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Agenda item III/7

DEVELOPMENT OF ADVANCED METHODS FOR THE PRODUCTION OF
CONCENTRATED PHOSPHORIC AND COMPOUND FERTILIZERS,
CARRIED OUT WITHIN THE FRAMEWORK OF CMEA^{1/}

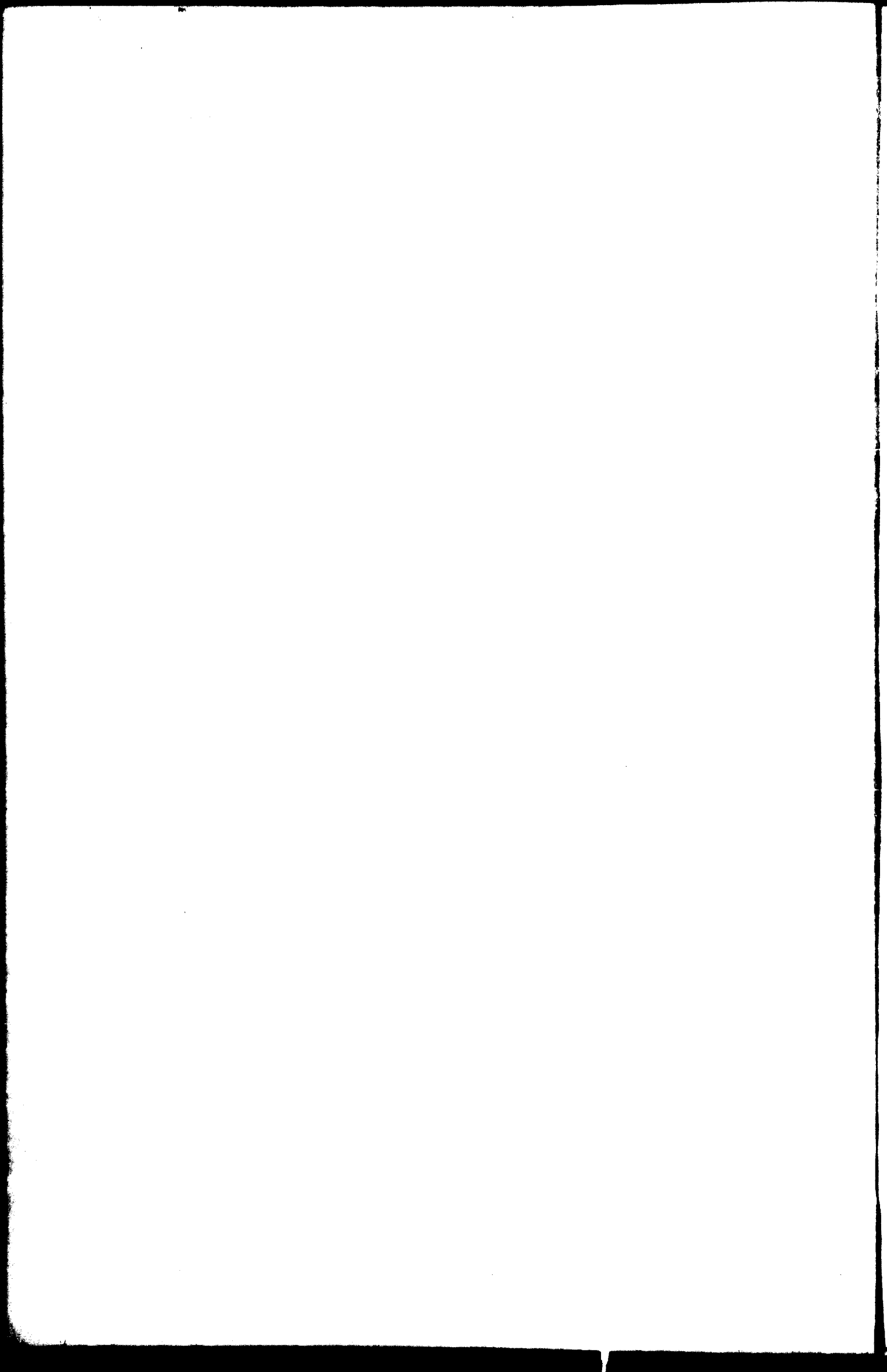
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Agricultural chemicalization, above all, through the growing output and consumption of mineral fertilizers, proves to be a major factor for further intensification of agricultural production. As revealed by the calculations made in the USSR, the application of mineral fertilizers, one of many factors affecting harvesting power, accounts for about 50% of harvest growth.

