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Development of A Double-Deck Disc Plug Ploughing Scheme

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Abstract: The article presents the results of the study of the plowing experiment, analyses of two-tier plows and the development of a scheme for two-tier plowing of the soil layer with the originally developed two-tier disk plow.

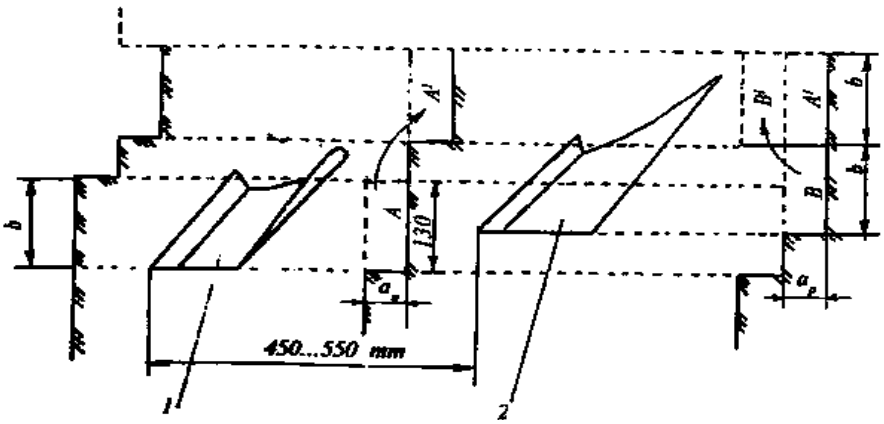
Keywords: two-tier dump and disk plows; upper disk housing; lower disk housing; soil layer; technological process of formation wrapping; plowing depth; width of grip; frame.

INTRODUCTION

In recent years, due to the widespread introduction of energy-saving technologies and technical means in agriculture in the main cultivation (ploughing) of land, the use of ploughs with a disc, that is, the working body has the shape of a spherical disc, is of great importance. Since they have less resistance to traction than reversible ploughs, high productivity, work without getting stuck in plant residues and weeds. On the basis of these provisions in the Research Institute of Agricultural Mechanization (NIIMSH) developed a disc plough used in the main tillage (ploughing) in the cultivation of cereals, repeated and other crops [1] and conducted its research experiments on the basis of parameters suitable for soil and climatic conditions of our region.

The tilting fork of the tier ploughing on the frame is installed sequentially at a distance of 450-550 mm from each other of the upper 1 and lower 2 bodies with the same working width (b=35 cm).

In the horizontal plane, the upper housing is mounted with an offset of 130 mm to the left side, unswept relative to the lower housing (Figure 1).



1 - upper tier enclosure; 2 - lower tier enclosure; A, B - plates of upper and lower tier enclosures.

Figure 1: Schematic diagram of double-deck ploughing

In the process of operation the upper body with depth a_u =10 cm, width b=*35* cm stacks layer *A* upside down to the position *A'*. Following it, the lower hull tilts layer *B with* a_p =20 cm deep and *b=35 cm* wide and pulls it on top of *A'*. Sometimes the hulls are also set so that $a_u = a_p$ =15 cm. The plough wall remaining after the tier plough has a stepped appearance.

This means that weed residues on the surface of layer A are completely and deeply buried during tier ploughing and it becomes difficult for them to green up. Another advantage of this method is that it ensures deep burial of unharvested stalks and other products.

If we take into account that the working width *b* must be at least 1.3 times the ploughing depth *a*, so that the soil layer is more fully tilted under the influence of the body (*b/a>1*.3). In case of double-deck ploughing b/a_u =1.5 up to the upper body; b/a_p =1.75 for the lower body, i.e. more than 1.3 is the basis for qualitative overturning of the layer [2].

Figure 2 shows the process of overturning of the formation sheared by the disc. It is considered that the formation does not deform and does not change its shape. But in fact, as a result of overturning, the layer moves in pieces along the working surface of the disc [3].

