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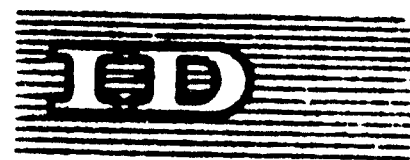
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**DEVELOPMENT AND INTRODUCTION OF
AGRICULTURAL MACHINERY**

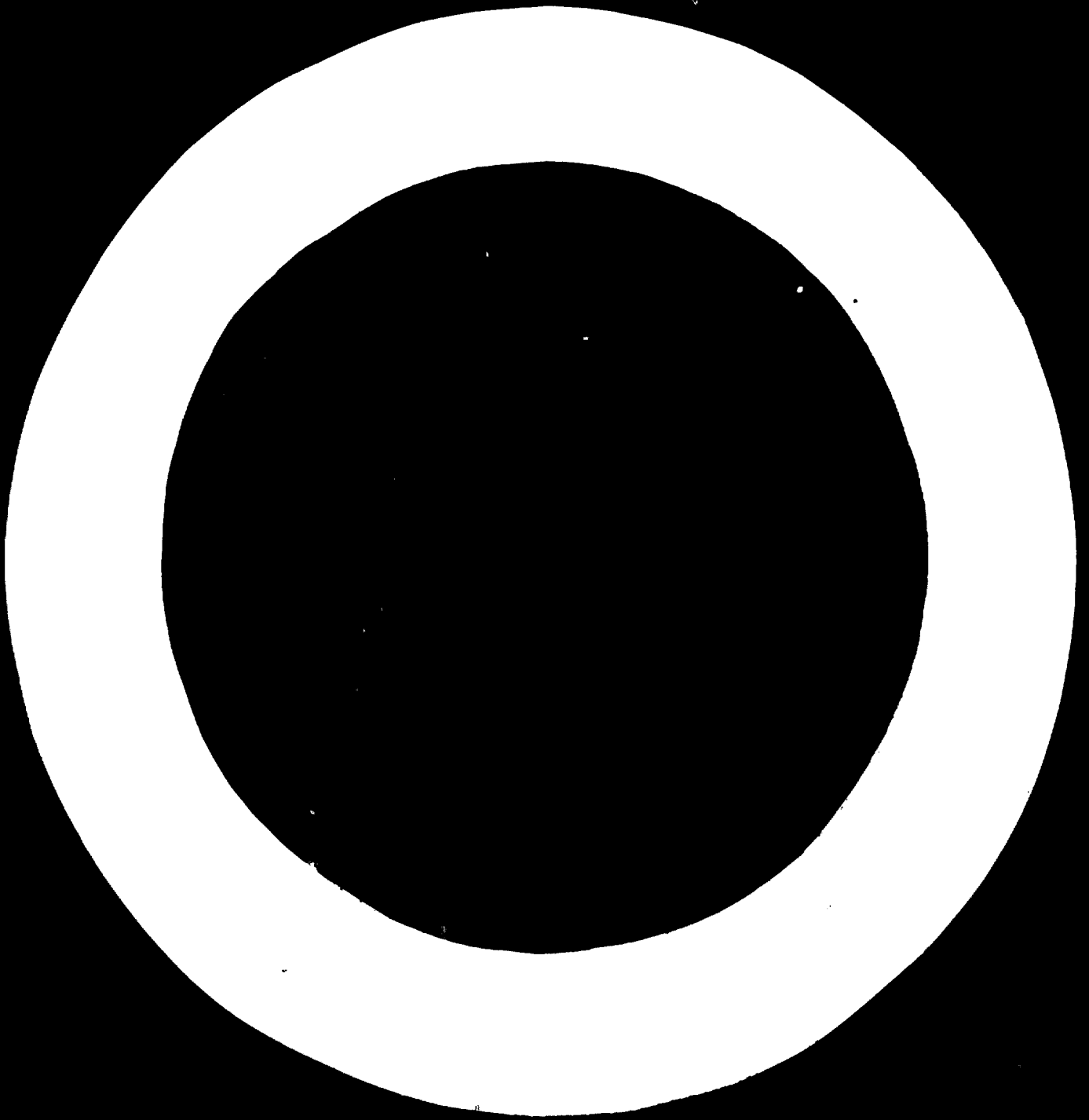
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DEVELOPMENT AND INTRODUCTION OF NEW MACHINERY IN COTTON GROWING

