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Research Conducted on Choosing the Type of Plug Body Which Works Without Completely Cutting the Soil Panel

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Abstract: The article presents the results of studies on the selection of the type of plow body that works without cutting the soil completely. In this case, according to the results of the comparison tests of different types of plug cases, the POT 01.000 case was recommended for the plug intended for general works.

Keywords: Soil, plow, tillage, aggregate working body, method, plow, resistance, tillage depth, moisture, hardness, plant residues, burial depth, plow bodies, test results.

Introduction. The main and pre-sowing tillage are the most energy-intensive processes in agricultural production. These processes account for 40-50% of the total energy required for the production of cotton, grain and other agricultural products. This shows that the issue of reducing energy consumption during the main and pre-sowing soil processing is a scientific and technical problem of great importance for agricultural production, and its positive solution can be used to burn thousands of tons throughout our country. It allows to save lubricants, reduce labor and material costs, increase productivity and durability of machines and weapons, and significantly reduce metal consumption for their production. All this ultimately leads to a decrease in the cost of agricultural products and further development of cotton, grain and other areas of agricultural production.

As a result of many years of scientific research and practice, the main soil treatment, i.e. plowing, is of great importance in achieving a high yield from agricultural crops. If this agrotechnical event is carried out in a timely and high-quality way, it will accumulate a lot of moisture in the soil, reduce the invasion of weeds in the fields, sow seeds of agricultural crops in good quality for their early recovery and good development of seedlings. favorable conditions are created.

In our republic, the production of O'R-4/5-40 plug for basic soil cultivation has been launched. The main requirement for plowing the soil with this plow is to ensure complete and deep burial of plant residues with low energy consumption, as well as high-quality plowing. Such quality indicators of Khaydov depend to a large extent on the improvement of the technological process and the construction and working bodies of soil tillage machines.

Research methods. The research was conducted using a field dynamometer device. Its structural scheme is shown in Fig. 2. It consists of frame 1, bodies 2 (non-dynamometer) and 3 (dynamometer), suspension mechanism 4, support wheel 5 and field board 6.

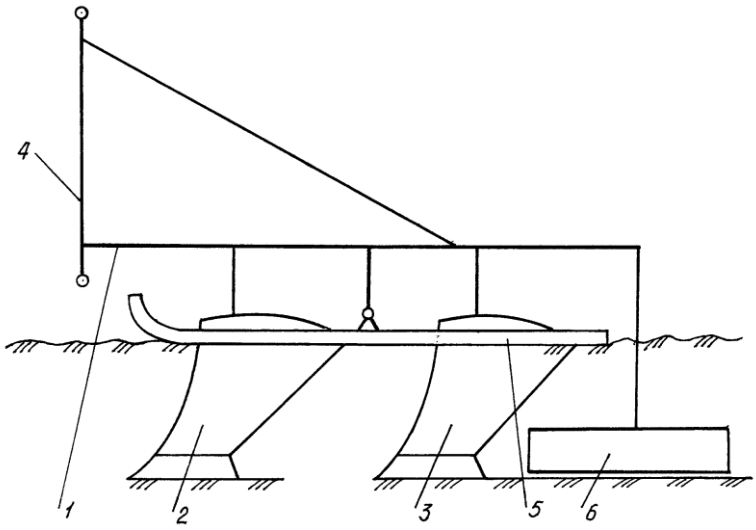


Figure 1. Scheme of the dynamometric field device

The design of the device ensures smooth parallel movement of the field board in the transverse direction. This ensures that the device works without tilting and that the body being dynamometered does not change the coverage width.

The sliding support slides along the surface of the unplowed field during plowing. The flat support part of the sliding support is 2.1 m long and 30 cm wide, which ensures stable movement of the device in depth in fields with unevenness.

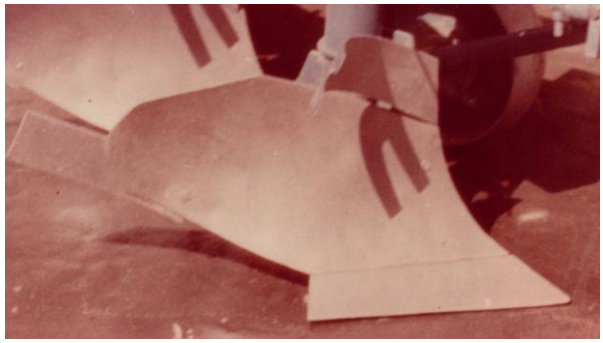
Before conducting the experiments, the speed of the drive unit was determined and the required working depth was set, the soil moisture in the layers of 0...10, 10...20, 20...30 and 30...40 cm against the general background and hardness, the height and thickness of plant remains, their mass were determined, 50 m long survey areas were determined.

