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Bucharest, Romania, 10-14 July 1972

SUMMARY OF THE REPORT ON THE CHEMICAL FERTILIZER PRODUCTION AND CONSUMPTION IN ALBANIA, BULGARIA, CZECHOSLOVAKIA, CYPRUS, GREECE, YUGOSLAVIA, MALTA, POLAND, ROMANIA SPAIN, TURKEY AND HUNGARY

by

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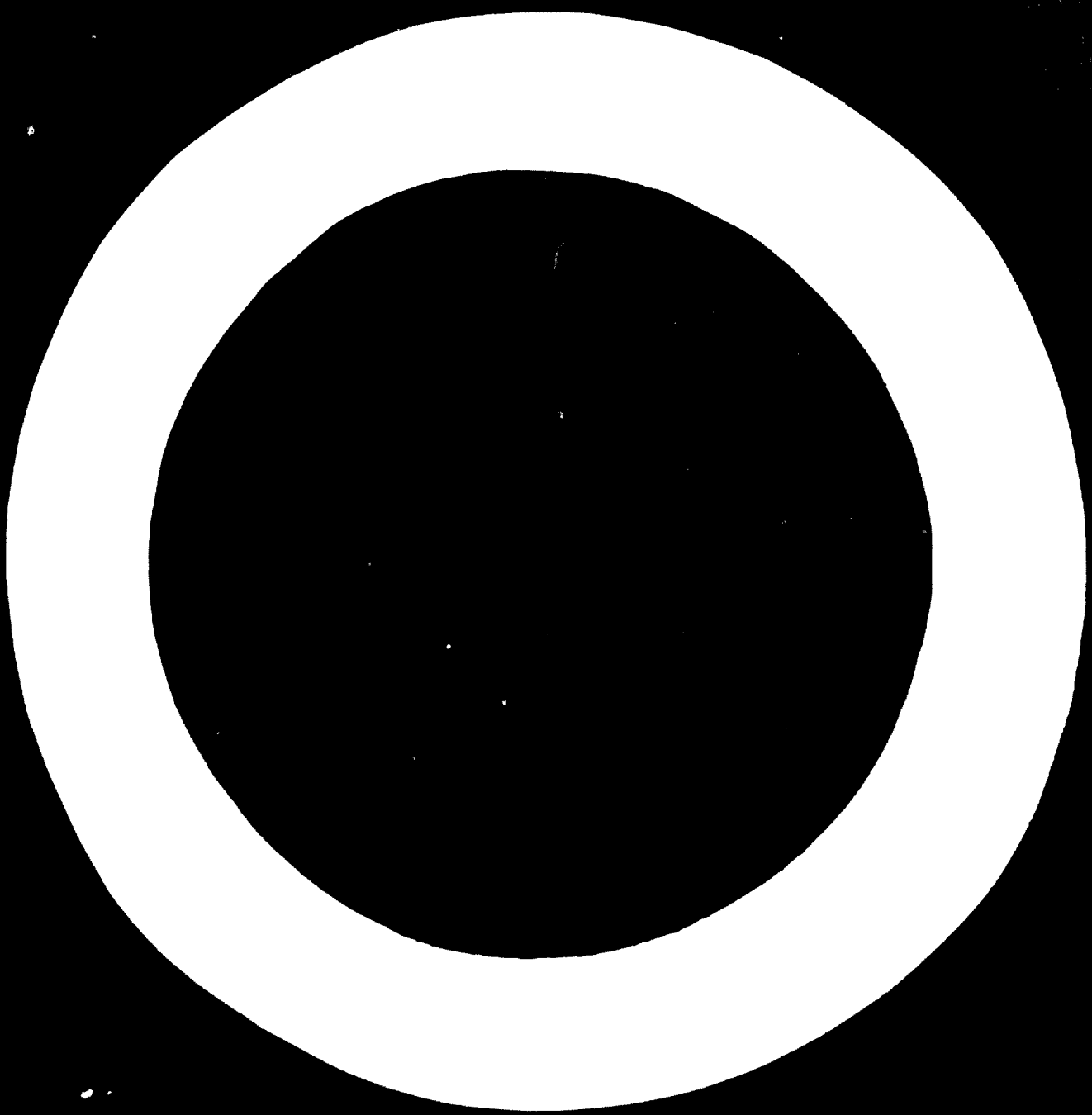

INTRODUCTION

A preliminary research of the chemical fertilizer problem, on the whole, in the countries that are the analysis purpose of this survey , has indicated that, generally, there is an important base for developing the consumption and the fertilizer output in these countries.

Under these conditions the chemical fertilizer state, in the countries under research was presented in point of the two main features, consumption and output.

The paper has three chapters.

Chapter I. - As for the chemical fertilizer consumption, there are analyzed aspects regarding the present consumptions, peovisions, knowledge degree, etc.

Chapter II. - In point of fertilizer output, there are presented the present state and trends as regards the raw material base, processes, fertilizer grades, developing conditions, etc.

Chapter III. - Trends regarding the chemical fertilizers in the countries under research, as compared to the general trends at a world scale - there is pointed out the way the most advanced trends all over the world are reflected in the specific development of each country.

x x

x

We mention that the report has been worked out

on the basis of the data and publications in the branch literature, to the extent they have been available to us. Under such circumstances, it is possible that the data shown herein should contain some lacks or should reflect only partially the state in a certain country. In this respect, we kindly ask the representatives of the countries under research to excuse the possible omissions and to contribute, as much as possible, to the completion or accuracy of data.

