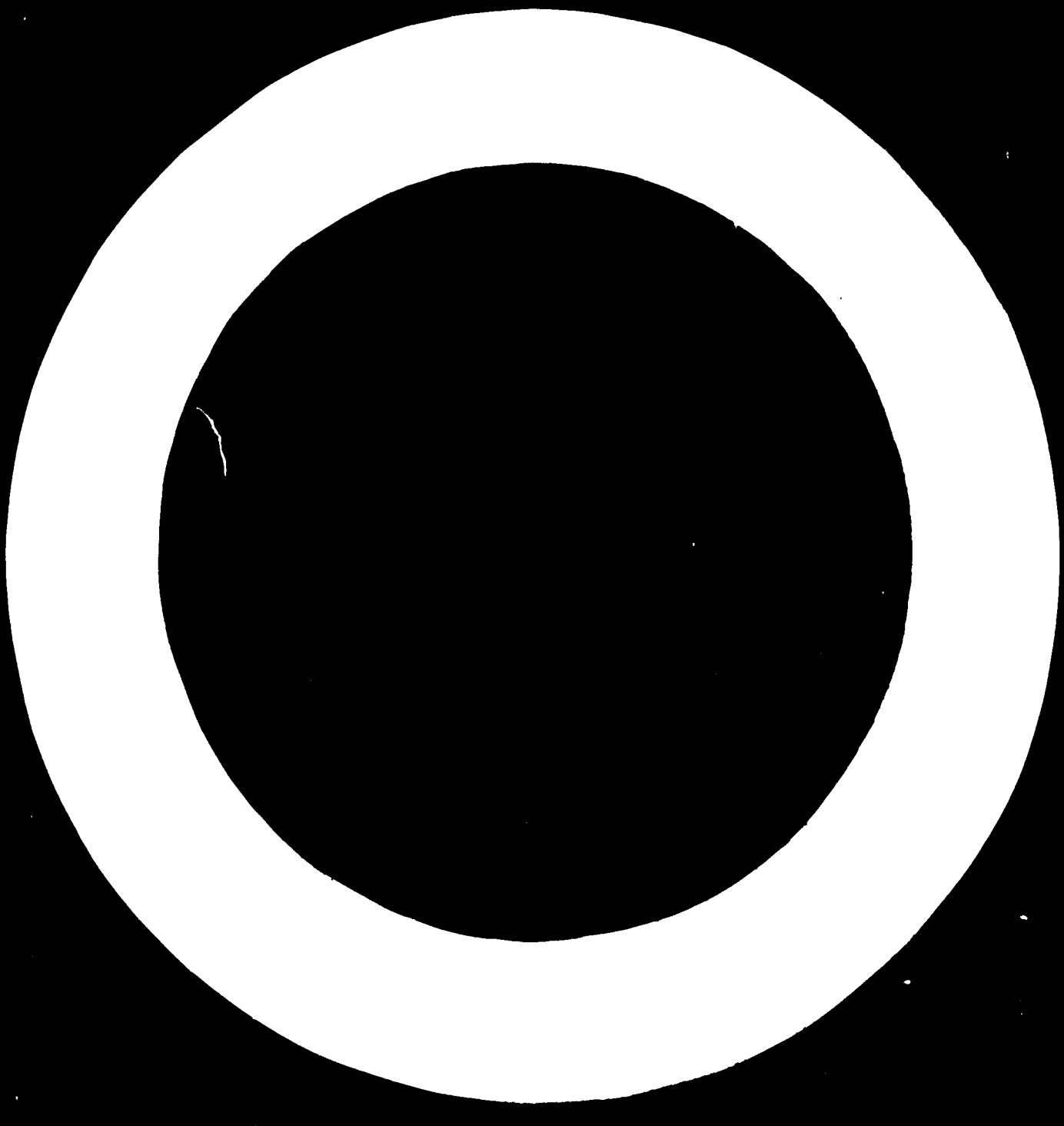
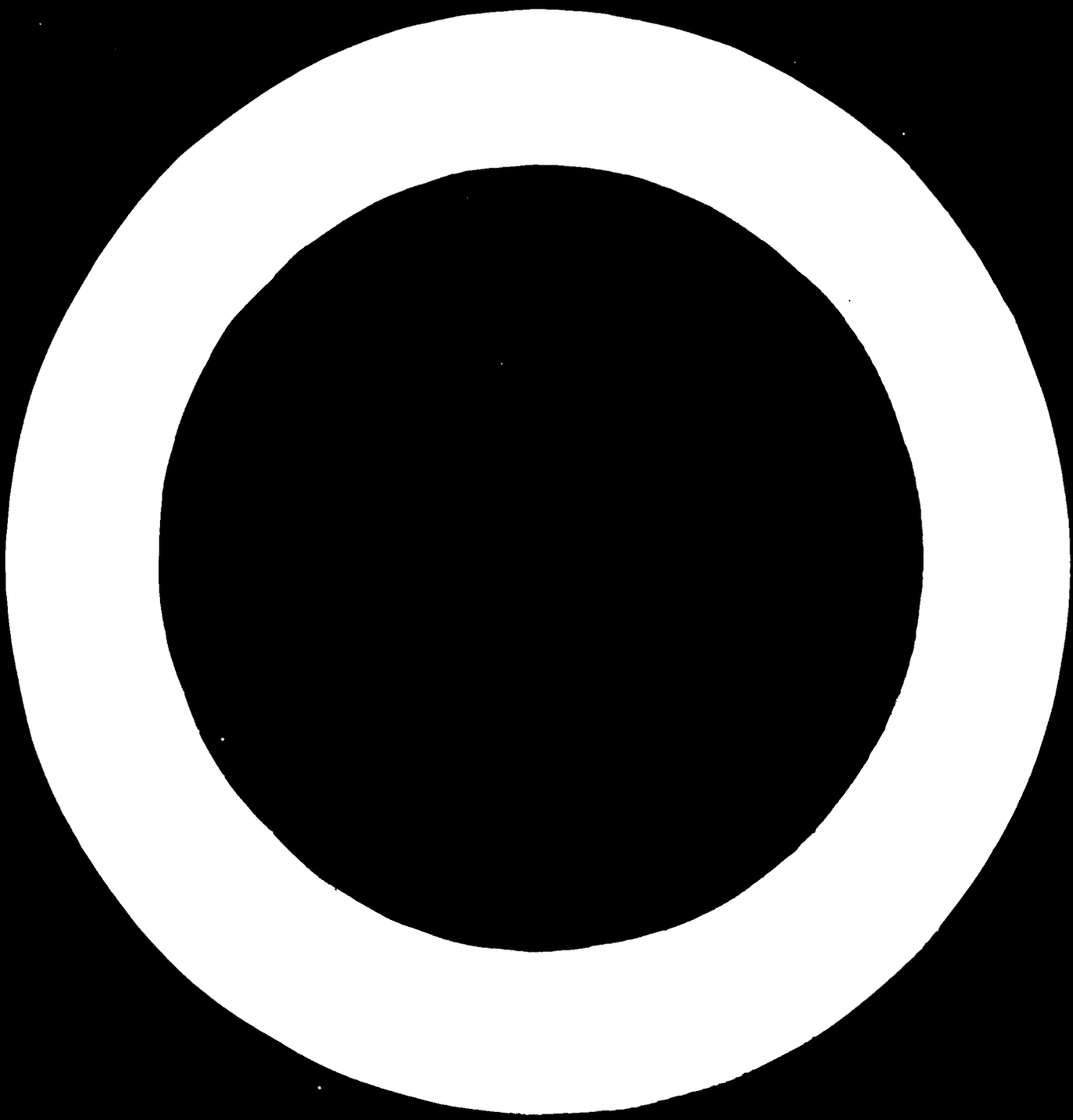