Uzbekistan is the leading producer of cotton in the Soviet Union and accounts for some 70 % of the country's cotton output.

The first available data on gross cotton production on the territory of present-day Uzbekistan dates back to the year 1860 when the region produced 25,000 tons of raw cotton. The maximum crop during the pre-revolutionary period was in 1915 and amounted to 830,000 tons. Today the Uzbek Republic produces well over 4 million tons of unginned cotton per annum.

Pre-revolutionary farming in Uzbekistan was based on back-breaking field work with the hoe and the wooden plough as the main implements. Great changes have taken place in cotton growing during the years of Soviet power. Soviet cotton growers today have at their disposal hundreds of thousands of modern tractors, seeders, cultivators and other machines and implements, which plough the soil, seed cotton, cultivate the plantations and harvest the cotton. The large-scale use of machinery has removed the strain out of field work, made it possible to increase cotton output considerably, raise labour productivity and reduce production cost.

In 1910 the territory of what is the Uzbek Republic today had 135,000 wooden ploughs and hardly 1,000 metal ploughs. The number of tractors (on a 15 H.P. basis) in Uzbekistan as of January 1, 1969 is as follows (minus tractors with mounted machinery) :

Total number of tractors in agriculture - 181,400
- including collective farms - 109,136

- state farms - 61,515
- other state enterprises
connected with agriculture- 10,749

The tremendous progress made by the Soviet Union in developing industry and particularly tractor and farm machine building has opened the way to introducing modern machinery in cotton growing on a large scale.

The machine fleet of Uzbek agriculture is constantly growing. In 1968 alone the collective and state farms of the republic received over 10,000 tractors, 1,430 grain harvesters and a big number of other machines. But it is not only the quantity that is important. Great qualitative changes have taken place in Soviet agricultural machinery. The development of farm machinery science and the establishment of numerous designing centres in the country have made it possible to create new models and improve existing machines. The Uzbek Republic designs and produces all the special machinery it requires for cotton growing.

The process of developing and introducing new machinery into agriculture involves a big number of research and administrative workers, various designing centres, industrial and agricultural establishments and right down to the rank and file worker. This paper gives an outline of the process of developing and introducing new machinery in agriculture.

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The basic direction for the development of agriculture and the target figures for raising agricultural production are outlined in "Control figures" compiled by the USSR State Planning Commission for a period of 10-15 years. These "Control figures" are examined and approved by the USSR Supreme

Soviet and from then on become an obligatory document for all administrative, research and production organizations and establishments in industry and agriculture.

The USSR Academy of Sciences and the USSR Agricultural Academy work out "Basic trends in research" covering all aspects of scientific studies including mechanization and electrification of agriculture for a certain period and aimed at facilitating fulfilment of the "Control figures".

Specifying the "Basic trends in research" the USSR Ministry of Agriculture instructs the leading research institutes to outline long-range technology and machine systems for all branches of agricultural production and for all zones of the Soviet Union. These recommendations are then discussed at zonal and USSR conferences of specialists and front-rank workers and approved by the Government.

The approved "Long-range technology and machine systems" serves as the basis for working out plans of research activities and also plans for the introduction of new machinery in agriculture.

The USSR Ministry of Agriculture draws up a plan for major research in agriculture on the stage by stage basis and also a joint co-ordination plan for research. The Ministry also selects and appoints leader research centres which take up their assigned problems and include them into their research plans. The Ministry also selects a number of other research centres to operate under the "leader" within the scope of the given research problem.