The basic report represents a detailed analysis of the chemical fertilizer problem, in the twelve countries under research.

The summary presents very briefly only the main problems dealt with.

To facilitate the simultaneous consulting of the abstract and of the paper, the notations in the paper, for titles of chapters, tables and bibliographical indications are maintained.

Chapter I

Chemical Fertilizer Consumption

I.1. Fertilizer Consumption at the level of 1970/1971.

The fertilizer consumption in a country depends on several factors, among which the most important are the soil and climate conditions, the sort of cultures, demographic conditions, etc.

In the specialized statistics, the fertilizer consumption is presented as related to the agricultural soils or to the inhabitant number.

Table 1 presents the chemical fertilizer consumption in thousands of tons of NPK active substance at the level of the agricultural year 1970/1971, related to arable soil, pastures and totally cultivated land.

It is possible to group the countries under consideration on the basis of the values in Table 1, in the classification proposed by UNIDO, as (1):

Table 1. Fertilizers Consumption (in AS active substance)

A.S. = active substance, or fertilizing elements

To	Total area, km² (2)	Cultivated land, 1000 ha (2) arable	pastures	total	Ratio % col 5/ col. 2	Col 3/ Col 5	Consumption Total, 1000 t.	1970 kg/ha col.5	1971 kg/ha col.5	(3) kg/ha col 1
Countries under study										
1. Albania	28,748	488	736	1,224	42.6	39.9	58	47.8		118.9
2. Bulgaria	110,912	4,538	1,147	5,685	51.2	88.8	786	138.3		173.2
3. Cyprus	9,251	434	80	514	55.6	84.4	26	50.6		59.9
4. Czechoslovakia	127,870	5,412	1,825	7,237	56.6	74.8	1.283	177.3		237.1
5. Greece	131,944	3,702	5,200	8,902	67.5	41.9	338	38.0		91.3
6. Yugoslavia	255,804	8,363	6,566	14,929	58.4	56.0	678	45.5		81.1
7. Malta	316	No available data.								
8. Poland	312,677	16,068	4,184 (4)	20,252	64.8	79.3	2.700	133.3		168.0
9. Romania	237,500	9,733 (5)	4,818 (5)	14,151	62.5	70.8	594	61.9		61.0
10. Spain	504,750	20,730	14,361	35,091	69.5	59.1	1.284	36.0		61.8
11. Turkey	780,576	25,348	28,666	54,014	69.2	46.9	435	8.1		17,2
12. Hungary	93,030	5,622	1,390	7,012	75.4	80.2	786	112.1		139.8

Note: 1 - Data taken from Statistics about S.R. of Romania, 1971, p.p.737,738,742,744.

2 - Columns 3 and 4, excerpt from - Sirsan A.- Small geographical Atlas - Bucharest, 1967, p.p.59-94, 105.

3 - Col.8 - excerpt from The British Sulphur Corp. Ltd., Statistical Supplement, no.4, Nov.-Dec.1971, p.p. 10,12,14.

4 - Group of islands - Malta (246 sq.km), Gozo, (67 sq.km), Comino (2.6 sq.km), col. 3,4 and 8 . No date available.

5 - From the Statistics about S.R. of Romania, 1971, p.p.272-273.

CLASSIFICATION ACCORDING TO THE FERTILIZER CONSUMPTION (NPK) IN KG/HA OF CULTIVATED LAND (arable + pastures + hayfields)

kg/ha	countries under study
< 25	Turkey
25 to 5o	Albania, Greece, Yugoslavia, Romania, Spain
5o to 1oo	Cyprus
1oo to 15o	Bulgaria, Poland, Hungary
15o to 2oo	Czechoslovakia
> 2oo	-

CLASSIFICATION ACCORDING TO THE FERTILIZER CONSUMPTION (NPK) IN KG/HA OF ARABLE LAND

kg/ha	countries under study
< 25 (very low)	Turkey
25 to 5o (low)	-
5o to 1oo (moderate)	Cyprus, Greece, Yugoslavia Romania, Spain
1oo to 2oo (high)	Albania, Bulgaria, Poland, Hungary
> 2oo (very high)	Czechoslovakia

I.3. Fertilizer Consumption expressed in NPK ratio

Under the present developing conditions, the three unanimously accepted main nutritive elements are: nitrogen, phosphorus, potassium.

At present, as well as in the future there is a more striking preference for the nitrogen element, in the developing countries; there is also an obvious trend towards a higher consumption of phosphorus, than of potassium.

Table 4 shows the NPK ratio through 1968 - 1970 included in the countries under study.

Analysing the values shown in Table 4, the following features can be underlined:

- in all the countries that are the subject of this survey - except Cyprus - the nitrogen element is the main one;
- in Albania, Bulgaria, Cyprus, Greece, Romania and Turkey, the potassium element is by far less used than phosphorus (1o to 2o%).
- the potassium consumption in Czechoslovakia and Poland is 5o% higher than the phosphorus one;
- in Yugoslavia and Hungary, the potassium consumption represents 8o-9o% out of the phosphorus one, and in Spain it is of about 5o% out of the phosphorus consumption;

It is foreseen that the value of the ratio NPK, dependent on the pedo-climatic conditions in each country, will change its structure in the future, by means of increasing the participation of potassium, whose importance is generally less known by the agricultural customers (2).

Concluding this subchapter, we mention only that the

importance of a fourth fertilizing macro-element, that is sulphur, shall not be disregarded since it seems to be necessary for plants, in equal quantities, to those of potassium. (3,4).