CONTENTS



I. FERTILIZER CONSUMPTION AND PRODUCTION IN THE REGION IN A MULTI-NATIONAL PERSPECTIVE

To the majority of countries in the region, agriculture is an important sector not only from the view point of its contribution to national income but also because the agricultural population represents a substantial part of total employment. There is also a rapid increase in the number of people to be fed at higher levels of nutrition. Therefore, the development and modernization of agriculture figures high in the list of national priorities and fertilizers are recognized as an important input amongst the five inputs required to increase agricultural productivity, i.e. fertilizer, farm machinery, water, improved seed varieties and pesticides.

Excluding the Gulf Emirates and Sheikhdoms, the eight countries: Iraq, Jordan, Kuwait, Lebanon, Saudi Arabia, South Yemen, Syria, and Yemen, comprising the UNESOB region, cover an area of about 3,376,000 square kilometres, of which only about 175,000 [1] square kilometres are estimated to be under cultivation, and of this area nearly a half remains fallow at any one time. If water were to be made available, additional large areas could be brought under cultivation, although some areas would require large fertilizer inputs. The population of the area in 1970 was about 33 million, and is projected [2] to reach 38.3 million in 1975 and 53.2 million in 1985.

1/ Inter-Country Co-operation for Agricultural Development, James Ilett, ESOB/MEET.4/WP.3.

2/ Agricultural Development in a Regional Perspective, UNESOB (1970).

/...

The UNIDO Monograph on Fertilizer Industry 3/ recommended that developing countries set definite and increasing targets for fertiliser consumption. Since the use of a given quantity of fertilizer will result, within limits, in additional yield of agricultural products, per capita fertilizer consumption becomes a significant factor for economic planners. There appears to be a significant correlation between the low nutritional levels, the low rate of agricultural and economic development on the one hand and the low per capita fertilizer consumption in most of the developing world. The UNIDO monograph, therefore, suggested that developing countries should plan for a per capita fertilizer consumption by 1975 of 10 kilogrammes nitrogeneous fertilizers, 5 kilogrammes phosphate fertilisers, and 2.5 kilogrammes potash fertilizers. These per capita targets were suggested as very rough minimum targets which would have to be adjusted to the particular situation of each developing country.

These minimum targets and the 1975 projected population of 38.3 million persons indicate that the suggested total fertiliser consumption for the region in 1975 would be 383,000 tons of nitrogeneous fertilizers, 191,500 tons of phosphate fertilizers, and 95,750 tons of potash fertilisers.

Excluding the two Yemens and the Gulf area, the estimated consumption of fertilisers in 1968/1969 for the UNESOB region was as shown in Table I.

Table I. Fertiliser consumption in some countries of the Middle East (a)

(1,000 tons)

	Actual consumption in 1968/1969	Projected consumption in 1974/1975	Proposed minimum consumption targets for 1975
N	44,870	85,755	300,000
P_2O_5	19,700	19,830	150,000
K_2O	5,365	5,270	75,000

(a) Iraq, Jordan, Lebanon, Saudi Arabia and Syria.

Source: FAO Fertilizers Annual Review (1969).

3/ Document No. ID/40/6.

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The total nitrogeneous fertilizer consumption of 44,870 tons represented only about 0.18 per cent of total world consumption in 1968/1969. The proposed targets for minimum fertilizer consumption in the same five countries are shown in the third column of Table I. The second column shows the 1974/1975 consumption of these five countries projected on the assumption that the average annual rate of growth in fertiliser consumption which prevailed in these countries for each of the three fertiliser nutrients during the four-year period 1964/1965 to 1968/1969 will continue to prevail between 1968/1969 and 1974/1975. The projected nitrogeneous fertiliser consumption in 1974/1975 amounts only to about 28 per cent of the proposed minimum target for 1975. In order to achieve the 1975 target, the annual growth rate would have to increase more than three fold. The projected consumption figures for phosphate and potash fertilisers are distorted as a result of the fact that total consumption figures for the two years 1964/1965 and 1968/1969 were almost of the same magnitude.

The oil reserves of the Arab countries, in the Middle East and North Africa, are estimated to be between 55 and 60 per cent of the entire world reserves. Over 85 per cent of those Arab reserves are in the Middle East. Compared to other regions in the world, crude oil production costs in the Middle East are considerably lower 1/. The region is also rich in natural gas. It is estimated that more than one-third of the proven natural gas reserves are located in the Middle East. However, in 1968, countries of the Middle East were flaring between 64 per cent and 93 per cent of their production. The industrial utilisation of this considerable wealth started only recently. The fertiliser production capacity of the region will increase considerably during the next two to three years. However if the

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1/ The Development of Petrochemical Industries in the Middle East Region, UNIDO.

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countries of the region are to reap the benefits of any of their comparative advantages, they probably must insure that costs of production and marketing are kept low in order not to waste their advantages on inefficient production, inadequate maintenance and ineffective marketing.

The fertiliser production capacity of the region is summarised in Table II. There are three plants actually operating in the region, two in Lebanon and two in Kuwait. The plant in Saudi Arabia has started production but is not yet fully operational. The plants under construction in Iraq, Qatar and Syria are at different stages of completion. Most of the countries are producing or will be producing fertilisers for export markets. Only in Lebanon and Syria is a significant part of national fertiliser production being used or is intended for national consumption.

Table II. Fertiliser production capacity of operating plants and plants under construction in the UNESCWA region in 1971

(1,000 tons per year)

	Ammonia	Nitric acid	Urea	Ammonium nitrate limestone	Ammonium nitrate	Ammonium sulphate	Sulphuric acid	Phosphoric acid	SSP	TSP	Complex Fertiliser
Iraq[a]	66		53			130	110				
Kuwait	713		643			150	120				
Lebanon				22.3		30	350[b]	100	100	200	83
Qatar[c]	300		330								
Saudi Arabia	200		365								
Syria[d]	50	186			148.5						
TOTAL:	1,329	186	1,391	22.3	148.5	310	580	100	100	200	83

a/ When Basra Fertiliser Plant becomes fully operational, late 1971 or early 1972.
b/ In 1972.
c/ Qatar Fertilizer Company Production facilities are expected to become operational by the end of 1972.
d/ Homs plant is expected to reach 50 per cent of capacity by the end of 1971.