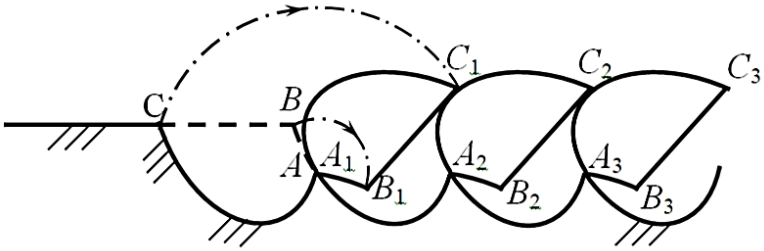
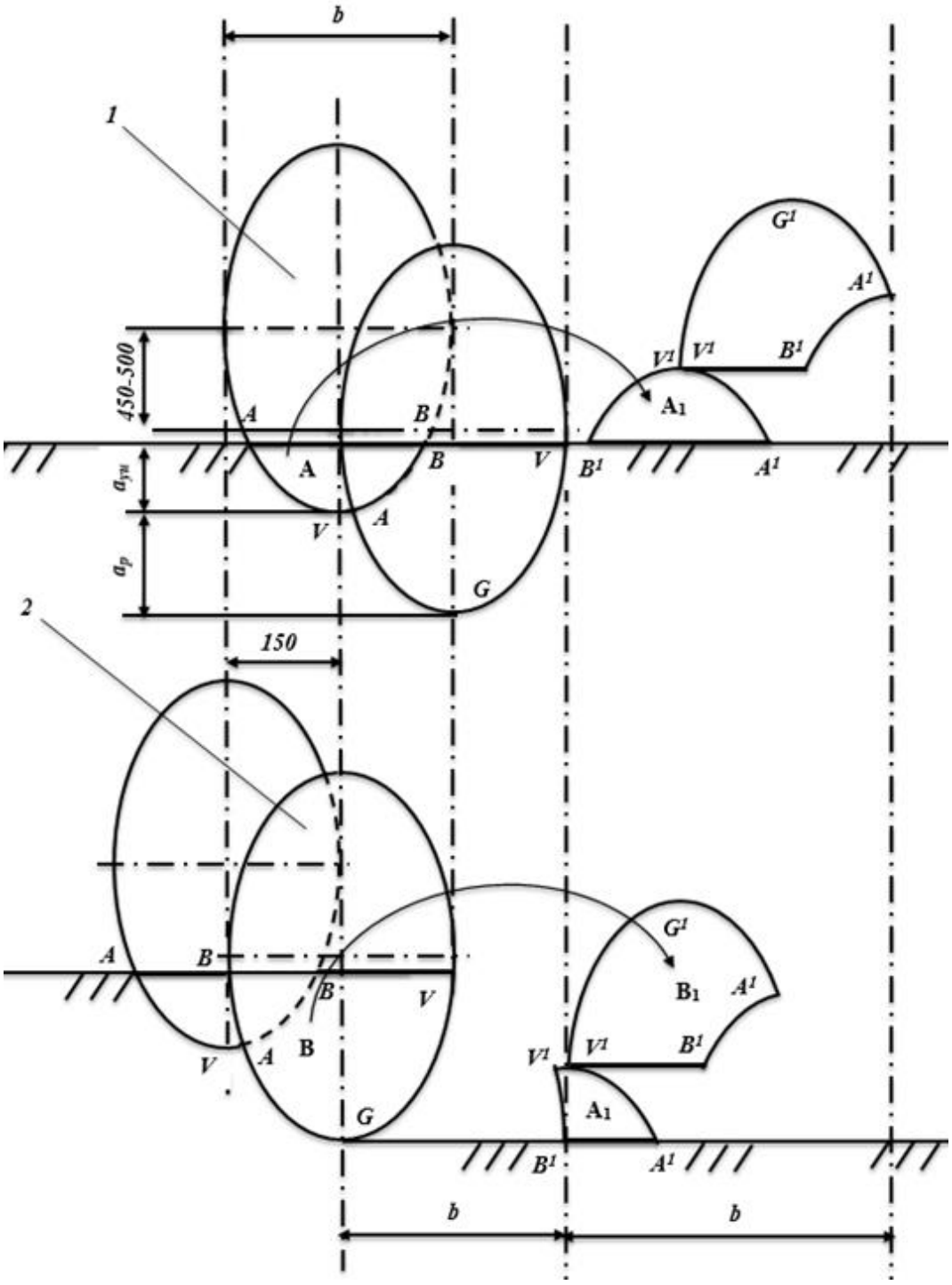


Figure 2: Schematic of formation tilting with conventional disc plough bodies.

Double-deck ploughing with a disc plough, in this method the upper 1 and lower 2 disc bodies with the same working width (*b=30* cm) are installed on the frame for ploughing successively at a distance of 450-500 mm from each other.

In the horizontal plane the upper disc body moves 150 mm towards the unploughed field relative to the lower one (Figure 3). During operation the upper disc body with depth a_{yu} =15 cm and width *b = 30* cm turns over and crushes layer *A* to the state A^1 . The following lower disc housing overturns layer *B with* depth a_p =20 cm and width *b=30* cm and presses it on top of layer A^1 . After ploughing fields with double-deck disc ploughs, the remaining plough wall looks like a hemisphere.



1 - case with upper disc; 2 - case with lower disc; a, b - layers of upper and lower tier.

Figure 3: Ploughing pattern of a double deck disc plough.

Conclusions. If we take into account that the disc body coverage width *b* should be at least 1.3 times the ploughing depth (*b/a>1*.3), so that the soil layer is more fully tipped under the influence of the disc body. When ploughing with double-deck disc ploughs b/a_{yu} =2,0 for the upper part of the body; b/a_p =1,5 for the lower part of the body, i.e. more than 1,3 is the basis for qualitative overturning of the layer.

Literature used

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