Table 4. Ratio between Fertilizing Elements, in the Fertilizer Consumption (x)

	Year	Fertilizer consumption - 1000 t				Ratio		
		N_2	P_2O_5	K_2O	Total	N:	N: P:	K:
Countries under study								
1.- Albania	1968	19	9	2	30	2.11:	1:	0.22
	1969	32	18	2	52	1.78:	1:	0.11
	1970	36	20	2	58	1.80:	1:	0.10
2. Bulgaria	1968	367	367	40	7 4	1.00:	1:	0.11
	1969	430	256	27	713	1.68:	1:	0.11
	1970	500	260	26	786	1.92:	1:	0.10
3. Cyprus	1968	10	12	2	24	0.83:	1:	0.17
	1969	11	11	2	24	1.00:	1:	0.18
	1970	12	12	2	26	1.00:	1:	0.17
4. Czechoslovakia	1968	302	310	463	1,075	0.97:	1:	1.49
	1969	400	312	476	1,188	1.28:	1:	1.53
	1970	419	350	514	1,283	1.20:	1:	1.46
5. Greece	1968	182	116	17	315	1.57:	1:	0.15
	1969	195	125	18	338	1.56:	1:	0.14
	1970	201	119	18	338	1.69:	1:	0.14
6. Yougoslavia	1968	270	195	182	547	1.38:	1:	0.93
	1969	237	143	117	547	2.01:	1:	0.82
	1970	303	200	175	678	1.52:	1:	0.88
7. Malta	No available data							
8. Poland	1968	680	540	790	2,010	1.26:	1:	1.46
	1969	785	595	1,036	2,416	1.32:	1:	1.74
	1970	850	650	1,200	2,700	1.31:	1:	1.85
9. Roumani	1968	330	140	14	484	2.36:	1:	0.10
	1969	350	169	19	538	2.07:	1:	0.11
	1970	367	203	24	594	1.81:	1:	0.12
10. Spain	1968	564	369	162	1,095	1.53:	1:	0.44
	1969	617	423	224	1,264	1.46:	1:	0.53
	1970	574	430	260	1,264	1.33:	1:	0.60
11. Turkey	1968	176	182	26	384	0.97:	1:	0.14
	1969	168	214	27	409	0.79:	1:	0.13
	1970	205	170	20	435	1.44:	1:	0.12
12. Hungary	1968	299	159	125	583	1.88:	1:	0.79
	1969	346	181	167	694	1.91:	1:	0.92
	1970	472	180	134	786	2.62:	1:	0.74

(x) Worked out on The British Sulphur Statistical Supplement, no.4, Nov.-Dec, 1971, p.p.10,12,14, except it.9, Romania, based on Statistics about Romania, 1971, p.p.328-329.

I.4. Fertilizer Consumption, having in view the period 1971 - 1980

As well as all over the world, in the studied countries there can be noticed a steady increase of fertilizer consumption, as shown in Table 5.

The increase is greater in the countries where no high consumption has been attained, as evaluated by international organizations at the level of 100-200 kg/ha (1). Bulgaria, Czechoslovakia, Romania, Spain and Hungary could be quoted in this respect (see Table 6).

Among the aspects raised by the fertilizer consumption, both at a world scale and in the countries under study, there are obvious some preferences for certain grades. From this point of view, there are known the following: the preponderance of ammonium sulphate, of ammonium nitrate and of 18% ordinary superphosphate, during the first period of using fertilizers; the decrease of their importance, by replacing them with fertilizers more concentrated in fertilizing substances - urea and double and triple superphosphate; the further use of complex and mixed fertilizers, having the advantage of the shipping and inclusion cost decrease; the penetration, nowadays, of the liquid fertilizers in the consumers' usage, these being efficient especially with irrigated areas - and of the fertilizers containing micro-elements.

The agricultural consumers' orientation towards certain grades has been the main factor for re-profiling fertilizer plants in all the fertilizer manufacturing countries.

There is to point out that in the basic paper, out of the available data, a detailed analysis has been done, for the

fertilizer.consumption in all the countries under study, except Malta, for which no information was available.

Table 5. Fertilizer Consumption Increase (x)

	Arable area, 1000 ha	Consumption A.S. 1000 t			Consumption A.S. kg/ha		Dynamics 1963 = 100	
		1968	1969	1970	1968	1970	1969	1970
Countries under study								
1. Albania	488	30	52	58	61.5	118.9	173	193
2. Bulgaria	4538	774	713	786	170.6	173.2	92	102
3. Cyprus	434	24	24	26	55,3	59.9	100	108
4. Czechoslovakia	5412	1075	1188	1283	198.6	237.1	111	119
5. Greece	3702	315	338	338	85.1	91.3	107	107
6. Yugoslavia	8363	547	547	678	65.4	81.1	100	124
7. Malta	no available data							
8. Poland	16068	2010	2416	2700	125.1	168.0	120	134
9. Romania	9733	484	538	594	48.7	61.0	111	123
10. Spain	20730	1095	1264	1264	52.8	61.0	115	115
11. Turkey	25348	384	409	435	15.1	17.2	107	113
12. Hungary	5622	583	694	786	103.7	139.8	119	135

(x) Out-worked: col.2 in Table 1, col.3
col.3,4 and 5 in The British Sulphur Corp.Ltd.Statistical Supplement no.4, p.10, 12, 14 except it.9 - Romania according to Statistics about Romania, 1971, p.328-329.-

Table 6. Provisions for the AS Fertilizer Consumption (x)

