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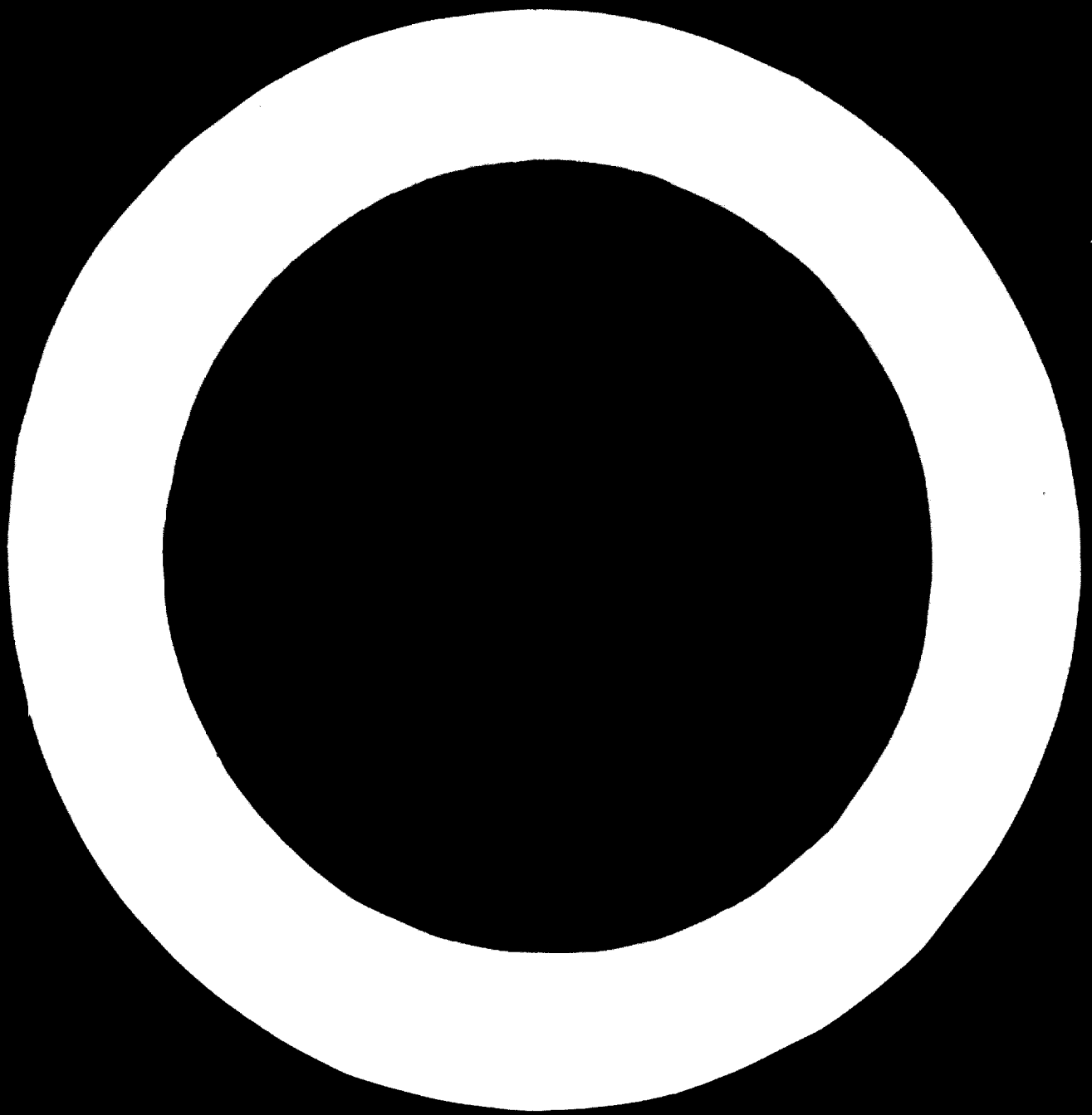
THE FERTILIZER INDUSTRY OF POLAND

by

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The Polish fertilizer industry has many years of experience. As far back as before the World War II a nearly full assortment of fertilizers was produced in this country.

Already before the war a steam reforming plant was commissioned for synthetic gas production based on natural gas.

