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The importance, methods of land leveling and analysis of equipment for their implementation

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The importance, methods of land leveling and analysis of equipment for their implementation

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Abstract. It has been proved in the world and our country's agriculture that the levelling of arable lands helps the land to improve the reclamation of lands and reduce the amount of water for irrigation. According to agro-technical requirements, the height of irregularities on the surface of the fields should not exceed ± 5 cm. Experiments and research show that crop yields decreased by 1.5-1.7 times and irrigation water consumption increased by 1.7-3.4 times when the surface roughness of the fields was ± 10-13 cm. According to the research carried out by E. B. Velichko and B. B. Shumakova, in areas where the height of irregularities reached ± 3 cm, the yield increased by 1.5 times compared to ± 5 cm, and irrigation water decreased by 1.6 times. In areas with such unevenness of ± 2 cm, the yield increased by an additional 19.9 c / ha (47%), the consumption of irrigation water for the production of 1 ton of rice decreased by 36% or 1621 m3 of the economy was achieved.

1. Introduction

There is a need for current and operational levelling of lands [1] are cited in scientific sources. According to the experience of the Union of Soviet Socialist Republics, the productivity of uneven cotton, wheat, soybean, safflower and other cultures fields has decreased by up to 40%, the quality of cotton and other plants in the lowlands has decreased, and the length and strength of cotton have decreased [2-9]. To increase soil fertility and make full use of irrigated lands, levelling machines and tools, and quality levelling of arable lands are the main issues. Practical experience in levelling the fields shows that in good and high-quality levelled areas, natural, soil fertility and productivity of machine-tractor units are also high [10-19]. The soil is spread evenly over the entire area, and when irrigated, the water is evenly distributed over the entire area. A uniformly distributed water leads to the simultaneous ripening of the soil.

2. Materials and methods

This creates conditions for timely implementation of storming, chiselling, herbicide spraying and fertilizing, sowing and other technological processes. In a flat steppe, water flows an hour faster than in an uneven steppe along an area of 100 meters, the ploughed soil layers are uniform and evenly moistened [1,2,9,19]. Cotton and other crops are well developed on the levelled lands. When machine-tractor units

work on uneven fields, the traction resistance of the tool changes, resulting in reduced speed, increased vertical vibrations, which negatively affects the operation of the machine-tractor unit and increase the moisture content of the soil surface [20-26]. Therefore, high-quality levelling of the ploughed soil is required before the implementation of technological processes and surface irrigation in the cultivation of crops [1, 2]. To distribute water evenly on the soil surface of the area to be sown and to use it efficiently, it is necessary to carry out high-quality levelling of irrigated arable lands. Levelling works will be carried out based on a geodetic description of a special project, taking into account the topography and slope of the site. In all irrigated areas, the thickness of the soil cut from the heights should not exceed half of the depth of the fertile layer, ie 15-20 cm, as a result of scientific research (figures 1 and 2) [1,2,9,19]. During the use and irrigation of agricultural machinery, the soil settles and washes away, and as a result of soil erosion caused by wind and water, the sown areas become uneven, which requires repeated levelling. Low-quality uneven crops are not carried out to the required level, and as a result, the volume of agro-technical measures for tillage has increased and the cost of use has increased.

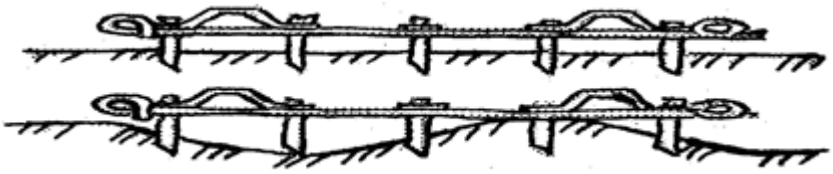

Figure 1. The process of working gear bodies in levelled and uneven areas

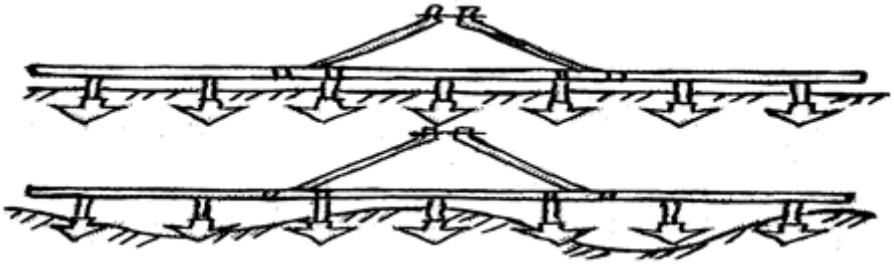

Figure 2. The process of working with a chisel-softener on levelled and uneven surfaces

Qualitative indicators at the required level of harrowing and chiselling are evaluated by the fact that their working bodies move to the same depth and the soil is compacted. When assaulting on an uneven surface, the impact forces acting on the teeth of the attack aircraft increase, as well as the vibration of the working bodies over the entire coverage width, which leads to a technical failure. If the depth of penetration of storm teeth is adjusted to 60 mm, then in the flattened section the teeth are processed to a depth of 50-80 mm, and in an uneven area, it can vary from 0 to 120 mm [1, 2]. When chiselling the soil, the depth of immersion of the softening working bodies of the chisel is adjusted to 150 mm, softeners on a levelled area work within 130-170 mm, on an uneven one within 0-150 mm.