Country	Arable area 1000 ha	Year	Fertilizer consumption AS kg/ha			
			1000 t	cultivated	arable	no indication
Bulgaria	4538	1970	786	138.3	173.2	-
		1975	...	...	...	217
		1980	...	...	...	247
		1990	...	...	...	279
Czechoslovakia	5412	1970	1283	177.3	237.1	-
		1975	...	...	...	220
		1980	...	...	...	252
		1990	...	...	...	296
Poland	16069	1970	2700	133.3	168.0	-
		1975	...	...	...	200
		1980	...	...	...	235
		1990	...	...	...	339
Romania	9733	1970	594	41.9	61.0	-
		1975	2115	...	217.3	-
Spain	20700	1970	1264	36.0	61.0	-
		1975	1560	...	75.2	-
Hungary	5622	1970	786	112.1	139.8	-
		1975	...	...	....	217
		1980	...	....	...	295
		1990	...	...	...	467

(x) Taken from: col.2 in Table 1, col.3
col.4 - year 1970, in Table 1, col.8
col.5 and col.6 in Table 1, col.9 and 10
col.7 - Bulgaria, Czechoslovakia, Poland, Hungary - in "Chemical Age", no.2734, 10.12.1971
col.4 - Romania, 1975, taken from the "Law for undertaking the Live year plan of economical and social development in S.R. of Romania, through 1971-1975", Political Publishing House, Bucharest, 1972, p.14.
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Ch. II Fertilizer Production

II. 1. General

As for most of the countries under consideration, the ever-increasing fertilizer demands have determined the investment policy in the fertilizer industry.

An analysis of the relation between production and consumption, through 1968-1969, points out the following aspects (ref. to Table 9).

- all the analyzed countries except Cyprus and Malta are fertilizer manufacturers; some of them have positive differences between production and consumption at the level of 1970/1971, differences which were meant for export.
- the greatest fertilizer shortage is to be found in Turkey which is the greatest chemical fertilizer importer.
- all the countries except Spain, are importing potash salts and phosphorus raw materials.

It is to be mentioned that the image resulting from the figures shown in Table 9 has a limited value as regards the period 1968-1971 included; during the very next years, the production development in most of the countries under consideration, is characterized by sensible increases, which modify the state shown in Table 9.

Table 9. Ratio between Fertilizer Output and Consumption, in the Countries under Study (1)

	1968/1969				1969/1970				1970/1971			
	Prod. 1000 t	Cons. 1000 t	Dif. 1000 t	P-C %	Prod. 1000 t	Cons. 1000 t	Dif. 1000 t	P-C %	Prod. 1000 t	Cons. 1000 t	Dif. 1000 t	P-C %
L	2	3	4	5	6	7	8	9	10	11	12	13
1.- Albania												
N_2	29	19	+ 10	+ 34.5	36	32	+ 4	+11.1	36	36	0	0
P_2O_5	10	9	+ 1	+ 10.0	19	18	+ 1	+ 5.3	20	20	0	0
K_2O	...	2	-	-	...	2	-	-	...	2	-	-
Total S.A.	...	30	-	-	...	52	-	-	...	58	-	-
2. Bulgaria												
N_2	504	367	+137	+ 27.2	586	430	+156	+26.6	602	500	+102	+16.9
P_2O_5	135	367	-832	- 63.2	139	256	-117	-45.7	148	260	-112	-43.1
K_2O	...	40	-	-	27	27	-	-	...	26	-	-
Total S.A.	...	774	-	-	...	713	-	-	...	786	-	-
3. Cyprus												
N_2	-	10	-10	-100.0	-	-11	- 11	-100.0	-	12	- 12	-100.0
P_2O_5	-	12	-12	-100.0	-	-11	- 11	-100.0	-	12	- 12	-100.0
K_2O	-	2	- 2	-	-	- 2	- 2	- 2	-	2	- 2	-
Total S.A.	-	24	-24	-	-	-24	- 24	-	-	26	- 26	

1	2	3	4	5	6	7	8	9	10	11	12	13
4. Czechoslovakia												
N_2	262	302	-40	-13.2	299	400	-101	-25.5	324	419	-95	-22.8
P_2O_5	264	310	-46	-14.8	289	312	-23	-7.4	322	350	-28	- 8.0
K_2O	...	463	-	-	...	476	-	-	...	514	-	-
Total S.A.	...	1075	-	-	...	1188	-	-	...	1283	-	-
5. Greece												
N_2	127	188	-55	-30.2	151	195	-44	-22.6	165	201	-36	-17,8
P_2O_5	130	116	+14	+10.8	120	125	- 5	- 4.0	114	119	- 5	- 4.2
K_2O	...	17	-	-	...	18	-	-	...	18	-	
Total S.A.	...	315	-	-	...	338	-	-	...	338	-	-
6. Yugoslavia												
N_2	148	270	-122	-45.2	183	287	-104	-36.2	290	303	±13	- 4.3
P_2O_5	182	195	- 13	- 6.7	189	143	+ 46	+24.3	208	200	+ 8	+ 3.8
K_2O	...	182	-	-	...	117	-	-	...	175	-	-
Total S.A.	...	647	-	-	...	547	-	-	...	678	-	-
7. Malta	NO available data.											
8. Poland												
N_2	759	680	+ 79	+10.4	958	785	+173	+18.1	1031	850	+181	+17.6
P_2O_5	474	540	- 66	-12.2	521	595	- 74	-12.4	600	650	- 50	- 7.7
K_2O	...	790	-	-	...	1036	-	-	...	1200	-	-
Total S.A.	...	2010	-	-	...	2416	-	-	....	2700	-	-