Within the 1950-1970 period the output of mineral fertilizers in CMEA member-countries increased by 6.9 times, the rise in the production of nitrogenous fertilizers being 11.2 times, phosphorous - 7.5 times, and potassium - 4.5 times. The proportion of CMEA members in the world output of mineral fertilizers (in terms of total nutritive capacity) rose from 21% in 1950 up to 32.6% in 1970.

The rapid growth of mineral fertilizer output in the CMEA member-countries is due, in particular, to the coordination of the countries' efforts within CMEA framework for the solution of some major problems which are of crucial significance, as far as conditions and development potentialities in this branch of national economy are concerned. These problems are being solved by combining the efforts of the interested CMEA countries for development of mineral deposits, elaboration and perfection

of production schemes and processes in mineral fertilizer output, manufacture and delivery of complete-unit and specialized equipment, product unification and standardization, as well as by coordinating research and experimental work. All of the problems are being solved in a complex way, involving close cooperation of all CMEA members, the coordination of their efforts being realized by the corresponding CMEA body - the Standing Commission on the Chemical Industry.

The CMEA Standing Commission on the Chemical Industry used information supplied by the member-countries for the technico-economic analysis of production and consumption of mineral fertilizers in CMEA countries. The purpose of this analysis was to throw light on the present state of affairs in this branch of national economy, to compare it with the progress made in the production and consumption of mineral fertilizers in other countries and to pinpoint main trends of further development in this field. Through the joint efforts of the CMEA Standing Commissions on the Chemical Industry and Agriculture and using the information received from the member countries, the CMEA member-countries requirements for mineral fertilizers (as to quantity and assortment) have been determined for the next 15-20 years, taking account of the norms existing in advanced intensive farming. The said materials are being used to work out basic development trends for cooperation among CMEA member-countries in the field of mineral fertilizer output. The Standing Commission on the Chemical Industry is directing this work towards preservation of high development rates in the mineral fertilizer industry in

CMEA member countries and towards raising the absolute and relative quantities of highly concentrated and compound fertilizers so as to enable agricultural requirements to be met in full. Thus, for instance, the proportion of urea in the assortment of nitrogenous fertilizer consumption in CMEA member countries amounted in 1960 to mere 1.5%; in 1965 it rose to 11%; and the planned figure for the coming years is up to 17-18%. The proportion of compound nitrogenous fertilizers will attain 48-52% by 1971, whilst the sum total of concentrated (ammonium nitrate, urea) and compound fertilizers will be up to 90-93%. Compound phosphorous fertilizers will account for 80%. At the same time, some CMEA countries intend to abolish completely ordinary superphosphate by going over to the production and consumption of concentrated superphosphate.

To promote further progress in the production of mineral fertilizers and taking account of today's trends in their changing assortment, the Standing Commission on the Chemical Industry is giving much attention to research and experimental work on these lines.

Cooperation among CMEA member countries in research and experimental work involves coordination of national plans of research and realization of this research either by own efforts and resources or through joint undertakings. In that case the division of labour is specified by contract and financing is effected both from joint contributions and from the resources of every one of the participating countries, as agreed upon by the countries concerned.

Coordination of activities on one or other research theme within the framework of the CMEA Standing Commission on the Chemical Industry is carried out by the Scientific-Technical Council (STC) with membership comprising the heads of the specialists' groups from every participating country. The Scientific-Technical Council holds periodic meetings, at least once a year, to discuss the progress of work on the theme as a whole and on individual assignments and to plan specific measures to eliminate lagging behind, if any, in the fulfillment of separate assignments, to elaborate working plans for subsequent periods, and to prepare a final statement upon termination of work on the theme as a whole and presenting it for approval by the Commission. The Scientific-Technical Council periodically reports to the Commission on the progress of work to enable the necessary decisions to be taken.

