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Increasing the Degree of Crushing of the Soil When Processing Between the Row of Categories

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Annotation: In the article, the conclusion is made that at between line the processing cotton group of a degree chopping up of ground can ensure at the expense of level-by-level processing or beforehand, that is before pass of working bodies cultivator of cutting of its surface in cross and longitudinal directions with the help special are narrow a knife.

One of the most important indicators of a cultivator is the degree of soil grinding (crushing). If this indicator is high, moisture retention in the soil and chemical and biological processes occurring in it are improved. This leads to better plant development and increased productivity. However, in many cases, the existing working bodies of a cultivator cannot grind the soil to the required level, especially after irrigating cotton and potato crops. However, the soil fraction in the required degree is important for the development of these crops.

In order to improve the degree of soil grinding during inter-row cultivation, we analyze the process of its interaction with the working body.

It is known that [under the influence of the working body 1,2 the soil]is first compressed (crushed) and when its compression reaches the limit of strength, it breaks and a prism-shaped piece separates from the blade . The separated piece is characterized by the following dimensions: the angle of fracture Ψ , the path traveled by the working body until the blade breaks S_c , the length of the broken part l_c , its lower v_n and upper v yu widths (Fig. 1). Palakhsa refraction angle can be found according to the formula of V.P. Goryachkin [3], i.e.

$$\psi = \frac{\pi}{2} - \frac{1}{2}\left(\alpha + \varphi_1 + \varphi_2\right), \qquad (1)$$

where *a is the angle of entry* of the working body into the soil qq a;

φ_1, φ_2 are the internal and external working angles of the soil .

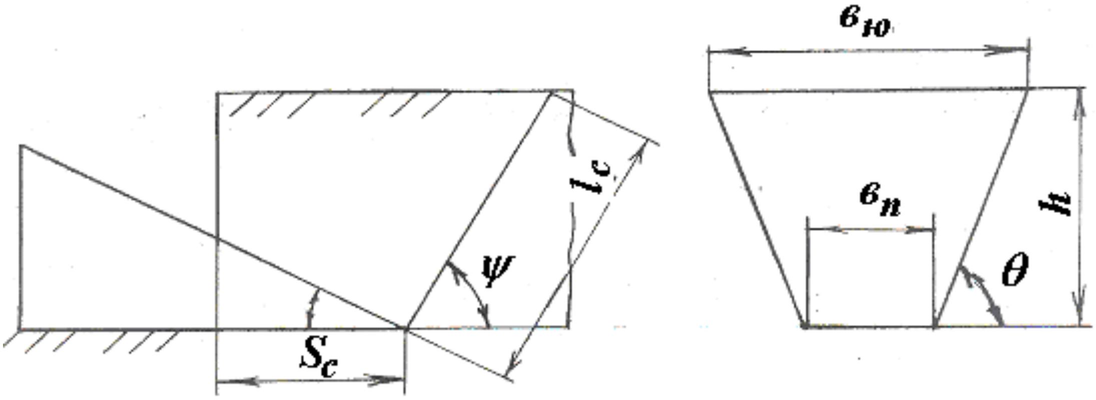

Figure 1. Deformation of the soil under the influence of the working body

From the scheme presented in Fig. 1

$$в_n = B; \qquad (2)$$

$$в_{ю} = B + 2htg\theta; \qquad (3)$$

$$l_c = \frac{h}{\cos\frac{1}{2}\left(\alpha + \varphi_1 + \varphi_2\right)}, \qquad (4)$$

where V is the width of the working body;

h - processing depth ;

θ is the lateral refraction angle of soil q .