	1	2	3	4	5	6	7	8	9	10	11	12	13
9. Romania													
	N_2	421	330	+91	+21.6	494	350	+144	+29.1	647	367	+ 280	+ 43.3
	P_2O_5	182	140	+42	+23.1	223	369	+ 52	+24.0	244	203	+ 41	+ 16.8
	K_2O	...	14	-	-	...	18	-	-	...	24	-	-
(x) Total	S.A.	...	484	-	-	...	538	-	-	...	594	-	-
10. Spain													
	N_2	487	564	-77	+13.6	563	617	- 54	- 8.8	584	574	+ 10	+ 1.7
	P_2O_5	361	369	- 8	- 2.2	375	423	- 48	-11.3	380	430	- 50	- 11.6
	K_2O	543	162	+381	-	551	224	+327	-	821	260	+ 261	- .
Total	S.A.	1391	1095	-	-	1489	1264	-	-	1485	1264	-	-
11. Turkey													
	N_2	36	176	-140	-79.5	96	168	- 72	-42.9	81	245	-164	- 66.9
	P_2O_5	69	182	-113	-62.1	48	214	-166	-77.6	54	170	-116	- 68.2
	K_2O	...	25	-	-	...	27	-	-	...	20	-	-
Total	S.A.	...	383	-	-	...	409	-	-	...	435	-	-
12. HUNGARY													
	N_2	253	299	-46	-15.4	300	346	- 46	-13.3	348	472	-124	- 26.3
	P_2O_5	152	159	- 7	- 4.4	170	181	- 11	- 6.1	167	180	- 13	- 7.2
	K_2O	...	125	-	-	...	167	-	-	...	134	-	-
Total	S.A.	...	583	-	-	...	694	-	-	...	786	-	-

(x) Taken from : The British Sulphur Corp. Ltd. Supplement, no.4, Nov.-Dec. 1971, pp.10,12,14, excep. it 9 (Romania acording to Statistics about Romania 1971, pp. 200-201 and pp. 328-329.

II.2. Specifical Features, for the countries under Study

In the basic paper, within the available information, there has been done a thorough analysis of the fertilizer output state, in the countries under study.

This survey is presenting very briefly only some aspects, characteristic of each country.

II.2.1. Albania

Albania has a nitrogen fertilizer industry, at Fieri (1), as well as an ammonia and ammonium nitrate one. In the present five-year planning, there are provisions for a super-phosphate plant at Lac; (2), as well as new nitrogen and phosphorus fertilizer plants (3).

On the basis of the known data, it is estimated that the internal output can cover the inside chemical fertilizer consumption.

II.2.2. Bulgaria

Bulgaria is a mainly nitrogen fertilizer producer, using as raw materials natural gas from inside supplies and petroleum from import (4,5,6). The nitrogen fertilizer output in Bulgaria has been directed, initially, towards ammonium nitrate of high concentration, and only later on importance has been paid to the urea output; now, special care is given to complex fertilizers.

Bulgaria is importing phosphate rock and potash salts (7). To produce N.P.K. fertilizers, Bulgaria has made use of nitric process.

The main industrial combinates, for chemical fertilizer production, are at Dimitrovgrad, Stara Zagora, Vrața, and one of the most large and up-to-date is planned to be made during the 6th developing planning, at Povelyanovo (5).

The existance and the ensuring of a raw material potential, and the great development of the fertilizer industry in Bulgaria

enable the estimation that there are proper conditions for both covering the internal consumption predicted at the level of 1980 and maintaining the state of a chemical fertilizer exporter.

II.2.3. Czechoslovakia

According to the specialized statistics, the fertilizer output in Czechoslovakia, and especially the nitrogen fertilizers, are through 1955-1970, on the top of the basic chemical product lists in point of increase dynamics.

The nitrogen fertilizer output is partially achieved on the basis of the native raw materials, lignite, (there is a tendency of being re-placed, with petrochemical products) refinery products and partially, imported natural gas (8). As for the complex fertilizer output, Czechoslovakia has to import natural phosphates, potash and sulphur salts, or intermediate products, i.e. phosphoric acid and ammonium mono-phosphate (9,10).

At the beginning of the decade, the fertilizer industry comprised the main grade types; in the future the fertilizer development is centred round urea and complex fertilizers, most of them on the basis of the phosphatic rock attack with nitric acid.

The main industrial plants are located at Sala Nad Vahom, Strazka, Zaluzi, Mostu, Lavosice. The present state and the provisions for 1970-1980, of the fertilizer industry in Czechoslovakia show that the internal output will be able to cover the consumption of the inside agricultural department and will supply an surplus amount for export.

II.2.4. Cyprus

Cyprus is interesting in point of the chemical fertilizer industry, on the basis of pyrite rocks. The European market imports large quantities of pyrite from Cyprus (11).

Considering that the total maximum consumption of fertilizers that can be reached by Cyprus is of about 100,000 AS/y and considering the increase output cost of the fertilizer plants, depending on their capacity decrease, the achievement of a Cyprus national production seems reasonable only when natural pyrite supplies are to be highly and competitively recovered.

Cyprus favourable position, as related to the main fertilizer markets, could yield a series of favourable solutions.

II.2.5. Greece

Nowadays, the economical evolution of Greece is characterized by an outstanding expansion. Greece is somehow differently directed as against the generally accepted principle of giving priority to gaseous or liquid hydrocarbon as raw materials for the ammonia output, continuing to develop its coal ammonia output, on the basis of its own sources, since it has not available petrochemical raw materials (21); the reason of this policy leads to the achievement of a nitrogen industry, not depending on outside factors (18,19,20).