The Scientific-Technical Council's working plan provides for experimental and project studies, for dividing the themes into specific assignments, and specifies the terms of their fulfillment by members of the work. The plan indicates the target to be attained in the work over the planned period, emphasis being laid, above all, on preparing the results of the work for commercial realization.

It is, moreover, pointed out in the working plan what forces and what organizations in every one of the countries are carrying out the given part of work.

Upon termination of the work or during its progress the Scientific-Technical Council decides on questions related to patent claims and publication.

Financing, material and technical resources, as well as provision of scientific cadres are carried out by each country within the framework of national planning, in accordance with the coordinated working plan on the theme. Should there arise a need for unique equipment, instruments, materials, etc. to be found in another country, the working plan provides for the use of such instruments and materials by a specific agreement between the countries.

Of all the three basic types of mineral fertilizers - nitrogenous, phosphorous and potassium - by far the greatest importance is attributed at present by the CMEA Standing Commission on the Chemical Industry to the problems related to the development of production of phosphorus-containing fertilizers, because, apart from the USSR, the CMEA member-countries have no phosphorous raw materials of their own.

The CMEA Standing Commission on the Chemical Industry and its working group in this field - working group on mineral fertilizers - have worked out a programme of cooperation between CMEA member countries to promote further progress in the production of phosphorus-containing fertilizers. Accordingly, much attention is being given to development and commercial realization of rationalized methods for raw materials processings, to development of new processes for production of highly-efficient concentrated and compound varieties of phosphorus-containing fertilizers, to development of new production equipment, process lines, etc.

Functioning since 1965 under the auspices of the CMEA Standing Commission on the Chemical Industry, as desired by CMEA member-countries, has been a scientific-technical council on the theme "Development of Advanced Method for Production of Concentrated Phosphorous and Compound Fertilizers". Its membership includes specialists from seven member-countries - Bulgaria, Hungary, the German Democratic Republic, Poland, Rumania, the Soviet Union and Czechoslovakia.

By today the various countries have reached the following results in their progress along the main guidelines (assignments) of the given theme:

1. Development and industrial realization of production processes in the manufacture of wet-process phosphoric acid.

This work is aimed at laying down the foundation for production of wet-process phosphoric and polyphosphoric acids and setting up on their basis the production of concentrated phosphorous and compound fertilizers (solid and liquid). The efforts are aimed both at finding out the most economical methods of wet-process acid concentration and at obtaining strong phosphoric acid in the very concentration process (semihydrate process, decomposition of phosphorous-containing raw material with oleum, etc.). It is assumed that production of strong phosphoric without concentration will reduce its costs (compared to that of wet-process acid) by about 8% and specific capital expenses, by about 15 to 20%. By today the following research on a semi-commercial scale has been completed in CMEA member-countries:

- in production of highly-concentrated phosphoric and semiphosphoric acids from wet-process phosphoric acid by immersion burning (Poland); data have been released for design of a large-size semi-industrial setup;

- in production of polyphosphoric acid from wet-process phosphoric acid by the method of barbotage concentration (in the Soviet Union); the results obtained have been used to furnish data for commercial projects;

- in production of strong (43-45% P_2O_5) phosphoric acid from apatites and phosphorites in the semihydrate process (in the Soviet Union); basic process indices have been recorded. The experimental results have been used in project studies for installing complementary equipment at commercial extraction setups;

- in new designs of extractors, vacuum-filter and deep-suction pump to be fit into the cascade scheme of wet-process phosphoric acid production.

Besides, work is continuing to develop the cascade scheme of wet-process phosphoric acid production with relevant data having been released for project studies on a commercial scale (in the Soviet Union). Efforts are also being made towards improvement of the process of phosphate ore decomposition by the dehydration technique with a view to achieve an intensification of the process and increasing the specific output per unit volume of the processing plant, along with the furnishing of data for reconstruction of existing chemical departments (in Poland).

2. Development of process technology and highly efficient plant for production of concentrated compound fertilizers, including plant operating on the low-return scheme.

As calculated by the USSR's organizations, the substitution of unblended fertilizers with compound ones in agriculture will result in substantial saving on labour expenses (0.2-0.3 man/day per 1 ton of fertilizer) on capital costs, by 8-10%, and on the cost of labour involved in application of the fertilizer to the soil, by 5-6%. Even if confined to a single coke-chemical plant, the production of ammonium phosphates and their application in agriculture in place of an equivalent amount of ammonium sulphate and double superphosphate will entail a saving of over 1.5 mil. roubles a year.