As research begins to produce practical results the leader institute and its affiliated organizations draw up

plans for the introduction of these results into industry. The plans include new technological processes, schemes and parameters of new working tools and machines, farming and live stock breeding requirements, individual models of machines and working tools. On the basis of this plan the USSR Ministry of Agriculture jointly with the USSR Farm Machinery Trust and the Ministry for Tractor and Farm Machinery Construction of the USSR draw up plans for experimental and designing work for a period of five years. The Ministry for Tractor and Farm Machinery Construction then appoints leader and affiliated designing centres for developing the designs of the new models and outlines the schedules of work.

All these plans are included into the national economy development plans of the USSR as a whole and of the Union republics individually.

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The development of any farm machine or implement begins at a research institute with the study of the conditions and the physical and mechanical properties of the media in which it will operate. For instance, in the case of a soil tilling machine the decisive factors will be the type, composition and humidity of the soil ; for harvesters it will be the materials or plants which the machines are expected to take in and process; for tractors it will be the agricultural produce, methods of loading and unloading and the road conditions. These studies are followed by theoretical elaboration of the expected technological process, the principles, type and basic parameters of the future working tools.

The most promising types and alternatives of working tools

which are developed experimentally are then given over for comprehensive studies and testing in laboratories and experimental stations. Special stands, instruments and installations imitating field conditions are developed at the research establishments to study the parameters and operating regimen of the experimental working tools. The working tools of soil tilling machines are studied and tested in a soil channel, which is a complicated laboratory installation with up-to-date measuring instruments and which imitates the ideal field conditions for the working tool. The picking unit and other mechanisms of cotton harvesters are studied on special installations. Cotton plants with open cotton bolls (stored in autumn) are fixed in a guide bar and delivered through the picking unit.

Other working processes and units are studied similarly and wide use is made of modern methods of research -- dynamic tensometers, slow-motion filming, photography, etc.

Farming methods laboratory and field studies involve the use of radio-active isotopes which make it possible to follow the movement of nutritive substances in plants with the help of tagged atoms. The same methods are used when it is necessary to study internal processes in the soil or in machine units. Tensometer instruments are used for measuring the frequency, value and sign of tension in inaccessible spots. Slow-motion and other special kinds of photography are used for the study of high-speed processes in machines.

Digital data obtained as a result of these studies are processed by methods of mathematical statistics and, in case of necessity with the help of electronic computers.

All these methods help to elucidate the regularities characterizing the object of studies, the range of changing parameters and the criteria for assessing processes. The research data is then used to develop laboratory and field units which under appropriate conditions are used to obtain the optimum geometrical, kinematical and technological parameters of the future machine. This stage of research, as others before it, involves the application of modern measuring instruments.

The laboratory and field unit, although it may meet the requirements of the technological operation for which it is intended, is not yet a finished machine. It can, however, serve as the basis for developing the experimental model of a working machine.

The results of this work are included in the plan of experimental designing work at a Special Designing Bureau which is entrusted with the task of developing the design of the experimental model.

The Research Institute, on the basis of its studies, draws up "Farming requirements" which are handed down to the Special Designing Bureau and which are used as the qualification criterion for the given farm machine or transportation system.

The farming requirements are examined and approved by the USSR Ministry of Agriculture, the USSR Farm Machinery Trust after which they are passed over to the Special Designing Bureaus and machine-testing stations where the new models are tested. Simultaneously the Research Institute hands down to the designing bureau the scheme and parameters of the new machine and its working tools and other data relating to the model.

On the basis of the data received from the research institute and the farming requirements the Special Designing Bureau works out the engineering assignment for the design of the new machine which is co-ordinated with the research institute, the local ministry of agriculture and farm machinery trust branch and is finally approved by the USSR Ministry for Tractor and Farm Machinery Construction, the USSR Ministry of Agriculture and the USSR Farm Machinery Trust.