Having available domestic pyrite sources, Greece is developing at present a strong sulphuric acid industry, (12,13,14).

On the basis of phosphatic rock and imported potash salts, Greece is also producing complex and mixed fertilizers (15,16,17).

The main industrial plants for intermediate products and fertilizers are located at Drapestona, Ptolemais, Thessaloniki, Nea Karvali, etc.

On the whole, at the level of 1970-1971, it is to be seen that consumption is about equal to the output, at the same time taking place a foreign trade action of fertilizer import and export.

The present economical development conditions in Greece enables the predictment of an increase of consumption, as well of the fertilizer output, in the near future, both in point of the classical grades, (superphosphate, ammonium nitrate), as well as complex fertilizers.

II.2.6. Yugoslavia

After 1966, the fertilizer industry in Yugoslavia has registered a substantial development (22). The raw materials used for the ammonia output are: coal (with a tendency to be replaced by petrochemical products), natural gases, coke gases, petroleum refinery products.

For phosphorus fertilizers, imported phosphatic rocks are used; nowadays, there are phosphatic rock prospections, foreseeing the partial covering of phosphatic rock need, on the basis of indigenous sources.

The potassium fertilizers are entirely made by means of potash salt import.

The sulphuric acid fabrication is based on waste gases from nonferrous metallurgy and on native sulphur raw materials.

Yugoslavia's fertilizer output initially based on calcium ammonium nitrate and ordinary superphosphate, is continuing its development, on the basis of concentrated fertilizers, urea, and triple superphosphate and complex fertilizers.

To produce N,P,K, fertilizers, two processes are used, attack (desintegration) by sulphuric acid and nitric desintegration as well.

Among the modern industrial complexes, the Kutina Combinate is mentioned (24).

After 1971, together with the achievement of the new industrial units, as planned, the fertilizer balance will become positive and Yugoslavia will come to be a fertilizer exporter, instead of an importer, as it was before 1966.

In the future it is estimated that the fertilizer production will cover the whole internal consumption at the level of 1975 while the further development of the fertilizer production will be achieved only in keeping with agriculture demands (22, 23).

II.2.7. Poland

The chemical fertilizer industry in Poland has many years of experience, producing a large range of grades even before the second world war.

The raw material for the ammonia production is natural gas, coke gases or coke (with the tendency to be replaced, up to 1975, by natural gas).

The phosphatic fertilizer production is based on imported phosphatic rock.

The sulphuric acid output is based on sulphur from native supplies.

The potassium fertilizers are based on imported potassium salts.

Nowadays, the fertilizer industry of Poland produces: ammonium nitrate, calcium ammonium nitrate, urea, calcium nitrate, calcium cyanamide, ammonium sulphate, ammoniac waters, ordinary superphosphate, calcined phosphate, ammonium phosphate, phosphatic rock concentrate.

In the future, the fertilizer production in Poland will extend to cover concentrated fertilizers and to fertilizers with many components (25).

It is to be mentioned the importance given in Poland to studies regarding the production and use of fertilisers containing micro-elements and liquid fertilizers.

Among the important industrial complexes are those at Pulawy (26), Gdansk, Police, etc.

Poland is an important produced of chemical fertilizers; although the use of fertilizers is intensive, in Poland it still remains an excess of production for export.

II.2.8. Romania

Starting with 1955, the fertilizer production in Romania is characterized by a continuous increase.

This industrial branch becam important within economy in Romania only after 1960, when the development has been really substantial.

Romania has important natural gas deposits, fact that allowed for the development of a strong nitrogen fertilizer industry (34).

We mention that the first ammonia plant in Europe based on natural gas, having a 1.000 t/year capacity has been put into operatic in 1939, in Romania, at Tîrnăveni.

The phosphatic rock and the potash salts are imported.

Nowadays, the fertilizer industry in Romania produces: ammonium nitrate and calcium ammonium nitrate, urea, ordinary superphosphate, triple superphosphate, complex fertilizers.

Among the most characteristic aspects of Romania's fertilizer production development, there are (27,28,29):

- the extension of concentrated fertilizer, urea and triple superphosphate production;

- the extension of complex fertilizer production;

- the production of phosphatic fertilizers in grades that ensure a maximum phosphorus solubility in water;

- the improvement of fertilizer physical qualities, in order to obtain products with as small a caking tendency as possible.

The limited available amounts of sulphur raw materials and the parallel development of the nitrogen fertilizer industry have determined, lately, the passage from phosphatic rock attack by sulphuric acid to the nitric process (30, 31, 32, 33).

Important chemical fertilizer industrial complexes in operation are at Făgăraş, Piatra-Neamţ, Craiova, Tîrgu-Mureş, Turnu-Măgurele, Năvodari, V.Călugărească and in course of building at Slobozia and in Arad.

The future development of chemical fertilizer production has in view not only to ensure the internal requirements, but also to create some nitrogen fertilizer available amounts for export.

As for the fertilizer quality, special care is given to varying the fertilizers and microelement fertilizer production.

II.2.9. Spain

The fertilizer industry development in Spain is characterized by large resources of phosphatic rock (40,41,42) as well as of important internal reserves of pyrite (43,44,45,46) and potassium(47).

Lignite and naphtha (36) are used to produce ammonia (with the tendency to be replaced by hydrocarbons).

The systematic exploitation of the pyrite mines at Huelva and the beginning of mining the phosphatic rock ores in the Spanish Sahara have created favourable conditions for a present and future development of a complete and integrated phosphorus fertilizer industry. In this respect the sensible increase of phosphoric and sulphuric acid is to be mentioned.

