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THE DEVELOPMENT OF RESEARCH ON AGRICULTURAL SUBJECTS

Following is a translation of an unsigned article in the Russian-language journal Vestnik Akademii Nauk SSSR (Herald of Acad Sci USSR), No 12, 1962, pp 92-95.

11.31

At its session of 12 October the presidium discussed the status and prospects of research being carried out at the Academy and directed toward the development of agricultural science and practice.

In opening the session Academician M.V. Keldysh reminded the members that during the discussion of this problem on 4 May the Presidium noted the lack of proper contact between the departments of chemical and biological sciences and agricultural science and practice and outlined a number of measures for the purpose of implementing the decisions of the March Plenum of the CC CPSU.

The President stressed the fact that, while the problems of selecting new varieties of plants and breeding highly productive species of animals must be developed in the Acad Sci USSR and in the scientific research agricultural institutes, there are problems which should be developed primarily by chemists and biologists of the Academy. These are first of all the synthesis and study of physiologically active substances and various types of fertilizers. The most important task as indicated by the president consists of raising to a proper level the work on the synthesis of herbicides, their study, and the creation of herbicides of general and selective action.

Reports to the session were submitted by Vice-President of the Acad Sci USSR Academician A.V. Topchiyev, Academician S.I. Vol'fkovich (of the Department of Chemical Sciences) and Corresponding Member of the Acad Sci USSR Yu.V. Rakitin (of the Department of Biological Sciences).

As shown by the reports, the decree of the Presidium of 4 May contributed to the development of scientific research connected with the problems of agriculture. The commission created at the departments of chemical and biological sciences summarized the suggestions of these institutes and outlined the ways of further development of these investigations and measures of speeding up the introduction of obtained results.

As suggested by the Acad Sci USSR, several completed scientific works are being introduced into practice, measures are prepared jointly with the Ministry of Agriculture USSR on the implementation of a number of other works, and a considerable number of works are referred for state tests and experimental-industrial verification.

The manufacture is expanding of actamethyl -- a phosphoroorganic insecticide of systemic action synthesized at Kazan' Chemical Institute of the Academy; a decision has been arrived at concerning the organization of the production of the contact insecticide adlrine, developed by the Institute of Organic Chemistry imeni N.D. Zelinskiy and by the Scientific Research Institute of Fertilizers and Insectofungicides imeni Ya.V. Samoylov, and the defoliant -- endotal -- suggested by the Institute of Organic Synthesis of the Acad Sci Latvian SSR. The plan of the Ministry of Geology and Conservation of Mineral Resources SSSR includes works on the development of potassium deposits of Kanskiy-Taseyevskiy Rayon of Krasnoyarskiy Kray where the Chemico-Metallurgical Institute of the Siberian Department of the Academy detected a unique deposit of sylvinite.

The Department of Chemical Sciences jointly with the Ministry of Agriculture USSR completed the preparation of suggestions regarding the utilization in agriculture of 10 new preparations developed by the institutes of the Acad Sci USSR of the union republics. These include: M-81 insecticide for the control of harmful suctorial agents of cotton, tetrachloropropane -- a preparation for controlling phylloxera of the vineyards, the K-20-35 preparations and avenin for the control of the garden beet weevil, a new zoocide ratindan, MG-T herbicide, a preparation for animal husbandry -- tokoferrol -- etc. Seven preparations were forwarded to the Ministry of Agriculture USSR for state tests.

The Department of Biological Sciences submitted to the Ministry of Agriculture USSR 15 suggestions for implementation in production. Some of these suggestions are being im-

plemented now. Thus, for instance, in regard to ultraviolet irradiation as a means of raising animal productivity, an order of the Ministry of Agriculture USSR has been issued and an instruction approved, prepared by the Institute of Biophysics. In order to raise the fertility of Persian lambs, vitamin A is widely used this year in the Turkmen SSR. At a number of hydrolysis plants a production of Vitamin B₁₂ has been envisaged for the use in animal husbandry.

A considerable expansion has taken place of works in the Institute of Genetics on the increase of fat-milkiness of cattle and on the increase of productivity of hogs and fowl.

A number of practical recommendations concerning the use of defoliants, inhibitors, and desiccants as means of growth regulation and development of agricultural crops, as well as the reduction of losses in gathering and storing the harvest, has been approved in the wide network of agricultural experimental stations. New varieties of agricultural crops of the Main Botanical Garden and Institute of Genetics are undergoing state testing.