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In an effort to examine possibilities for regional co-operation, the Industrial Development Centre for Arab States (IDCAS) was recently directed by its Board of Directors to undertake a study on the status of the fertilizers and petrochemicals industries in the Arab countries, and the potentialities of co-operation and co-ordination amongst them. The study on the fertilizers industry was completed and the report published in August 1970. It reviewed the present status of the industry in 12 Arab countries 5/ and Qatar. The study also projected fertilizers consumption and production for the years 1975 and 1980. The IDCAS projections for some of the UNESOB countries are referred to in part II of this report. The main findings and recommendations of the IDCAS study may be summarized in the following:

(1) The study concluded that all Arab countries (North African and Middle Eastern) were net importers of nitrogenous fertilizers in 1968. But this situation is expected to change radically by 1975 when the Arab countries may be exporting as much as one million tons of nitrogenous fertilizers. In 1968, only UAR, Kuwait and Lebanon were producing nitrogenous fertilizers. The 1975 and 1980 consumption of nitrogenous fertilizers of the UNESOB countries was forecast to be 132,000 tons and 201,000 tons respectively;

(2) with regard to phosphate fertilizers, the study found the Arab countries to be net exporters in 1968. The surplus available for export is expected to reach about 750,000 tons by 1975. In 1968, there were five Arab countries producing phosphate fertilizers: Morocco, Algeria, Tunisia, UAR and Lebanon. The UNESOB countries consumption of phosphate fertilizers is expected to reach 79,000 tons in 1975 and 58,000 tons in 1980;

5/ Algeria, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Saudi Arabia, Sudan, Syria, Tunisia and UAR.

/...

(3) no potash fertilizers are being produced in the Arab countries although at one time production in Jordan was contemplated. The study forecast total potash fertilizer consumption for the UNESOB countries in 1975 to be 11,000 tons and in 1980 18,000 tons;

(4) the study urged Arab countries to enter into long-term agreements between themselves enabling countries with a demand for fertilizers exceedin their national production to secure supplies from those Arab countries possessing raw materials, fuel or other comparative advantages in the production of fertilizers. The supplying of liquid ammonia by the latter countries to other Arab countries for the establishment of national fertilizer industries was also to be considered;

(5) Arab countries should enter into joint ventures for the productio of fertilizers with due regard being given to the concept of production specialization by those naturally endowed countries;

(6) serious steps should be taken to revive the project for exploitin potash in Jordan; and,

(7) an Arab Union of fertilizer producers should be established to, inter-alia, co-ordinate marketing.

Early in 1971, a Seminar was organized by IDCAS and held in Kuwait. The Seminar made some important recommendations including a recommendation for the urgent establishment of a specialized Arab institute for the fertilizers industry to provide documentation services, undertake techno-economic studies, and assist in the training of personnel. The Seminar also endorsed the establishment of the Arab union of fertilizer producers.

Intra-regional trade in fertilizers within the Middle East has so far been limited. However the two producing countries in the region, Lebanon and Kuwait, are presently exporting fertilizers to other countries within the region. In 1969, Lebanon exported phosphate fertilizers to Syria, Jordan and Iraq; and Kuwait exported in the same year nitrogeneous

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fertilizers (ammonium sulphate) to Iraq and Saudi Arabia. A breakdown of the exports 6/ in 1968/1969 shows that Kuwait exported 59,800 tons of nitrogeneous fertilizers as urea and 15,000 tons of nitrogeneous fertilizers as ammonium sulphate. The total quantity of nitrogeneous fertilizers imported 7/ in 1968/1969 as ammonium sulphate by the three major users in the region, Iraq, Lebanon and Syria, was 11,130 tons. Urea was imported only by Syria (920 tons of nutrient). Available data did not make it possible for this analysis to be carried much further, but it would seem likely that a detailed analysis of fertilizer requirements of each country in the region would help considerably in identifying those fertilizer needs which could be satisfied through intra-regional trade. Such an analysis should also cover the Arab countries of North Africa as well as other neighbouring countries in Europe and Asia.

6/ Source: FAO Fertilizer Annual Review (1969).

7/ Source: FAO Fertilizer Annual Review (1969).

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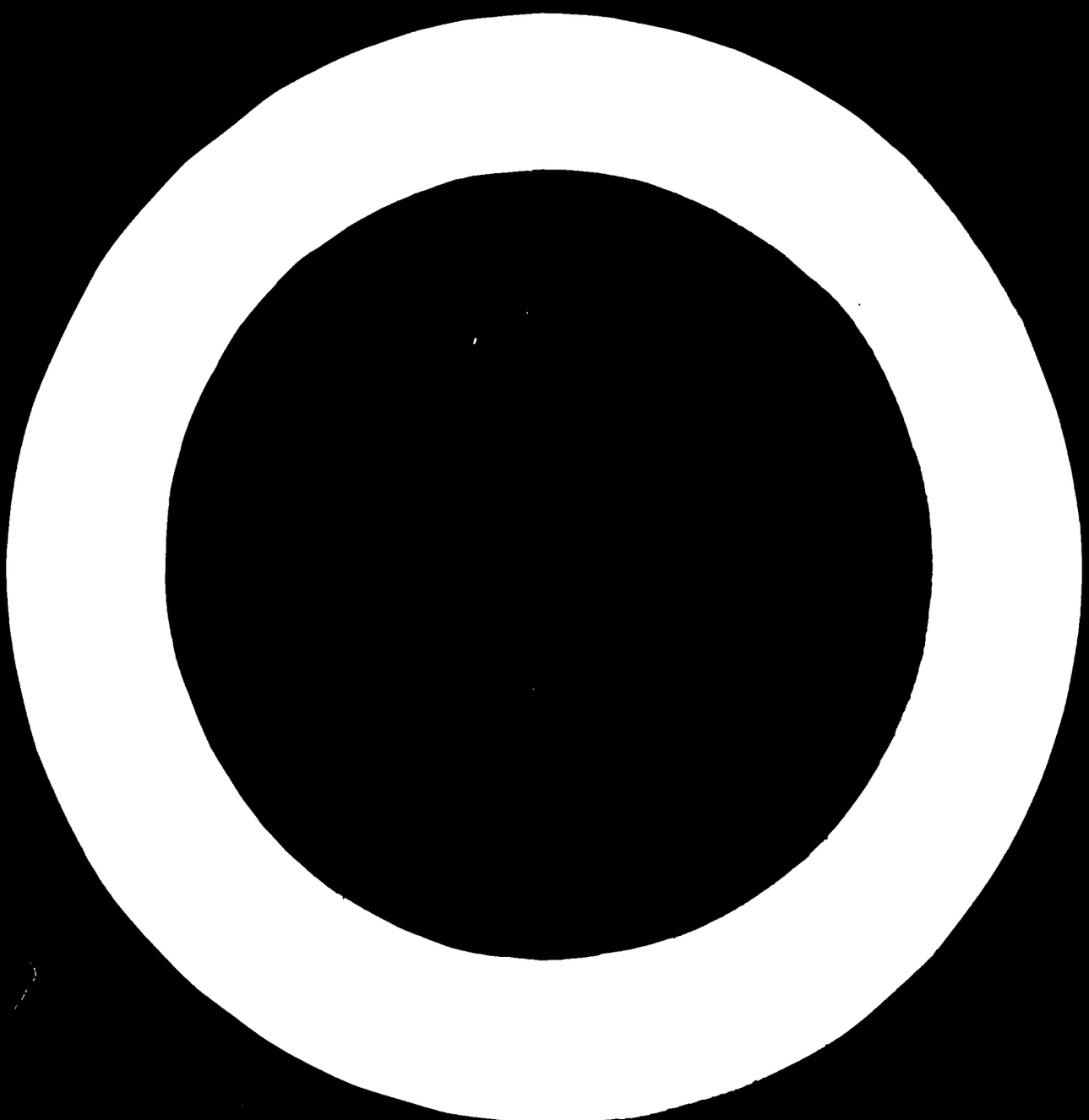