In Spain a varied range of fertilizers is produced: ammonium sulphate, ammonium nitrate, urea, calcium cyanamide, ordinary superphosphate, triple superphosphate, ammonium phosphate, dicalcium phosphate, complex mixed and liquid fertilizers.

The tendency for concentrated, complex and liquid fertilizers is also noticed in the qualitative development of fertilizer production in Spain.

Among the analyzed countries, Spain is the only one which has got potash salt ores, exporting great quantities in many countries of Europe, America, Africa (48).

An improvement will be also achieved in the potassium fertilizer production by introducing the potassium sulphate production (49).

Among the important fertilizer plants there are to be mentioned the following: Barros, Cartăgena, Puertollano, Tarragona, Huelva, etc.

The great development of the fertilizer industry in Spain, has practically excluded the import, internal consumption being counterbalanced by the native production.

II.2.10. Turkey

In Turkey it is noticed a developing action of the native chemical fertilizer production, in order to decrease the import, which is now increasing, due to the fact that the production did not increase at the same rate as the consumption.

One of the important problems which condition the nitrogen fertilizer industry development, in Turkey, is the dependence of ammonia on import; in the future the ammonia production in Turkey is foreseen to be based on petrochemical raw materials, at Izmir and Gemlik (50).

Turkey has sulphur raw materials, which enabled the development of a sulphuric acid production (51, 52).

The phosphatic rock is imported.

The chemical fertilizer grades produced in Turkey at present are: ammonium sulphate, calcium ammonium nitrate, ordinary superphosphate, triple superphosphate, diammenium phosphate.

It is mentioned that in the phosphorus fertilizer industry development in Turkey there have participated some countries from the East Europe.

So, Romania has achieved the ordinary superphosphate plant at Elazig and a sulphuric acid one at Samsun; U.S.S.R. has achieved a sulphuric acid unit at Bandirma (51).

II.2.11. Hungary

Unlike the other countries in the East Eurdpe (Bulgaria, Poland, Romania) the fertilizer industry development in Hungary, has recorded a slower progress.

In contrast with the previous period, the present and the future stage are characterized by an important development of the fertilizer industry.

The raw materials used for the nitrogen fertilizer industry were lignite and coke(oven) gases till 1964, when they passed to the natural gas import from Romania (57). At present, the nitrogen fertilizer industry in Hungary is greatly based on its own sources of natural gases.

The phosphatic rock (53) and the potash salts are imported.

The nitrogen industry of Hungary was centered on calcium ammonium nitrate and only during the more recent period urea was introduced in the production profile.

As well, until recently, the phosphorus fertilizer industry was dominated by ordinary superphosphate production.

The general tendency to produce complex and concentrated fertilizers was adopted and developed now on a large scale in Hungary too(55, 56, 58, 59, 60).

It was adopted the nitric process to desintegrate the phosphatic rock (54).

Among the important chemical fertilizer complexes we mention: Kazincbarcika, Varpalota, Tiszapalkonya, Peremarton, Szalnok, Budapest, etc.

The special development, in the last period, of the fertilizer production in Hungary will enable to cover the internal consumption (without an important available quantity for export).

As a result, Hungary will no longer be a commodity market for the great fertilizer producers.

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CH. III. TENDENCIES REGARDING CHEMICAL FERTILIZERS IN THE COUNTRIES UNDER STUDY AS COMPARED TO OVERALL WORLD TENDENCIES

The state of fertilizers, consumption and production in the countries this report deals with, in most cases reflects the application of the most advanced tendencies at a world scale to each country particular conditions.

These countries possess or get from outside the raw materials required for chemical fertilizer industry.

Except Cyprus and Malta, that have not yet a chemical fertilizer industry of their own, all these countries we studied have developed strong fertilizer industries based on inner or imported raw materials and intermediate products, including large size plants, based on advanced processes from a technical point of view.

The latest achievements introduced in the manufacturing processes at a world scale have been obtained by most of the mentioned countries.

Thus, large ammonia plants of a 600-1000 t/day, with a single production line, provided with steam drive centrifugal compressors, minimum electrical power consumption and thermal power generators are under construction or in operation in countries such as: Bulgaria, Czechoslovakia, Poland, Romania, Spain and Hungary.

Modern urea large sized plants, with total circulation, based both on conventional urea manufacturing processes and on modern "stripping"-type processes are under construction or in operation in: Bulgaria, Czechoslovakia, Poland, Romania, Spain and Hungary.

Nitric acid, ammonium nitrate, sulphuric acid, phosphoric acid, ammonium phosphates, nitrophosphates etc. process plants are also

characterized by large sizes, being based on equipments and processes among the most up-to-date ones.

The modernizing of the manufacturing processes and the growth of production lines capacity enable the use of computers to operate the chemical fertilizer plants to increase the efficiency.

The efficiency of such large-sized units based on up-to-date processes is embodied by the production cost decrease of final products and intermediate products.

These industrial complexes achievement enabled the manufacturing of new modern fertilizer grades and - at the same time - contributed to the economical national system consolidation in the respective countries.

The problem of pollution, much debated at international level lately also constitutes a steady preoccupation for the analysed countries, having an advanced fertilizer industry.

We quote Czechoslovakia's and Romania's processes for sulphur dioxide recovery in the waste gases that, besides avoiding, the pollution effect, also obtains the sulphur dioxide recovery with outstanding economical results (4).