The Polish fertilizer industry development is connected with the names of the well known chemists as Polzeniusz, I. Mościcki and T. Hobler.

During the second World War Polish fertilizer industry was severely damaged. The first years after the War were the years of the Polish industry reconstruction. In these years favourable conditions were created for extension of fertilizer industry. In consequence of the fundamental social and economic reforms the economic level of the farmers rose as well as their purchasing power. In the consecutive five years investment plans expenditures on fertilizer industry were considerable, about 20 per cent of all capital expenditures on investment in chemical industry in that time.

The growth of fertilizers consumption is shown in the table below in which the consumption of three main fertilizing constituents NPK in the period of 1955 to 1970 are listed as well as the planned fertilizers consumption till 1980.

Fertilizers consumption increase in Poland

Year	1938	1950	1955	1960	1965	1970	1975	1980
	2	3	4	5	6	7	8	9
Nitrogenous fertilizers thousand tons N	30,1	93,7	138	251	386	834	1250	1500
Phosphoric fertilizers thousand tons P ₂ O ₅	54,4	102,6	146	180	324	648	1000	1250
Potassium fertilizers thousand tons K ₂ O	40,6	166,2	260	312	396	1130	1550	1750
Total thousand tons NPK	125,1	362,5	544	743	1106	2612	3800	4500
Fertilizers consumption kg NPK/ha arable soil	4,91	17,7	26,7	136,5	56,4	123,61	195	230

As can be seen from the above figures the quantities delivered to the farmers allowed to increase the very small doses as they were before the war and immediately after the war up to 123.6 kg NPK per hectare in 1970. As result of further fertilizer production increase 195 kg NPK consumption will be reached in 1975 and 230.7 kg NPK/ha are expected in 1980.

The plan of fertilizer consumption up to 1975 is nearly the same as the production plan of nitrogenous and phosphoric fertilizers. After 1975 some import of phosphoric fertilizers is foreseen which for 1980 is estimated at 230 thousand tons P_2O_5 .

Periodic shortages or surpluses are compensated by import or export. Potassium fertilizers are all imported.

The following compilation proves that the opinion of great effectiveness of fertilizer application and their favourable influence on yield was correct. In this compilation are given average yields over longer time periods, average fertilizer consumption in pure nutrients NPK per hectare as well as crops increase per 1 kg NPK/ha.

Period	1956 - 60	1961 - 65	1966 - 70
	1	2	3
4 cereals yield q/ha	15,10	17,40	20,2
NPK consumption kg/ha	31,2	46,8	92,7
Crops increase kg/ha	-	230,0	280,0
NPK consumption increase kg/ha	-	15,6	45,9
Cereals yield increase kg for kg NPK/ha	-	14,7	6,1

Assortment

Nitrogen fertilizer industry in Poland produces the following nitrogenous fertilizers: ammonium nitrate, lime ammonium nitrate, which are both about 58 per cent of all nitrogenous fertilizers, urea which is about 33 per cent of all nitrogenous fertilizers, calcium nitrate, calcium cyanamide, ammonium sulphate and aqueous ammonia.

Participation of particular fertilizers assortments until present time and in future is shown in the table below.

Nitrogenous fertilizers assortment in 1955 - 80 in thousand tons N.

	1960	1965	1970	1975	1980
Lime ammonium nitrate 25 %	98,2	147,3	225,0	127,3	273
Calcium nitrate	13,4	12,3	8,0	9	9
Ammonium nitrate	94,3	94,2	370,0	690	642
Calcium cyanamide	36,2	34,4	2,2	-	-
Urea	0,4	42,8	390,0	405	440
Ammonium sulphate	26,4	45,0	63,0	88	100
Aqueous ammonia and other liquid fertilizers	1,1	18,0	13,8	22	88
Complex fertilizers	-	-	-	120	196
Total	270,0	394,0	1031,0	1967	1700

Raw materials

Poland has satisfactory conditions for nitrogenous fertilizer industry development, and these are raw materials and adequate energy sources.

Raw material for ammonia production is natural gas, coke and coke gas. Modern methods of ammonia production from natural gas through high pressure steam reforming produce much cheaper ammonia. Under Polish conditions the ammonia production cost difference between ammonia based on coke and natural gas is 40 per cent. For this reason all the plants based on coke will be changed to natural gas until 1975, when 95 per cent of ammonia production will be based on natural gas.