II. BRIEF REVIEW OF FERTILIZER CONSUMPTION AND PRODUCTION IN SOME COUNTRIES OF THE REGION

Iraq

Availability of fertilizer raw materials and fuel

The crude oil reserves of Iraq are estimated to amount to 3,700 million tons. Actual production in 1968 was 74 million tons. The estimated reserves of natural gas are 566 billion cubic metres, with production in 1968 at 5.4 billion cubic metres. Although natural sulphur and phosphate rock are known to be present in Iraq, no estimates of reserves were available. However, 120,000 tons per year of sulphur are being produced from natural gas. In 1970, Iraq had a refining capacity of 115,700 barrels per calendar day.

Fertilizer production capacity

The first and only fertilizer production unit in Iraq, the Basra Fertilizer Plant, started its first trials in March 1971. The contracts for the construction of the plant were signed in October 1967. The one-stream ammonia section has a capacity of 200 tons per day, using Rumeila natural gas (sweet gas) which is piped over a distance of 36 km. at 20 atmospheres. The maximum sulphur content of the gas is 10 - 15 ppm.

The one stream ammonium sulphate section has a capacity of 420 tons per day and consumes 105 tons of sulphur per day. Elemental sulphur from Iraq and Kuwait is used. 325 tons of sulphuric acid is produced per day using the contact process at atmospheric pressure, and vanadium oxide as a catalyst. The plant has two sulphuric acid storage tanks with a capacity of 1,000 tons each. Direct ammonia is used. Crystallizers are used instead of saturators and therefore the ammonium sulphate quality is good.

The urea section has a capacity of 160 tons per day and its reactor temperature is 115°C at a pressure of 295 atmospheres. Crystallizers are used to reduce the biurate content to 0.5%.

The Basra plant has its own services and utilities and presently employs about 300 persons, but total employment is expected to increase to 800.

As Iraq is reported to be using little urea, most of the plants' urea production is intended for export. The relatively cheap cost of production resulting from low cost natural gas and sulphur is expected to ensure the sale of the plants' production in export markets.

Future plans

The National Industrial Minerals Corporation of Iraq is presently investigating a project for the construction of a triple superphosphate plant with a capacity of about 150-200,000 tons per year using local phosphate rock. Construction is not expected to start, however, before 1975/76. There have also been proposals for the expansion of the Basra Fertiliser Plant.

Consumption and production of fertilizers

Table III shows the consumption of the three main fertilisers during the years 1964/65 to 1968/69. Estimates of fertiliser consumption and production in the years 1975 and 1980 are also shown.

Table III. Consumption and production of fertilisers in Iraq

(metric tons)

		1964/5	1965/6	1966/7	1967/8	1968/9	Estimates 1975	Estimates 1980
N	Consumption	2,271	2,022	4,750	6,395	6,837	50,000	80,000
	Production	-	-	-	-	-	50,000	250,000
P_2O_5	Consumption	386	818	1,77[illegible]	2,681	2,520	4,000	7,000
	Production	-	-	-	-	-	-	70,000
K_2O	Consumption	306	3	225	250	53	3,000	5,000
	Production	-	-	-	-	-	-	-

Source: 1964/65 - 1968/69 FAO Fertilisers annual review (1969)
1975 and 1980 IDCAS estimates

The average annual rates of growth during the four-year period 1964/65 to 1968/69 and during the six-year period 1968/69 to 1975 are shown in Table IV.

Table IV. Average annual rates of growth of fertilizer consumption in Iraq

	1964/65 to 1968/69 (per cent)	1968/69 to 1975 (per cent)
N	32	39
P_2O_5	60	8
K_2O	35.5	330

The population of Iraq in 1970 was 9.5 million and is projected 8/ to reach 11.24 million in 1975, and 16.0 million in 1985. The suggested per capita minimum fertilizer consumption target figures for the year 1975 were used together with the 1975 population figure to calculate total target figures for fertilizer consumption in Iraq in 1975. These target totals are: 112,400 tons of N fertilizers, 56,200 tons of P_2O_5 fertilizers and 28,100 tons of K_2O fertilizers. The estimated Nitrogen fertilizer consumption in 1975 is less than half as much as the suggested minimum target for 1975.

JORDAN

Availability of fertilizer raw materials and fuel

Although Jordan has no oil or natural gas, its reserves of phosphate rock are estimated at 290 million tons with production in 1968 amounting to 1.16 million tons. With regard to potash, Jordan has an estimated 42,000 million tons of salt water, but no production is being undertaken at present. There is one refinery in Jordan with a capacity of 330,000 tons per year using crude oil from Saudi Arabia.

8/ Agricultural development in a regional perspective, UNESOB (1970)

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Fertilizer production capacity

Although, at present, no fertilizers are being produced in Jordan, a project is under study for the establishment of a plant to produce 200,000 tons of triple super-phosphates.