Most of the analysed countries acknowledge the advantages of concentrated fertilizers and the importance of a correct ratio between the three basic nutrients: nitrogen, phosphorus, potassium.

In this respect, the fertilizer industries in most of the analysed countries record qualitative transformations, thus the production of high grade concentrated and complex fertilizers acquiring a particular value.

As regards liquid fertilizers, we can conclude that their use is so far, restricted in the analysed countries both to radicle and extraradicle nutrition.

The advantages of the liquid fertilizers (the possibility of accurate uniform fertilizer spreading the possibility of introducing them into the irrigation water, the absence of caking and dusting, and of mixed fertilizer segregation, lower costs for their storage and handling than for solids, the possibility of mixing them with insecticides and herbicides) plea for the expansion of their use.

Czechoslovakia, Yugoslavia, Poland, and Spain are particularly preoccupied by the use of liquid fertilizers.

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From the aspects analysed herein, we come to the conclusion that the countries this report refers to, are in full developing quantitative and qualitative progress in the fertilizer production and consumption evolution.

We appreciate that the moment chosen for working out this analysis is one of the most acute in the fertilizer history of these countries.

It is to underline the fact that the experience of the countries with strong industries and intensive use of chemical fertilizers is well-known, and the results thus obtained are applied in many of the countries under study.

Countries that developed more recently the fertilizer industry have overlooked the stages of looking for efficient technical solutions, enjoying the most up-to-date progress reached by advanced countries in the production and the use of fertilizers.

The concentration of production in large industrial complexes, the efficient transport of raw materials, intermediate products and final products, yield the premises for stimulating and developing the inter-countries cooperation.

In the future, one can foresee technical progresses in the fertilizer industry, that should lead to the continuous decrease of investments and production costs and that should enable the production of such grades that meet to the greatest extent the plant nutrition requirements.

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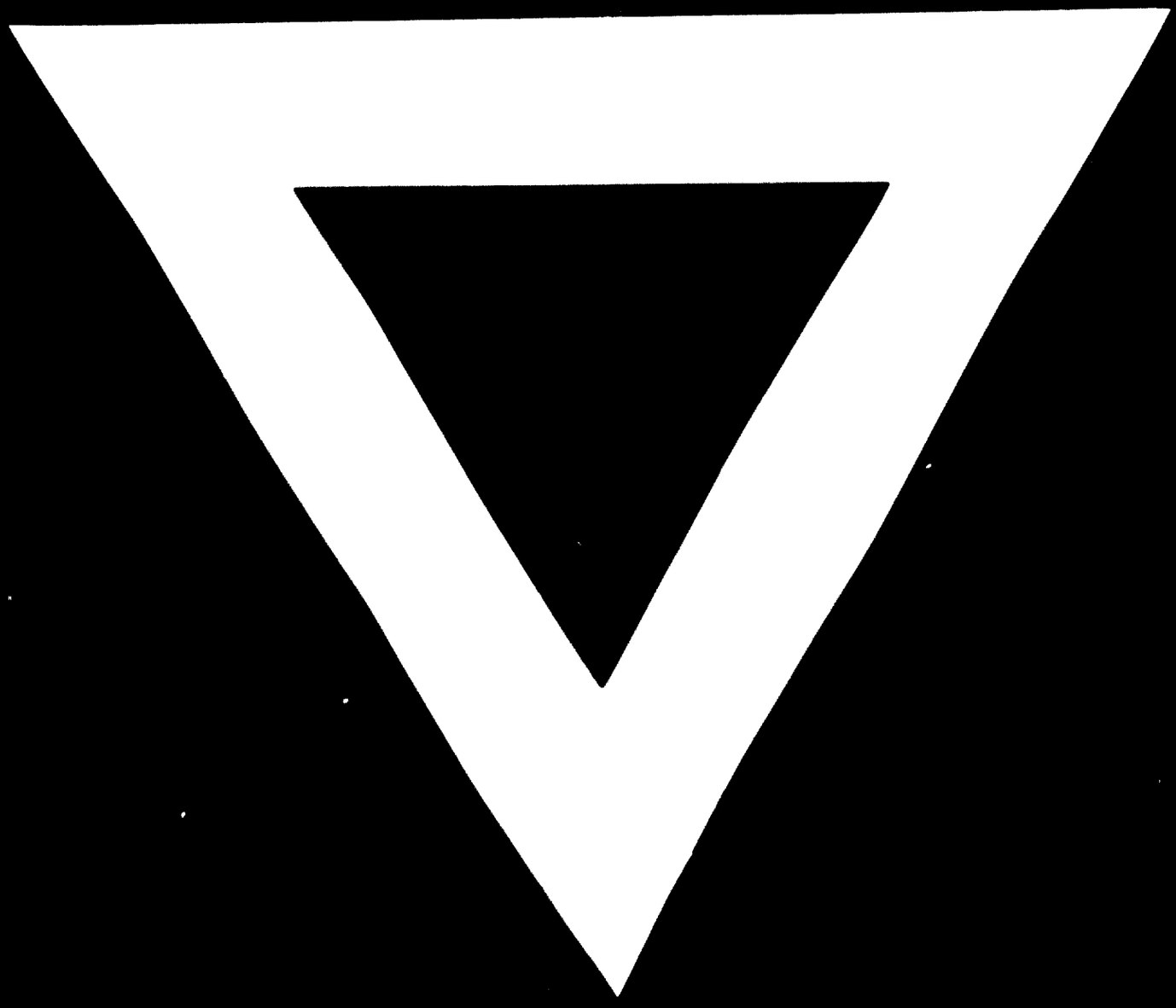

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