By the present time the stage of commercial realization has been reached in COMECON member countries on the following projects:

- production of nitrophoska by the nitrogen-sulphuric acid method (realized on a commercial scale in the German Democratic Republic, the Soviet Union and Czechoslovakia);

- Production of nitrophoska by the carbonate method (at the stage of commercial realization in Czechoslovakia);

- production of diammonitrophoska, diamphos (16.5:48) and diammonureosfoska (18:18:18) with the use of the ammoniator-granulator (data for project studies have been released - the Soviet Union);

- production of nitrophoska by the freezing method (a commercially operating department built in Czechoslovakia);

- production of compound fertilizers (nitrophos, nitrophoska, nitroammophos, nitroammophoska, ammophos) with the use of an originally designed apparatus (PKSG) which combines drying and granulation processes (commercial design data have been released - the Soviet Union). The use of the new apparatus will enable the specific electric power and fuel consumption in fertilizer drying and granulation to be reduced by, respectively, 7.6 kWh/t and 29 kg/t even in comparison with the universally known spherodaiser of the "PEK" company. Moreover, the manufacture of the more efficiently operating PKSG in place of spherodaiser and dryers entails an annual saving of metal in excess of 1 t per 1000 t of fertilizer output;

- production of liquid and compound fertilizers on the basis of thermal phosphoric acid (in the Soviet Union);

- data have been issued for designing a chemical department for production of concentrated compound fertilizers on the basis of ammonia and polyphosphoric acid (pressureless) - in the Soviet Union.

Besides, work is continuing today in COMECON member countries in the field of production of potassium and calcium polyphosphates, in development of production technologies to obtain highly concentrated compound fertilizers with the use of urea, in drawing up optimal parameters for production of compound fertilizers through nitric-acid decomposition from various grades of phosphorous raw material, as well as in the development of production technologies to obtain fertilizers from not easily concentrated phosphorites by means of thermal technique. All the

above activities are to be continued up to the point of furnishing data on semi-commercial and commercial design and realization.

3. Development of production technologies to turn out mixed and compound-mixed fertilizers.

Brought up to the stage of commercial realization in CMEA countries have been the following research projects:

- production of granulated compound-mixed fertilizers with the use of the tray-type granulator (in Czechoslovakia); a project of production line with an annual capacity of 20 to 50 thousand tons of fertilizers has been prepared. Products of different grades have been examined on a large scale as to their physico-chemical properties and agrochemical efficiency;
- production of granulated compound-mixed fertilizers with the use of the rotating drum (Soviet Union). Design work is in progress on fertilizer-mixing plant of 50 and 100 thousand tons capacity annually.

Research on semi-commercial scale is being carried on in:

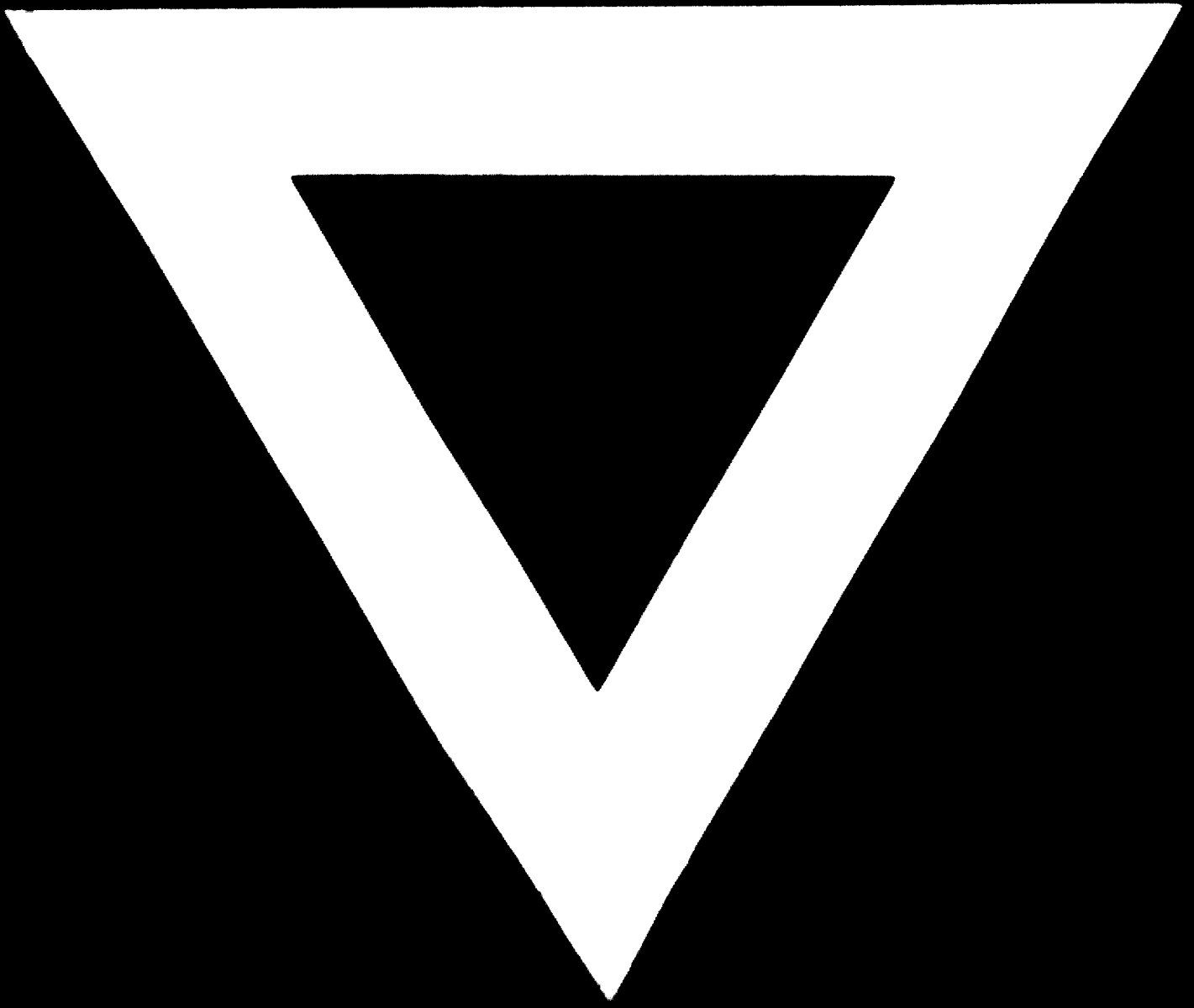
- production of NPK-fertilizers with the use of the granulation stage of urea-formaldehyde, urea-acetaldehyde and urea-furfural condensates (Czechoslovakia). Production setups of 200-300 kg/hr capacity were used to yield fertilizers of 13:10:13 composition, whose agrochemical properties have been tested in vegetation and field experiments. Technical-economic calculations have revealed that the use of these fertilizers may yield profit amounting to 100-400 crowns/hectare, due to increasing farm yields.

Work is also continuing at present for the development of production technologies to obtain concentrated liquid and suspended fertilizers on the basis of nitric-acid decomposition of phosphate raw material. Other work deals with the development of technological processes to derive concentrated liquid PK and NPK fertilizers on the basis of concentrated wet-process orthophosphoric acid.

Work being carried on within the STC framework deals, among other things, with the production of compound fertilizers comprising slow-acting forms of nitrogen and potassium, with the development of production technologies to obtain compound fertilizers comprising microelements, as well as with the improvement of physico-mechanical properties of mineral fertilizers and with the standardization of techniques for their assessment, and with some other problems.

On a number of additional issues resulting from the above theme, work is carried on also in line with the research coordination plan of the working group on mineral fertilizers. The CMEA Standing Commission on the Chemical Industry at one of its latest sessions approved the 1971-1975 coordination plan for this working group.

The interested CMEA countries' opinion and the achieved positive results being duly taken into account, the CMEA Standing Commission on the Chemical Industry is taking steps to promote further coordination of cooperation plans of the CMEA member-countries for carrying on research and experimental work, including the continuation of the STC activities on the theme under consideration.



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