Consumption of fertilisers

Table V shows fertilizer consumption in Jordan for the years 1964 to 1968. The IDCAS study estimates of consumption in 1975 and 1980 are also shown in the table. The consumption of fertilisers in Jordan would appear to be quite low. The IDCAS 1975 estimate of N fertiliser consumption is less than one sixth of the minimum suggested target for 1975 (the projected 1975 population of Jordan is 2.64 million and the per capita target is 10 kgs. N., i.e. a total of consumption of 26,400). The average annual growth rate of fertiliser consumption during the four-year period 1964-1968 was:

9.3 per cent for N fertilizers
3.6 per cent for P_2O_5 fertilisers
-29.7 per cent for K_2O fertilisers

If the above growth rates for nitrogenous and phosphate fertilisers are used to project the 1975 consumption figures, the latter would amount to about 3700 tons of N fertilisers and 1920 tons of P_2O_5 fertilisers. These consumption figures closely approximate the IDCAS study estimates.

Table V. Fertiliser consumption in Jordan
(metric tons)

		1964	1965	1966	1967	1968	1975 +	1980 +
N	Consumption	1400 *	1800 *	2000 *	2000 *	2000 *	4000	6000
	Production	-	-	-	-	-	-	-
P_2O_5	Consumption	1303	800 *	800 *	1100 *	1500 *	2000	4000
	Production	-	-	-	-	-	-	-
K_2O	Consumption	2040	2500 *	3000 *	500 *	500 *	1000	2000
	Production	-	-	-	-	-	-	-

Source: FAO Fertilisers Annual Review (1969)
* Unofficial figures
\+ IDCAS estimates

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KUWAIT

Availability of fertilizer raw materials and fuel

The crude oil reserves of Kuwait amount to 9.5 billion tons. Production in 1969 was 120 million tons. Natural gas reserves are estimated to be 940 billion cubic metres, with production in 1969 amounting to 12 billion cubic metres. The refinery capacity of the three refineries operating in Kuwait is 489,000 2/ barrels per calendar day.

Fertiliser production capacity

1. The Kuwait Chemical Fertiliser Company (KCFC).

This company was established in 1965 and the plant inaugurated in 1967. The fertiliser complex is located at the Shuaiba industrial area and consists of four operating plants:

- Liquid Ammonia plant with a capacity of: 400 M.Tons/day
- Urea plant with a capacity of: 550 M.Tons/day
- Ammonium Sulphate plant with a capacity of: 500 M.Tons/day
- Sulphuric Acid plant with a capacity of: 400 M.Tons/day

The entire production of KCFC is intended for export. Its production and export in 1970 are shown in Table VI below. KCFC has been exporting nitrogen fertilisers to some 36 countries in the Middle East, Asia and Africa, but the main marketing area covers the countries bordering the Eastern Mediterranean, Red Sea and the Indian Ocean.

Table VI. Kuwait production and exports of fertilisers in 1970

(metric tons)

	Production	Exports
Ammonium Sulphate	71,200	63,670
Urea	162,290	159,336
Liquid Ammonia	119,600	-
Sulphuric Acid	57,820	

2/ OPEC Annual Statistical Bulletin (1970)

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2. The Petrochemical Manufacturing Company

This company is constructing a second nitrogenous fertilizer complex in the industrial area of Shuaiba, close to the Kuwait Chemical Fertiliser Company (KCFC).

This complex will comprise four main units:

Two Ammonia units, each with a capacity of 880 tons/day; and

two Urea units, each with a capacity of 700 tons/day.

All these units were supposed to have started production by February 1971. It is estimated that the production of one ammonia plant would be sufficient to meet the needs of the two urea plants. The production of the second plant will be exported. The estimated costs of this complex is about 80 million U.S. dollars.

Consumption of fertilizers

There is very little agriculture in Kuwait and only about 0.10% of the total area of the country, which is 17,000 square kilometres, is under cultivation. The present consumption of fertilisers is, therefore, insignificant. However, the Government has in progress, a number of water and soil survey projects which could considerably increase the demand for fertilisers if positive results are achieved.

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LEBANON

Availability of fertilizer raw materials and fuel

In contrast with most other countries of the region, no fertilizer raw materials or fuel are available in Lebanon. However, there are two refineries in the country with a total crude capacity of two million tons per year. Both refineries import crude oil from Saudi Arabia and Iraq. Plans are also being discussed for the construction of a third refinery.

Fertilizer production capacity

There are two fertilizer plants in Lebanon:

(1) The Lebanon Chemical Company (LCC) is a privately owned enterprise with an annual rated production capacity of:

100,000 tons	Phosphoric acid
100,000 tons	Single Superphosphates
200,000 tons	Triple Superphosphates
350,000 tons[a]	Sulphuric Acid

The LCC imports its raw materials from France, Jordan, Iraq and Tunisia, and exports over 80% of its production. Its facilities were commissioned in 1969.

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a to be reached in 1972

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(2) The ESSO Fertiliser Company is a joint venture between ESSO Company and a group of Lebanese businessmen. Its rated annual production capacity is:

Ammonium Sulphate (21%N)	30,000 tons
Ammonium Nitrate-Limestone (26%N)	22,300 tons
NPK	83,000 tons

In 1970, the plant operated at about 50-55% of rated capacity in spite of tariff protection. Sulphuric acid and superphosphates are provided by LCC, whereas ammonia is imported from Greece. ESSO's fertiliser production is geared to supply the wide range of nutrients which the various types of Lebanese soil require. A clay coating agent, which is produced locally, is used to coat each fertiliser granule, thereby maintaining its stability over long periods of time. Heavy duty plastic bags are used for bagging in order to keep the fertiliser air tight.

Consumption and production of fertilisers

The expected rate of annual growth of fertiliser consumption in Lebanon is about 5%. However, a rapid increase in fertiliser consumption is certain to take place when the Litani irrigation project is completed in about 5 - 10 years. This project is expected to increase the irrigated area by about 50%. Table VII shows consumption figures for the years 1964/65 to 1968/69. Estimates of consumption and production for the years 1975 and 1980 were taken from the IDCAS study. For comparison purpose, the suggested minimum consumption targets for 1975 are also shown in the table. The 1970 population of Lebanon was 2.6 million and is projected * to reach 3.03 million in 1975.

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* Agricultural development in a regional perspective UNESCO (1970)

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Table VII Consumption and production of fertilizers in Lebanon
(metric tons)

		1964/65	1965/66	1966/67	1967/68	1968/69	Suggested minimum consumption targets for 1975	1975*	1980*
N	Consumption	11,038	10,016	11,500+	12,532	13,488	30,300	23,000	27,000
	Production	-	7,000	7,100	5,300	10,777	-	21,000	21,000
P_2O_5	Consumption	11,672	3,616	6,000+	7,000+	8,005	15,150	12,000	15,000
	Production	13,300	[illegible]	14,000	23,500	25,[illegible]40	-	52,000§	52,000§
K_2O	Consumption	2,344	1,054	2,900+	3,000+	2,737	7,575	4,000	5,000

+ Unofficial figures
* IBRD Estimates
§ when 100 is fully operational
/ Calendar year referring to the first part of the split year

The average annual rates of growth of fertilizer consumption during the four-year period 1964/65 to 1968/69 and during the six-year period 1968/69 to the estimate year of 1975 are shown in Table VIII below.