Nitrogen plants

There are at present in Poland four large nitrogen works and the fifth is being built. Three of them were constructed according to Polish design and the apparatuses were manufactured mostly in this country.

The Puławy Works were built under foreign licences. The production capacity, 3,000 tons of ammonia per day places these works among the greatest in the world.

Phosphoric fertilizers

The following types of phosphoric fertilizers are produced in Poland: simple superphosphate, thermo phosphate, ammonium phosphate and ground phosphate rock.

Phosphoric fertilizer production developed is shown in the table below where are given plans for particular assortments till 1980.

Phosphoric fertilizer assortment in thousand t P_2O_5 .

Lp.	Year	1960	1965	1970	1975	1980
		3	4	5	6	7
1.	Granulated superphosphate	43,2	80,0	154,0	184,0	340,0
2.	Dusty superphosphate	81,0	154,0	270,0	218,0	
3.	Triple superphosphate	-	-	43,0	142,0	-
4.	Thermophosphate	64,8	79,8	87,0	45,0	-
5.	Dicalcium phosphate and other / ground phosphate rock, bone meal /	18,0	30,2	-	-	-
6.	Ammonium phosphate	-	-	-	220,0	220,0
7.	NPK fertilizer	-	-	-	110,0	220,0
8.	Ground phosphate rock	-	-	45,0	63,0	80,0
9.	PK fertilizer	-	-	-	-	140,0
10.	Complex liquid fertilizer	-	-	-	-	20,0
Total:		207	344	599	982	1020

Phosphoric fertilizer production according to farmers' expectations will be extended in form of multi - component fertilizers solely. After 1975 production of three component NPK fertilizer will be started based on ammonium phosphate with the ratio 1 : 3 : 3. After 1975 production of two component potassium - phosphorus fertilizer is also planned as well as production of so called spring fertilizer with the ratio 1 : 1 : 1.

Production of phosphoric fertilizers takes place in ten works of various sizes. Recently two modern phosphoric works were built: phosphoric acid plant and triple phosphate plant in Gdafsk with the capacity of 138 thousand tons P_2O_5 per year and ammonium phosphate plant in Police near Szesecin. The latter one is being erected and after its completion will produce 440 thousand tons per year in four production lines.

Phosphoric fertilizer plants were built according to Polish design. Only for ammonium phosphate and triple superphosphate plant based on phosphate rock from Morocco the licence was bought.

Raw materials

Phosphoric fertilizer production is based on phosphate rock imported from North Africa and USSR. Sulphuric acid production - half product for phosphoric fertilizers - is based on Polish sulphur.

Potassium fertilizers

The whole requirement of potassium fertilizers is covered now and in future by import of potassium salts from G.D.R. and USSR.

By steps as complex fertilizer production grows it is expected that bigger quantities of K_2O will be supplied in this form.

Other fertilizers

In addition to the above described other fertilizers are becoming important along with the growing level of soil cultivation.

These are:

Calcium fertilizers

Liming of the soil has become one of the main measures in soil cultivation.

The requirements in this regards are covered by the following sources:

1. Mining and milling of natural limestone, chalk and dolomite.
2. Milling high furnaces slags and other industrial waste.

Magnesium fertilizers

Magnesium requirements are covered in parallel with calcium supplies in dolomites, high furnace slage and other industrial waste..

Micronutrients

Agricultural experimental stations have determined the initial micronutrients requirements for agriculture and have estimated their range. During the next 10-15 years the number of applied micronutrients can be limited to: boron, copper, manganese, molybdenum and zinc.

Actually superphosphate with boron which contains 2.5 ± 0.5 per cent boron compounds - B_2O_3 - is used on a large scale.

It is planned that these micronutrients requirements will be covered by industrial waste utilised for soil liming and in form of additions to fertilisers, particularly to superphosphates and thermophosphates and in form of salts and others applied for spraying as well as for special purposes in form of chelates.

The problems concerning production and application of micronutrients are naturally studied in the scientific institutes of agriculture and chemical industry.