3. Procedure of research

Based on research work, current (operational) planning of saline-washed arable lands by basic planners is required once every 2-3 years. Many years of scientific research by professors and teachers of the Bukhara branch of KhMITI and the Tashkent Institute of Irrigation and Agricultural Mechanization Engineers proved that the quality of a long-wheelbase levelling machine is higher than the quality of road-building and reclamation machines (grader, bulldozer, scraper, etc.). Experiments have shown that a good, high-quality surface levelling can be achieved in two or more passes by a planner with a long base on the current levelling, but it is impossible to carry out such a levelling process on simple road-building machines or GN-2, 8, GN-4 suspended balancers. At the same time, the low efficiency of the

existing straightening machines does not ensure the timely completion of the current straightening. This problem can be solved by increasing the productivity of long-base straightening machines [1].

When using the existing planners R-2.8A, R-4, PA-3, PPA-3.1, the field level that meets the established requirements is ensured by the fact that the unit moves 3-4 times or more in a row [2]. This leads to the destruction of the sowing background and reduces the quality of subsequent mechanization.

Analysis of the literature and studies have shown that Akhmedzhanov M.A., Samsonova N.P., Bratyshev I.P., Kuzina E.N., Babadzhanov I.A., A.A. enough research has been done to improve the efficiency of long-wheelbase straighteners. Therefore, in this study, it is proposed to justify the speed and coverage of basic planners and install a spherical disk device for softening the soil on the front side of the planner bucket while improving the working bodies of the planner and the technological process of its operation. The device consists of a longitudinal beam and spherical disks located along the right and left axes, and the disks are placed along the right and left axes so that the shell on the opposite side is outside. The disc device installed on the base leveller reduces the overall resistance of the machine due to loosening the soil, and the operation of the bucket on loosened soil improves the smoothness of the leveller and the quality of the levelling (figure 3). The novelty of this technical solution is protected by the patent of the Agency for Intellectual Property of the Republic of Uzbekistan for the utility model FAR 01235. This work is aimed at justifying the dimensions of this device, which ensures high-quality levelling of sown areas [2].

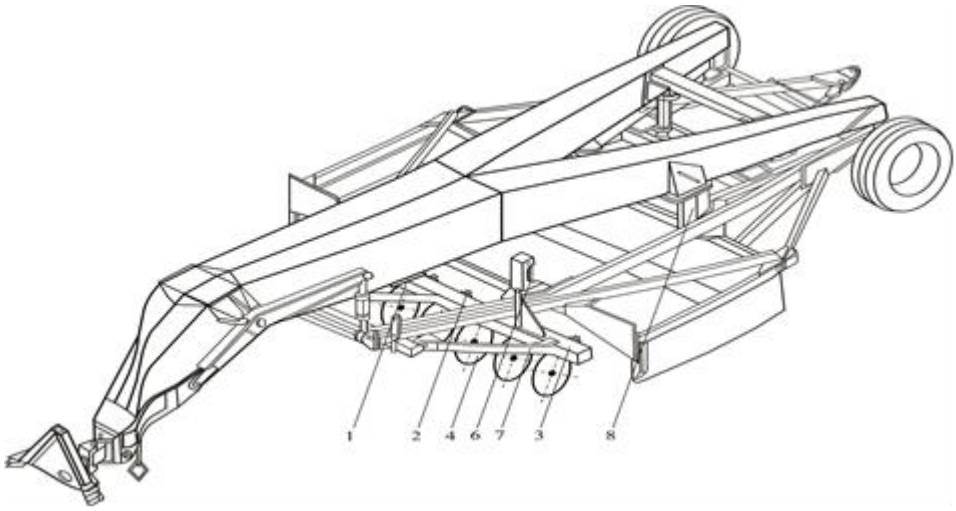

Figure 3. Base Leveling Device Equipped with Softening Disc Device

The recommended device is a transverse beam 1, a right axis 2, a left axis 3 with disks mounted on them with softening spherical disks 4 and 5, a pressure spring device 6 for adjusting the immersion depth of the working bodies 6, a disk device frame and a drive device. holder 7, the device consists of a hydraulic cylinder 8, which provides lifting and lowering. This leveller simultaneously softens and levels crop areas. This allows you to effectively use the power of the machine and improve the quality of the layout. With the help of the device, the quality of levelling work is improved due to the simultaneous softening and levelling of crop areas.

It should be noted that studies have not been carried out previously to justify the dimensions of the disk device (working body) installed on the base straightening machine. Based on research and analysis, the goal is to improve the efficiency of the mechanization tool used in the current layout.

4. Conclusion

Practical experience in levelling the fields shows that in good and high-quality levelled areas, natural, soil fertility and productivity of machine-tractor units are also high. The soil is spread evenly over the

entire area, and when irrigated, the water is evenly distributed over the entire area. A uniformly distributed water leads to the simultaneous ripening of the soil. Therefore, in this study, it is proposed to justify the speed and coverage of basic planners and install a spherical disk device for softening the soil on the front side of the planner bucket while improving the working bodies of the planner and the technological process of its operation. The device consists of a longitudinal beam and spherical disks located along the right and left axes, and the disks are placed along the right and left axes so that the shell on the opposite side is outside. The novelty of this technical solution is protected by the patent of the Agency for Intellectual Property of the Republic of Uzbekistan for the utility model FAR 01235. This work is aimed at justifying the dimensions of this device, which ensures high-quality levelling of sown areas.

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