Table VIII. Average annual rates of growth of fertilizer consumption in Lebanon

	1964/65 to 1968/69 (actual)	1968/69 to 1975
	per cent	per cent
N	4	5.4
P_2O_5	-9	7
K_2O	3.9	6.5

QATAR

Availability of fertilizer raw materials and fuel

The estimates crude oil reserves of Qatar amount to 683 million metric tons. Current crude oil production is about 55,850 cubic metres per day. Associated natural gas reserves in the country are estimated to be about 1370 billion cubic metres with current production at the rate of 11.75 million cubic metres per day. The refinery capacity of Qatar is 680 barrels per day.

Fertiliser production capacity

The only fertiliser production facility in Qatar, the Qatar Fertilizer Company, is presently under construction. The company was incorporated in Qatar in 1969. Erection of the plant was started in 1971 and completion is scheduled for April 1972. The plant consists primarily of a process section for the production of 900 metric tons per day of ammonia and 1000 metric tons per day of urea. Of the daily output of ammonia, 570 tons will be used in the urea process section for the production of prilled urea and the remainder will be stored in liquid form and exported in bulk. It is expected that commissioning will start in the 2nd quarter of 1972 and that the ammonia section will operate at full capacity a short time thereafter and the urea section in the last quarter of 1972.

The plants' production is intended entirely for export and a long term management and marketing agreement has been concluded with a European firm.

Consumption and production of fertilizers

The consumption of fertilisers in Qatar is insignificant, but the production of nitrogenous fertilizers is expected to reach 150,000 tons per year by 1975.

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SAUDI ARABIA

Availability of fertiliser raw material and fuel

The crude oil reserves of Saudi Arabia are estimated to be 140 billion barrels with production in 1970 at 3.5 million barrels per day. Estimated reserves of associated and non-associated natural gas amount to about 1133 billion cubic metres. Production in 1970 amounted to about 54 million cubic metres daily, 60% of which was flared and the rest utilised. Although the country has considerable ore reserves of phosphate, pyrite, gypsum and other minerals, none of these is being exploited.

Fertiliser production capacity

The only fertiliser producing company in the country, the Saudi Arabian Fertiliser Company (SAFCO), was formed in 1965 as a joint venture between Petromin [a] and private investors. Total investments in the project exceed US$ 44.5 million. Plant construction started in 1967 and was completed by the end of 1969. The plant's sulphur recovery unit has a capacity of 35 tons of sulphur per day. The ammonia unit is designed to produce 600 tons per day. The plant has one of the largest urea units in the world with a design capacity of 1100 tons per day. The single stream plant first produced ammonia at the end of 1969. However, the plant has not yet been brought into stream.

Future plans

At present, the Saudi Arabian authorities are not planning to expand the SAFCO facilities. Plans to construct a sulphur recovery plant have been abandoned for the present time, mainly because of recent changes in the international price of sulphur. However, studies are in progress for the utlisation of phosphate rock for the development of a phosphate fertiliser industry. Also under study are projects for the mining of magnesium for export markets and for the evaporation of sea water to produce potash, magnesium, chlorine and salt.

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a General Petroleum and Mineral Organisation, Saudi Arabia.

Consumption and production of fertilizers

Table IX presents fertilizer consumption for the years 1965/1966 to 1968/1969 as given in the FAO 1969 Fertilizers Annual Review. The table also shows the consumption figures for 1975 and 1980 as estimated by the IDCAS study . A column has been added to show the 1975 fertilizer consumption target calculated on the basis of the estimated 1975 population figure and the suggested per capita target minimum fertilizer consumption for 1975. The population of Saudi Arabia in 1970 was estimated at 5 million and is expected to reach 5.84 million in 1975 and 7.91 in 1985. It should be borne in mind, however, that fertilizer consumption figures given by other sources vary considerably from those shown in the table.

Table IX - Consumption and production of fertilizers in Saudi Arabia

(metric tons)

		1965/1966	1966/1967	1967/1968	1968/1969	Suggested minimum fertilizer consumption targets for 1975	IDCAS estimates 1975	IDCAS estimates 1980
N	Consumption	2,863	5,119	1,000	1,000	58,400	5,000	8,000
	Production	-	-	-	-	-	160,000	160,000
P_2O_5	Consumption	2,464	3,124	1,000	1,000	29,200	1,000	2,000
	Production	-	-	-	-	-	-	-
K_2O	Consumption	1,199	1,909	1,000	1,000	14,600	2,000	3,000
	Production	-	-	-	-	-	-	-

Source: 1965/66, 1966/67, 1967/68, 1968/69 FAO Fertilisers Annual Review (1969) (1967/68 and 1968/69 figures are FAO estimates).

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SYRIA

Fertilizer raw materials and fuel

Although oil was first discovered in Syria in 1967, production did not start until 1968. Crude oil reserves in the Syrian Arab Republic amount to 1133 million cubic metres of which 388 million cubic metres are utilizeable. In 1970, actual production was 4.8 million cubic metres. It is planned to produce 15.0 million cubic metres in 1975 and 20 million in 1980. The natural gas reserves amount to 3.2 billion cubic metres, 95% of which is presently being flared.

Deposits of phosphate rock are estimated at 97 million tons, but no production is being undertaken at present. There is one petroleum refinery in Syria, at Homs with a capacity of 2.7 million tons.

Fertilizer production capacity

There is only one fertilizer production plant in Syria and it is nearing completion at Homs and is expected to start production in September 1971 and reach 50% of capacity by the end of 1971. Initial studies for the plant were started in 1961 but contracts were not concluded until 1965, and the plant was expected to be completed in 1969.

The plant will utilize Naptha from the Homs refinery. The nitrogenous fertilizer complex comprises a 150 tons per day (50,000 tons per year) ammonia unit, and nitric acid and ammonium nitrate units. The ammonia plant is based on the Naptha steam reforming process.

Future plans

The Government of the Syrian Arab Republic is planning to establish a plant for the production of 100,000 tons per year of triple superphosphates at Homs near the nitrogen fertilizer complex utilizing rock phosphate from Palmyre. This plant is planned to go into production in 1974.

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Consumption and production of fertilizers

Table X shows fertilizer consumption figures for the years 1964/65 to 1968/69. During this four-year period the consumption of nitrogenous fertilizers increased at an average annual rate of about 15.6%. The rate was 11.4% for phosphate fertilizers and 45% for potash fertilizers. Table XI shows two estimates of consumption figures for 1975 and 1980. On the basis of a projected population of 7.153 million in 1975 and using the per capita minimum target fertilizer consumption figures, total suggested minimum fertilizer consumption figures were calculated and are also shown in table XI. The 1975 IDCAS estimates imply an average annual consumption growth rate, over consumption in 1968/69 of 22% for nitrogenous fertilizers 33% for phosphate fertilizers and 64% for potash fertilizers.