Liquid fertilizers

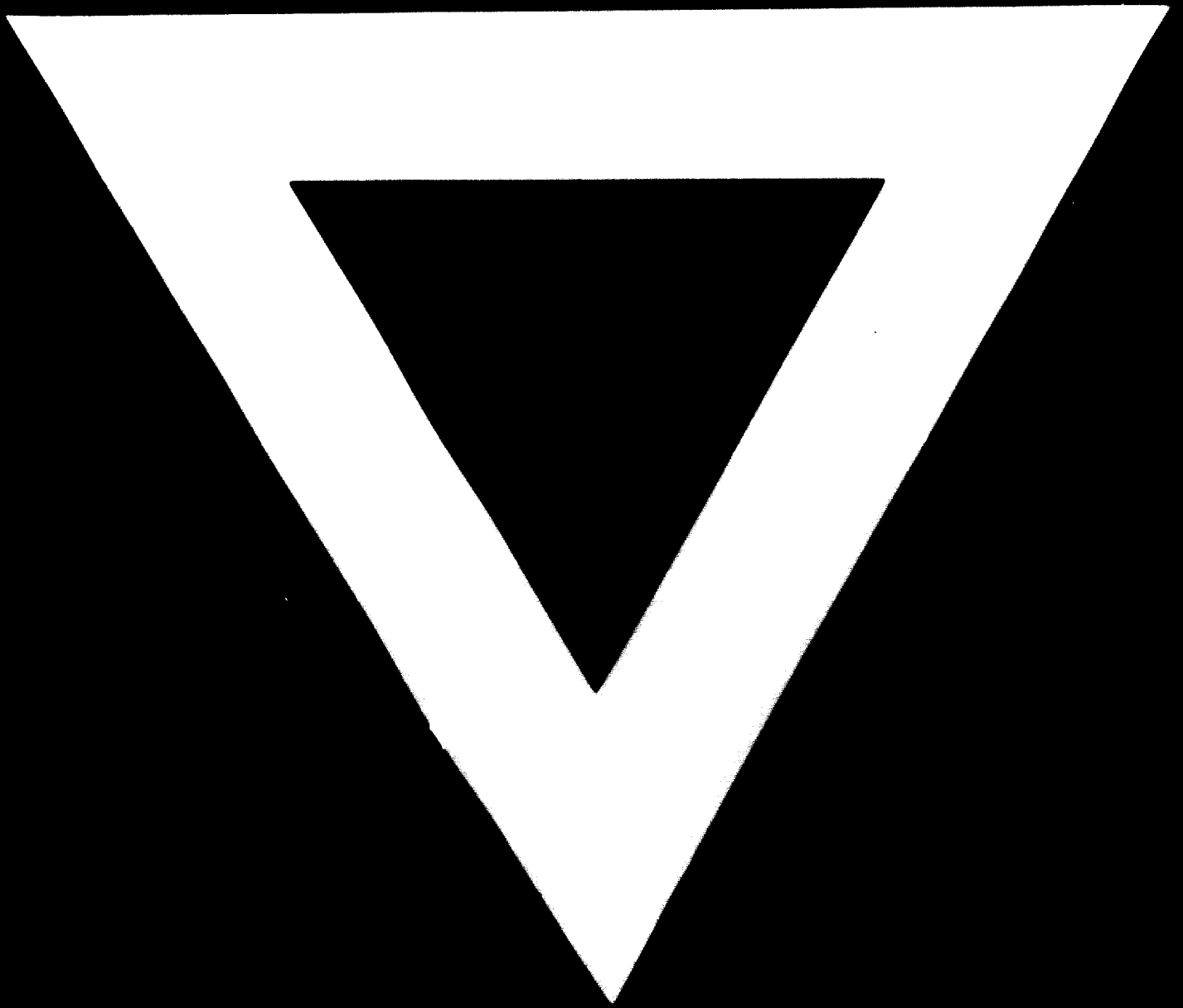
The only liquid fertilizer which is applied in Poland is aqueous ammonia. Production and application of other liquid fertilizers are being studied.

Economical problems

Until recently the demand for fertilizers was greater than their supply. This was the result of farmers professional education on one hand and good price margin between fertilizers and agricultural products prices on the other.

The increase of crops obtained in grain and straw, of root crops, industrial and pasturable root crops, as result of fertilizer application and price policy encourages farmers for a wide application of fertilizers. This is the fundamental State's policy, which aims at a greatest possibly reduction of grain and other food stuffs imports.





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