Together with measures on accelerating the introduction of completed works, the research is being expanded on the problems of chemistry and biology connected with agriculture. In the institutes of the Department of Chemical Sciences new laboratories have been organized -- that of photosynthesis at the Institute of Geochemistry and Analytical Chemistry named V.I. Vernadskiy, corticoid compounds at the Institute of Organic Chemistry, enzymic catalysis at the Institute of Chemical Physics; in a number of institutes new groups have been created by transferring the associates of these institutes to work on agricultural problems.

At the Institute of Organic Chemistry works have begun on the synthesis and study of the mechanism of the herbicide action with the use of radioactive isotopes, on the study of ways of synthesis and stereochemistry of transformation of polycyclic compounds, akin to gibberellins, on the synthesis of physiologically active substances on the basis of cyclohexene- and cyclohexane-butanols, as well as cycloheptones, etc. At the Institute of Elemental Organic Compounds works have been expanded on the synthesis of food aminoacids, and at the Institute of Chemical Physics -- on the kinetics and mechanism of nitrogen fixation by the enzymic systems of microorganisms.

At the request of the Ministry of Agriculture USSR, research has been undertaken at the Institute of Microbiology, Main Botanical Garden, and Botanical Institute imeni V.L. Komarov on the control of cotton wilt.

A considerable expansion has taken place of research at the departments of chemical and biological sciences on various subjects which had been previously undertaken by Academy scientists.

In particular, in a number of chemical institutes which are in contact with the establishments of the Department of Biological Sciences, State Committee on the Council of Ministers USSR on Chemistry, and All-Union Academy of Agricultural Sciences imeni V.I. Lenin (VASKhNIL) works will be carried out on the search for new insecticides on the base of phosphoorganic compounds. At the Institute of Plant Physiology imeni K.A. Timiryazev research has been intensified on biologically active substances, at the Institute of Microbiology -- on the use of antibiotics in animal husbandry, and at the Institute of Biochemistry -- on the use of vitamins in animal husbandry. Successful research is conducted on the control of helminthoses of agricultural animals and plants at the laboratory of Helminthology of the Acad Sci USSR.

The Departments of Chemical and Biological Sciences established close contact with the Ministry of Agriculture USSR and the State Committee of the Council of Ministers USSR on the coordination of scientific research works. However, up to the present, no such contact has as yet been established with the State Committee of the Council of Ministers USSR in regard to chemistry.

The Department of Biological Sciences jointly with VASKhNIL conducted scientific sessions on the problems of harvest protecting and on the problem of individual development of agricultural animals.

A.V. Topchiyev pointed out in his report that, so far, little has been accomplished in regard to the setting up of new works and mobilizing the creative initiative of scientists by the chemical institutes of inorganic profile and, in the first place, by the Institute of General and Inorganic Chemistry imeni N.S. Kurnakov. However, on the whole, in the Department of Chemical Sciences no sufficient expansion has taken place of the work on the synthesis of herbicides, stimulators and inhibitors of growth, defoliants and desiccants,

preparations for control of a number of diseases and harmful agents of the agricultural crops, and the theoretical problems of the chemistry of fertilizers.

One of the important tasks of the Academy, according to A.V. Topchiyev, is the extensive organization of research on the economical effectiveness of chemization of agriculture and the direct participation in the solution of theoretical and systematic problems in this field.

S.I. Vol'fkovich particularly dwelt in his report on the importance of the developing of production and use of selective herbicides. Up to the present, the Soviet investigators tested about 300 preparations of which 25 proved to be promising, but the industry is manufacturing only five of them. Yet herbicides make possible not only to economize on means and time spent on the elimination of weeds, but also contribute to the manifold increase of the productivity of labor, improvement in the quality of vegetable production and, hence, an improvement also in the quality of fodder for the animals.

A number of reports were devoted to the problem of coordination and unification of the efforts of specialists of various branches in the work on agricultural subjects.

For example, Academician N.N. Shemyakin spoke of the need of separation of coordination centers which would provide a directed development of research on various problems and a directed research for new preparations essential to agriculture. In his opinion, such a center, for instance, for the entire insectofungicide "front" can be the Institute of Elemental Organic Compounds of the Acad Sci USSR which would undertake the coordination of the efforts of specialists of not only academic, but also other scientific research establishments, and would determine in essence the scientific policy in the development of this problem by enrolling the service of chemists, biochemists, plant physiologists, etc.