After all these preliminaries the special designing bureau develops the blueprints and produces the experimental model which is subjected to laboratory and field tests by the designing bureau with the participation of representatives from the research institute which developed the parameters, farming requirements and principles of the new model. These tests help to clarify to what extent the new model corresponds to the farming requirements and the engineering assignment and expose all its design and technological faults.

The results of these internal tests are discussed at the joint engineering and scientific council of all the sides concerned. If the experimental model is approved a decision is taken to carry on with its development.

The special designing bureau takes into consideration the shortcomings revealed in the course of internal tests and improves the design. Several improved experimental machines are then manufactured and given over for State tests at the zonal machine testing stations.

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The machine testing stations use unified methods in carrying out laboratory, field and economy tests of the new

machine. The station determines the farming, engineering, economic and power indices of the model as well as the durability of various units and of the machine as a whole. The results of these tests are compared with the farming requirements and the indices of the best Soviet and foreign made models of similar design.

The machines are tested in a production complex with other machinery specified for the given zone. In special cases when a very complicated machine has been developed an interdepartmental commission is set up to supervise State tests and reach a decision. The machine testing station and the interdepartmental commission are responsible for letting out the new model into quantity production and they have the right to return it to the designing bureau for elimination of faults and demand repeated state tests.

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If the machine testing station and the interdepartmental commission approve the machine the USSR Ministry for Tractor and Farm Machine Building entrust one of the plants under its command to manufacture an experimental consignment of machines. These machines are then taken up by a number of farms for full-scale testing in operational conditions in various soil and climatical zones. These tests are conducted under the supervision of representatives from the machine testing station, the special designing bureau, the research institute and the manufacturer. The results of these full-scale tests are summarized and serve as the basis for substantiating quantity production of the new model.

The final decision on whether to take up the machine for

quantity production or not is taken at a joint scientific and engineering council of the USSR Ministry of Agriculture, the USSR Farm Machinery Trust and the USSR Ministry for Tractor and Farm Machine Building with the participation of representatives from the research institutes, special designing bureaus and farms where the experimental models were tested. If the council adopts a decision to take up the machine for quantity production the model is then included into the national economy plan for the industrial production of new models.

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The special designing bureau takes into consideration all the remarks made in the course of full-scale tests of the machine and the decision of the scientific and engineering council on its quantity production and hands down to the plant which is to take the model for quantity production all the blueprints and other data necessary for launching production. In its turn the plant works out the production technology, the necessary instruments, accessories, etc, and launches quantity production of the machine.

During the initial stage of production the special designing bureau maintains close contacts with the plant and makes all the necessary corrections in the design. The plant in its turn constantly improves technology of production and the machine design with a view on reducing costs and simplifying manufacture as as to increase output with minimum expenditure.

* * *

A number of experimental machines released by the plant.

are given over to various research establishments which study machine parametres and farming requirements as well as machine operation and durability. Some of the machines are given over to model farms located in different soil and climatical zones where they are tested to see whether they fit into the machine series accepted for the given zone of farming.