Table X Consumption of fertilizer in Syria 1964/65 - 1968/69

(metric tons)

		1964/65	1965/66	1966/67	1967/68	1968/69
N	Consumption	12,098	12,851	9,664	16,912	21,607
	Production	-	-	-	-	-
P_2O_5	Consumption	4,336	4,435	4,770	5,525	6,680
	Production	-	-	-	-	-
K_2O	Consumption	242	198	389	1,163	1,075
	Production	-	-	-	-	-

Source: FAO Fertilizer Annual Review (1969)

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Table XI. Consumption and production of fertilizers in Syria in 1975 and 1980

(metric tons)

		1975			1980	
		Suggested minimum target	UNIDO Expert's estimates	IDCAS estimates	UNIDO Expert's estimates	IDCAS Estimates
N	Consumption	71,530	58,000	50,000	121,000	80,000
	Production	-	40,000	40,000	170,000	170,000
P_2O_5	Consumption	35,765	28,000	20,000	67,000	30,000
	Production	-	-	210,000	210,000	210,000
K_2O	Consumption	17,880	12,000	1,000	35,000	3,000
	Production	-	-	-	-	-

III. THE EXPERIENCE OF SOME COUNTRIES OF THE UNESOB REGION IN THE DEVELOPMENT OF FERTILIZER INDUSTRIES AND THE ROLE OF UNESOB IN THEIR FUTURE DEVELOPMENT

Planning and implementation of fertilizer plants

Operating plants in the UNESOB region do not seem to have met with any serious difficulties in the construction and putting on stream of their production facilities. This may be partly attributable to the fact that these plants are ventures owned jointly by nationals and foreign partners possessing considerable know-how in the field.

Of the three plants presently under construction, one is a joint venture between the government concerned and experienced foreign firms. The necessary priorities in all aspects of the implementation of the project have been given by the government and the management of the plant does not expect any serious construction or start-up delays.

However, the situation is quite different with regard to another plant under construction in the region. Although this plant was to have commenced production towards the end of 1969, production had not yet started in mid 1970. This delay is causing considerable losses not only as a result of some equipment and personnel resting idle but also because of the continuing import of fertilizers and the foreign exchange outlays. Implementation of the project was assigned to three different contractors without provision for an experienced and efficient co-ordinating body. The result was that some sections of the plant were completed and the guarantees connected with it expired while other sections were still under construction.

Another plant in the region first started production at the end of 1969 and reached 50 per cent of urea design capacity early in 1970. Subsequently numerous problems arose such as power failures, inadequate process steam, cooling water problems, and troubles with the subsequent sulphur removal unit and with the centrifugal compressors. The refrigeration system

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is of an extremely complex design and difficulties were also faced with the ammonia converter. The reason for these difficulties is attributed mainly to the fact that the responsibility of the designers with regard to start-up supervision was not very clearly defined and difficulties faced by the plant management with regard to faulty design and equipment are being taken up not with the designers but with the multitude of manufacturers of each individual piece of equipment. Moreover, failure occuring now as a result of small economies made at the time of design are costing large sums of money for repairs and replacements.

The implementation of another fertiliser production facility in the region was considered by one of the national supervisory engineers to be a model case of efficient implementation. Although full capacity production has not been reached yet, the 5 per cent contingency allocation of funds was never used. The plant started its first trials during the first quarter of 1971. Although no foreign partners participated in the ownership of this company, successful implementation so far seems to be attributable to the proper co-ordination of the work of the contractors who were responsible for erection and start-up.

Although UNIDO could provide, at the request of governments, technical assistance on an ad hoc basis to advise governments by identifying problem areas in the implementation plans of projects or by recommending more effective implementation techniques, requests for such assistance must necessarily be submitted at an early stage in the life of a project. UNESOB, by virtue of its presence in the region, could assist in the early evaluation of plans and the tentative indication of the assistance needed from various sources. In co-operation with UNIDO and IDCAS, UNESOB organized in 1970 an Inter-regional Training Workshop on the Implementation of Industrial Projects and Related Systems. The training workshop took place in Beirut and was attended by participants from several Arab countries.

Furthermore, UNESOB could, in co-operation with UNIDO, at the request of governments, organize national seminars on implementation. Such a seminar could be held in the requesting country or in Beirut and could be designed

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specifically to deal with the implementation of the specific fertilizer project proposed or approved for implementation. Participants to the seminar would be the national personnel expected to be involved with any and all aspects of the project. Naturally, the usefulness of such a training seminar depends to a large extent on the timing for holding it and should preferably be held before the contracts for the construction of the proposed plant are finalized.

Production and management in fertilizer plants

Little or no management problems are being faced by operating plants in the region. This is due firstly to the fact that the presence of experienced foreign partners facilitates the identification of the foreign skills required and provides a source of supply of such skills; secondly, to the lack of artificial or short-sighted restrictions on the employment of foreign technologists in the countries where those plants are operating. However, in some other countries of the region, the problem of adequate management and production personnel is by far the most crucial.

In one country, the planning and supervision of erection of the fertilizer plant was undertaken by one organization, that was responsible for project planning and implementation, but the plant will be handed over to another organization to operate it. This approach may give rise to the practice of blaming "the other organization" for problems encountered and can result in serious delays and losses. Adverse consequences could be greatly reduced if the management-organization could have shared, or at least been effectively involved in the responsibilities of project planning and implementation. The training of an adequate nucleus of national technicians, supervisors and managers requires long periods of time and should be adequately planned for well in advance. The fertilizer industry is a highly capital intensive industry with constantly changing technologies. If maximum use is to be made of the invested capital and of the benefits

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of technology transfers and dissemination, the largest possible number of nationals should be trained at all possible levels required for the efficient operation of fertilizer production units.

In the case of one plant in the region, only six nationals were receiving training in instrumentation, and a few others in chemical engineering in a European country.

In another country within the region, no provision was made for a group of experienced foreign technologists to assist national management in the technical operation of the plant after erection and start-up are completed. This has resulted in the uncoordinated recruitment of individual technicians from all over the world and in management becoming too involved with bringing the plant into stream to give adequate attention to the training of nationals. However, some progress was made in training nationals at lower levels of skills by using the technique of subdividing jobs into smaller job units. This technique is worthy of further investigation.

In co-operation with UNIDO, and at the request of governments, UNESOB could assist in organising regional or national training seminars in selected fields related to the operation of fertiliser production facilities. UNESOB could also assist in the selection of suitable candidates for overseas training organised by UNIDO or other UN Organisations.

Marketing of fertilizer production

With regard to domestic consumption of fertilizers, some of the problems faced by countries of the region are: difficulty of educating farmers to use the optimum economic quantities of fertilizers, the low prices of farm products, the shortage of credit for fertilizer purchases, and the inadequate supply of improved seed varieties. Most governments of the region are already formulating policies to deal with such problems.