Corresponding Member of the Acad Sci USSR T.S. Khachaturov, suggested the creation of a group which would include economists, biologists, and chemists for the evaluation of the economic effectiveness of not only the measures which science intends to recommend to the industry but also measures which it itself intends to develop, i.e., to attempt the evaluation of the effectiveness of the outlined research trends, so as to be able to decide with certainty whether they are worth to be developed. He pointed out that the first steps have al-

ready been made in this direction -- in particular a definite work has been carried out on the study of the effectiveness of the use of fertilizers.

Corresponding Member of the Acad Sci USSR Ya.V. Peyve, speaking of the importance of promising theoretical research, stressed in particular the necessity of studying the physiological and biochemical processes which determine the quantitative and qualitative harvest indexes, of searching for effective means of regulating the growth and development of plants and animals, and synthesizing preparations which influence these processes. For instance, the study of the role of molybdenum in the internal biochemical processes in legumes opens the way to a solution of the very important task of raising the protein content in seeds and the green mass of these crops. Ya. V. Peyve cited a number of other examples which attest to the necessity of the development of complex biological, biochemical, and purely chemical problems directly connected with the solution of concrete practical problems.

An important subject was touched upon by Academician A.A. Imshenetskiy -- on the necessity of creating within the system of the Ministry of Agriculture USSR a special agricultural microbiological industry, so as to ensure the production of biological preparation on a scale commensurate with the needs of agriculture; these preparations are : yeast, fodder preparations, growth stimulators, vitamins, hormones, bacterial fertilizers, enzymes, aminocids, etc. At present these preparations are produced as a rule on a small scale, in essence by occasional enterprises in various areas of the Soviet Union, often without observing the correct technological rules.

In supporting the statement of A.A. Imshenetskiy, V.H. Bukin supplemented his arguments with the following one: homemade manufacture is much more expensive than industrial production. He stressed the fact that the wide production and use of vitamins, antibiotics, and other additives employed in the enrichment of forage will make possible a two-fold or greater reduction of the amount of fodder required in animal husbandry.

Corresponding Member of the Acad Sci USSR A.G. Vologdin dwelt on the problem of the possibility of employing the valuable components of waste products of various enterprises in the manufacture of fertilizers which, in his opinion, will at the same time be of substantial benefit to agriculture and

will prevent the contamination of the air, water, and large territories of our country which are adjacent to these enterprises. G.A. Volgdin thinks, for example, that sulfate waters of various types, slag, and ashes can be transformed into excellent fertilizers by means of mixing them with fossilized plantar substances (lignite, peat, etc.); also the components of industrial fumes which contaminate the atmosphere may, in his opinion, be utilized for this purpose.

In his concluding remarks the President underlined again that the Acad Sci USSR should play an active and leading role in the development of theoretical problems which are of importance to the agricultural practice. Certain works have been completed, a number of important problems have been posed but, according to the speaker there is no special drive as yet in such important and central matter as herbicides. M.V. Keldysh recommended the development by all possible means of contact with agricultural organizations; he supported the suggestions contained in the speeches of M.M. Shemyakin and A.A. Imshenetskiy.

In its resolution the Presidium outlined a number of measures the realization of which should contribute to the further development of research in the institutes of the Acad Sci USSR on agricultural subjects.

In attaching great importance to the expansion of scientific contacts with the establishments of the Ministry of Agriculture USSR, the Presidium charged the departments of biological and chemical sciences to conduct sessions jointly with the Ministry in 1963-1964 on such problems as the use of vitamins and antibiotics in animal husbandry, the preservation and storage of succulent foods, the rise in quality and stimulation of seeding and planting material, synthesis and employment of herbicides and growth stimulants, defoliants, and desiccants, the chemical control of helminthes, and new varieties of microfertilizers.

A suggestion was approved of the Department of Chemical Sciences and the All-Union Chemical Society imeni D.I. Mendeleev of devoting the next Mendeleev Congress mainly to the chemization of agriculture.

The Presidium considered it essential to publish series of reference books on the problems of employment of chemical preparations in agricultural production, as well as scientific popular brochures which would elucidate the basic achievements of chemistry and biology applicable to the needs of agriculture.