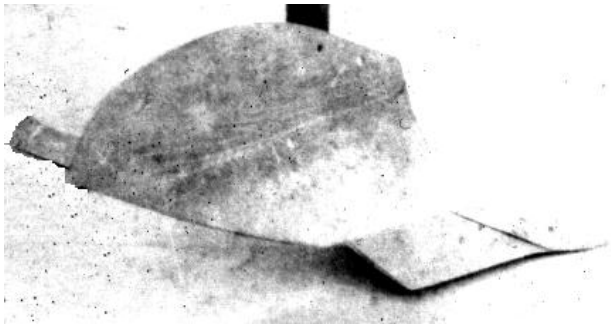
We determined the quality of the soil compaction at six points in each version of the experiment (three according to the movement of the unit, three according to its return). To determine the compaction of the soil, a soil sample of 0.25 m2 was taken using a bottomless box (size 0.5x0.5 m). The obtained samples were divided into fractions larger than 100 mm, 100...50 mm and smaller than 0 mm. Separation of the obtained samples into the specified fractions was carried out in the field itself with flat sieves with holes of 100 and 50 mm. At the same time, large pieces were picked by hand, and then the soil was sifted with the sieves mentioned above. We weighed all the fractions and calculated the percentage of the obtained soil sample to the total mass.

According to agrotechnical requirements, fractions smaller than 50 mm are acceptable. Therefore, the ratio of the soil fraction with a size (diameter) smaller than 50 mm to the total mass of the sample was taken as the degree of soil erosion.

The data obtained in experimental research are processed by mathematical statistical methods on a computer.

Research results. Various types of cases are prepared for conducting experimental studies (Fig. 2).





a) POT 01.000 case; b) POM 01.000 case; c) K 30 R case

Figure 2. Plug housings prepared for conducting experimental research

In order to choose the type of housing, comparative tests of POT 01.000, POM 01.000 and KZ0R (Lemken) models were conducted.

The case of POT 01.000 (Fig. 2, a) has a semi-screw type appearance. Its coverage width is 40 cm. It is made up of a cast coulter, a plowshare, a coulter, a turner, and a field board. A corner cutter is installed in the upper part of the chest of the turner. This case is installed on the PON-3-45 plug.

POM 01.000 semi-screw (quick) housing (Fig. 2, b). Its coverage width is 40 cm. It is made up of a welded head, a trapezoidal ploughshare attached to it, an awl, a turner and a field board. An angle cutter is installed on the body above the upper section of the tipper, and an extension (feather) is installed on the tipper wing. This case is installed on the PON-4-40 plug.

K30R is also a semi-screw type case (Fig. 2, c). Its coverage width is 40 cm. It consists of a welded plough, a ploughshare, an awl, a turner and a field board attached to it. A corner cutter is mounted on the upper part of the tipper's chest, and an extension is attached to the tipper's wing. This housing is installed on the Lemken "Vari-Europal" plow. All tested housings are designed for driving to a depth of 35 cm.

During this experiment, the processing depth of the device was 35 cm, and the speed of the unit was set at 8 km/h.

In order to have the same effect on the obtained results, the coverage width of all cases was set to the same, i.e. 40 cm.

The results of the experiments are presented in the table below.

The results of comparative tests of different cases of plugs intended for general works

Name of indicators	POT 01.000	POM 01.000	K 30 R
Speed of movement, km/h	7,8	7,9	7,8
Driving depth, cm M_{sr} $\pm\sigma$	 34,8 1,9	 34,9 2,8	 34,3 2,4
Coverage width, cm	40	40	40
The depth of burial of plant remains, cm M_{sr} $\pm\sigma$	 17,6 4,1	 12,7 5,9	 13,5 6,0
Complete burial of plant residues, %	96,1	81,4	84,1
Fertilization quality of the soil, % Size of fractions, mm greater than 100 100...50 less than 50	 8,9 12,0 79,1	 10,2 11,3 78,5	 9,4 13,4 76,3
Tensile strength, kN	10,18	11,53	10,68
Relative resistance, kPa	73,13	82,62	77,87

As can be seen from the data presented in the table, the results of the POT 01.000 housing showed high performance among the compared housings in terms of the main performance indicators.

In the experiments, the processing depth of all the bodies has almost the same value (34.3...34.9 cm), and their compliance with the specified depth shows that they are stable in depth. At the same time, POT 01.000 housing compared to POM 01.000 and K30R housings is 4...5 cm and 12...15% more deep and complete burial of plant remains, respectively, which corresponds to existing agrotechnical requirements. and the specific resistance was 6...13 percent less, respectively.

Due to the optimal conditions of soil moisture at the time of the experiment, all the test cases had the required indicators of the quality of soil crushing (grinding).

Based on the above, the POT 01.000 housing is recommended for general purpose plugs.

Conclusion.

Choosing the type of plug bodies using the methods of determining the resistance of the plug working bodies, the depth of cultivation and the moisture, hardness of the cultivated field soil, the height of plant residues and weeds and the depth of their burial. studies were conducted and the results were analyzed.

Based on the results of the experimental research, it was determined that the POT 01.000 housing meets the agrotechnical requirements and was accepted for further research.

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