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The government of one country in the region has extended tariff protection to a fertiliser plant producing for the local market. Although protection increased the company's share of the local market to 80 per cent, the company was still operating at a loss. The advantages and disadvantages of tariff protection need to be carefully weighed in order to avoid the protection of inefficient operations or obsolete technologies. UNIDO could assist governments, at their requests, in investigating individual cases for protection.

The difficulties faced by fertiliser producers in exporting fertilisers include: competition from other suppliers coupled with fluctuations in world prices of fertilisers, and the high freight rates.

Two of the plants under construction in the region have concluded long-term marketing agreements with world-known marketing firms. One such agreement is for a period of 20 years, the other is for 17 years. The bulk of the production of these two plants is intended mainly for export.

Another fertiliser company in the region which is also exporting most of its production has established an active marketing department with agents and representatives within or nearby potential importing countries. However, the company is still facing marketing problems because of credit facilities previously extended to those importing countries which restrict the latter countries' purchases of fertilisers to the credit donor countries. Furthermore, prevailing freight rates have put this country's exports at a disadvantage.

It would seem necessary that market conditions should be thoroughly investigated before plants are constructed with a view not only to determining the economic feasibility of the project but also to determine the proper size of plant and whether to stop production at an intermediate stage and market the intermediate products or proceed all the way to end-products.

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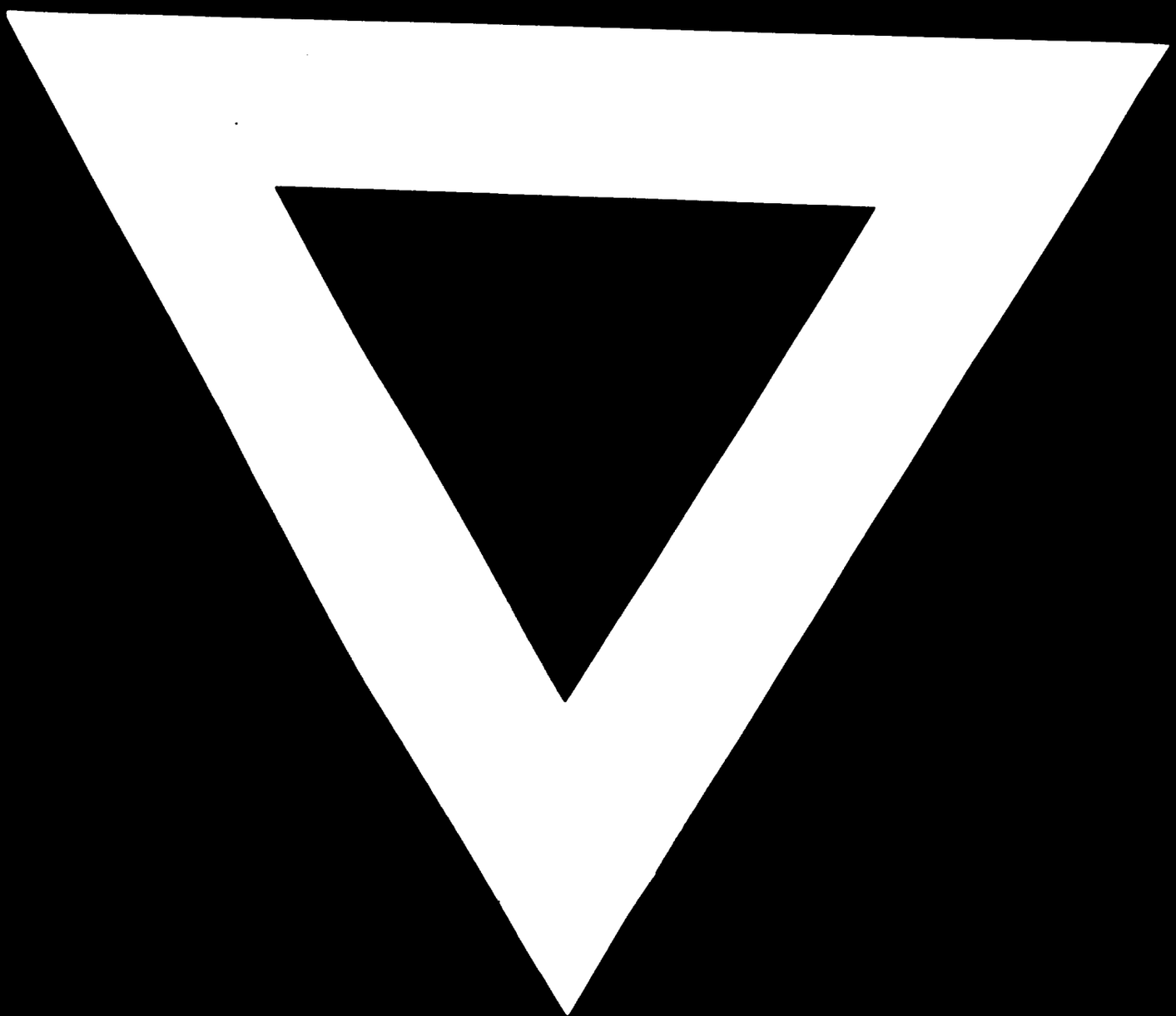
Even after the plants are in full operation, the constant monitoring of world market prices and other conditions is necessary in order to successfully export fertilizers. Export markets are of great importance to this region with its wealth of relatively cheap fertilizer raw materials, and it will necessarily require sometime for countries of the region to familiarize themselves with the workings of the international market for fertilizers. UNESOB may be able to assist plants in the region by providing information on sources of data pertaining to available demand and supply projections or by undertaking to analyse future demand for specific countries in the region. However, UNESOB's role in this respect is obviously somewhat limited.

The future development of the fertiliser industry in the UNESOB region

The Arab countries, in the Middle East and North Africa, have already initiated steps which may lead to some co-ordination and co-operation in some sectors of industrial development. The fertilizer industry was one of the sectors selected at the earliest stages for close study and analysis with a view to identifying opportunities for co-ordination and co-operation in the development of the fertiliser industry. The recommendations of the study recently completed by IDCAS were summarised earlier on in this respect. The specialised Arab institute for the fertilisers industry may be located in one of the countries in the UNESOB region. This will enable UNESOB to work closely with the institute and meet whatever possible assistance needs which may arise. At the same time, in co-operation with UNIDO, and at the request of two or more governments, UNESOB could study and analyse the prospects for development or expansion of the industry in these countries. Possibilities for inter and intra-industry linkage of the fertiliser industry with other industries offer countries of the region special advantages which require careful consideration and study. Regional planning and co-ordination in the development of the fertiliser industry could lead to accelerating the development of a number of other industries. The advantages of regional co-operation are not confined to countries with small markets, substantial benefits can also accrue to large countries.



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