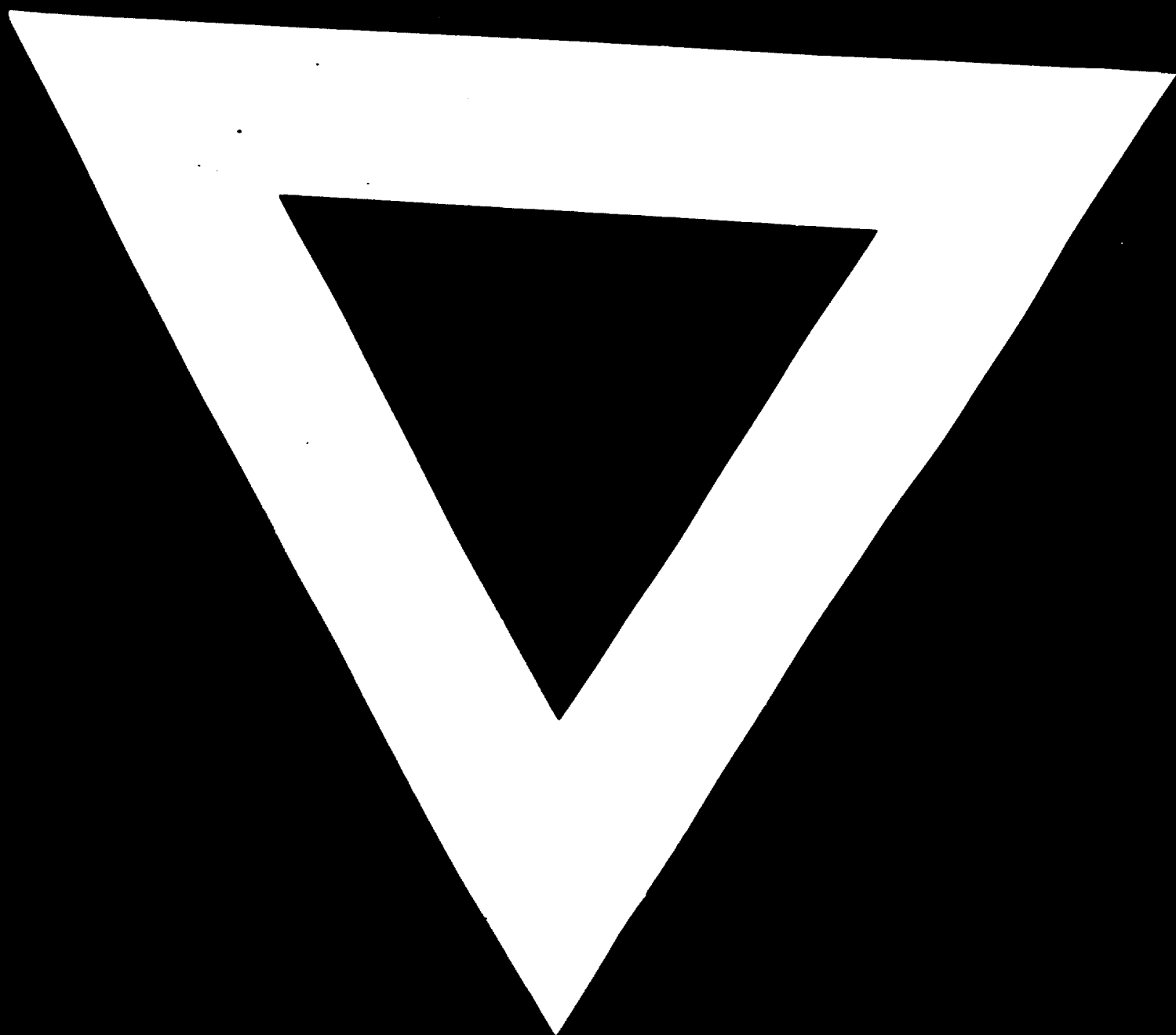
Simultaneously with detailed tests, these research organizations determine rational methods of utilizing the new machinery, output norms, fuel and lubricants expenditure, maintenance costs and other norms. The indices of the new models are specified and compared with existing machines.

This data is given over to the agricultural administration together with the first big consignments of machines.

After the new model has been taken up for quantity production, one machine a year is given over to various zonal machine testing stations for control tests and comparison with the standard model which is deposited with the machine testing station responsible for the state tests and approval of the model for quantity production.

The research institutes concerned with the new model continue studies of the machine, work out maintenance rules, repair methods and introduce various improvements in the design. They also work on problems of restoration of parts and units and estimate the depreciation period.

If more efficient machinery is developed the research institute makes recommendations to replace the model and remove it from industrial production. This helps to provide Soviet agriculture with all the necessary machines for the integrated mechanization of farming (including cotton growing).



10.8.73