To find the path traveled by the working body until the beam breaks, we consider the forces acting on the beam from its side (Fig . 2). The normal *N* and frictional forces $F = Ntg\,\phi_2$ act on the beam from the working body. We divide these forces into forces N^1 parallel to the fracture plane *and N n* $_{perpendicular}$ to $_{it}$, i.e.

$$N_к = \frac{N}{\cos\varphi_2}\sin\left(\alpha + \varphi_2 + \psi\right); \qquad (5)$$

$$N_n = \frac{N}{\cos\varphi_2}\cos(\alpha+\varphi_2+\psi). \qquad (6)$$

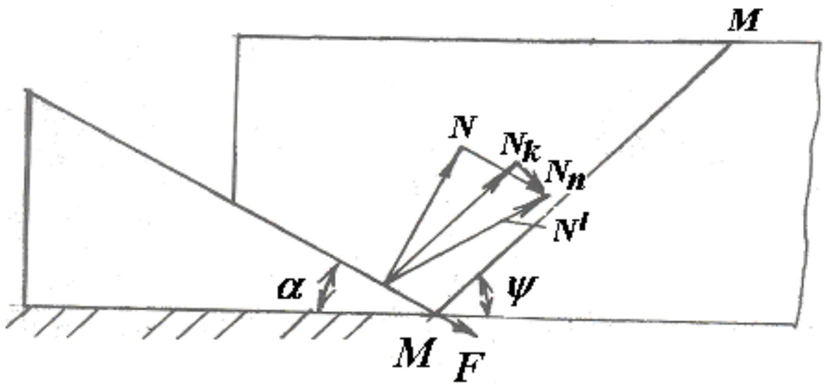

Figure 2. Forces acting on the work body .

These forces produce *normal* and *normal* stresses in the fracture plane , respectively

$$\tau = \frac{N_\kappa \sin\psi}{(B+hctg\theta)h} = \frac{N\sin\psi\sin(\alpha+\varphi_2+\psi)}{(B+hctg\theta)h\cos\varphi_2}; \qquad (7)$$

$$\sigma = \frac{N_n \sin\psi}{(B+hctg\theta)h} = \frac{N\sin\psi\cos(\alpha+\varphi_2+\psi)}{(B+hctg\theta)h\cos\varphi_2}. \qquad (8)$$

Coulomb -Mohr theory, the fracture of a material occurs when the ratio between *t* and *s* describes the equation in the house q [4]

$$\tau + \sigma\ tg\varphi_1 = \tau_{np}, \qquad (9)$$

where t_{pr} is the limit stress of soil q to fragmentation (fracture).

τ and σ *We* insert q values according to expressions (7) and (8) into expression (9) and we get

$$\tau_{np} = \frac{N_k \sin\psi\sin(\alpha+\varphi_1+\varphi_2+\psi)}{(B+hctg\theta)h\cos\varphi_1\cos\varphi_2}. \qquad (10)$$

this expression with respect to *N* and, making some modifications, we obtain the following expression

$$N = \frac{\tau_{np}(B+hctg\theta)h\cos\varphi_1\cos\varphi_2}{\cos^2\frac{1}{2}(\alpha+\varphi_1+\varphi_2)}. \qquad (11)$$

If we assume that the resistance of the soil to compression until it fails is directly proportional to the volume of the medium being compressed , then the normal force N *can* be determined by the following expression [4,5]

$$N = qV = 0{,}5qS_c^2 Btg\alpha, \qquad (12)$$

where q is the volumetric compaction coefficient of soil q .

Solving expressions (11) and (12) together, we find S_c

$$S_c = \frac{1}{\cos\frac{1}{2}(\alpha + \varphi_1 + \varphi_2)} \sqrt{\frac{2\tau_{np}(B + hctg\theta)h\cos\varphi_1\cos\varphi_2 ctg\alpha}{qB}} \cdot \quad (13)$$

analysis of expressions (1) – (4) and (13) it is clear that the size of the clod separated from the tine and, consequently, the degree of soil grinding depends on the depth of cultivation , the width of the working body, its angle of entry, and the physical and mechanical properties of the soil .

soil pulverization for a given working tool and a given working depth can be achieved by layering it or by pre-cutting its surface in the transverse and longitudinal directions with special narrow blades , that is, before the working tool passes.

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