КОМУНАЛЬНИЙ ЗАКЛАД ВИЩОЇ ОСВІТИ «ДНІПРОВСЬКА АКАДЕМІЯ НЕПЕРЕРВНОЇ ОСВІТИ»
ДНІПРОПЕТРОВСЬКОЇ ОБЛАСНОЇ РАДИ
РАДА МОЛОДИХ ВЧЕНИХ АКАДЕМІЇ
РАДА МОЛОДИХ ВЧЕНИХ ДНІПРОПЕТРОВСЬКОЇ ОБЛАСТІ

СЕРТИФІКАТ

Засвідчує, що

КОВБАСА ВОЛОДИМИР ПЕТРОВИЧ

взяв (взяла) участь у **Всеукраїнській науково-практичній інтернет-конференції**
«Молодий вчений модерну – фундамент розвитку освіти, науки та бізнесу України»

20 травня 2020 року
Дніпро

Ректор **Віктор СИЧЕНКО**

THE EFFECT OF GEOMETRIC PARAMETERS OF THE SHARE MOLE PLOW ON DEFORMATIONAL CHARACTERISTICS OF SOIL IN FORMATION OF CAVITY FOR IMPERVIOUS SCREEN

В.П. Ковбаса

Україна, м. Вінниця, Вінницький національний аграрний університет, доктор технічних наук, професор

There is a necessity of laying moisturizers together with an impervious screen for maintaining the moisture and best spread it in the horizontal direction under in-soil irrigation of agricultural plants [1].

For this purpose, share mole plow can be used. Substantiation of that tool's geometrical parameters and modes of operation is an actual scientific problem.

The solution of this problem allows us to determine the functional dependences of effect of the tool's geometric parameters and soil's mechanical properties on the distribution of its strain rates and stress components [1, 2].

This makes it possible, when share mole plow interacts with the soil, to predict the location of zones in which the ratio of the stress components corresponds to a transition to the plastic state up to the disruption of the continuity for a certain plasticity criterion.

The use of the method of differential components of biharmonic potential functions in the contact zone of soil with share mole plow. For the formation of the cavity in which the screen will be placed, using the method of broach can be used share mole plow, scheme of movement of which is illustrated in Fig. 1 [1-3].

The following notation is adopted in the figure: the coordinate system xyz represents the coordinates of the soil half-space and coincides with the share mole plow coordinate system , $н$ - the ploughshare running depth relative to the

field surface f_S, $_B$ - the working width of the ploughshare, $_N$ - the normal to the plane of the ploughshare.

The equation of the working part of the surface of the ploughshare in the coordinate system idem has the form of equation of plane [3]:

$$f \underset{a\ b}{\wedge i+rzl+irULzi} = \underset{c}{o}, \quad (1)$$

where a, b,c - the coefficients that determine the inclination of the plane to the corresponding coordinate axes $_{o\%,on,o}$£; $_r$- the Height of the share's vertical projection,

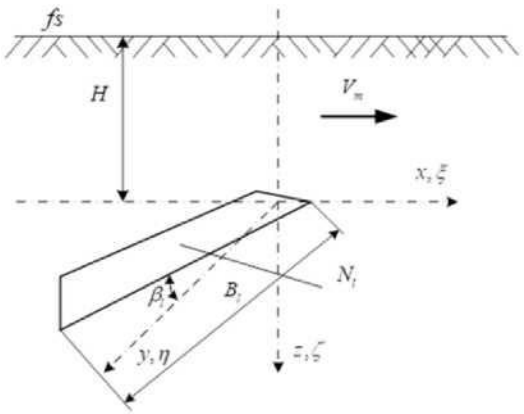
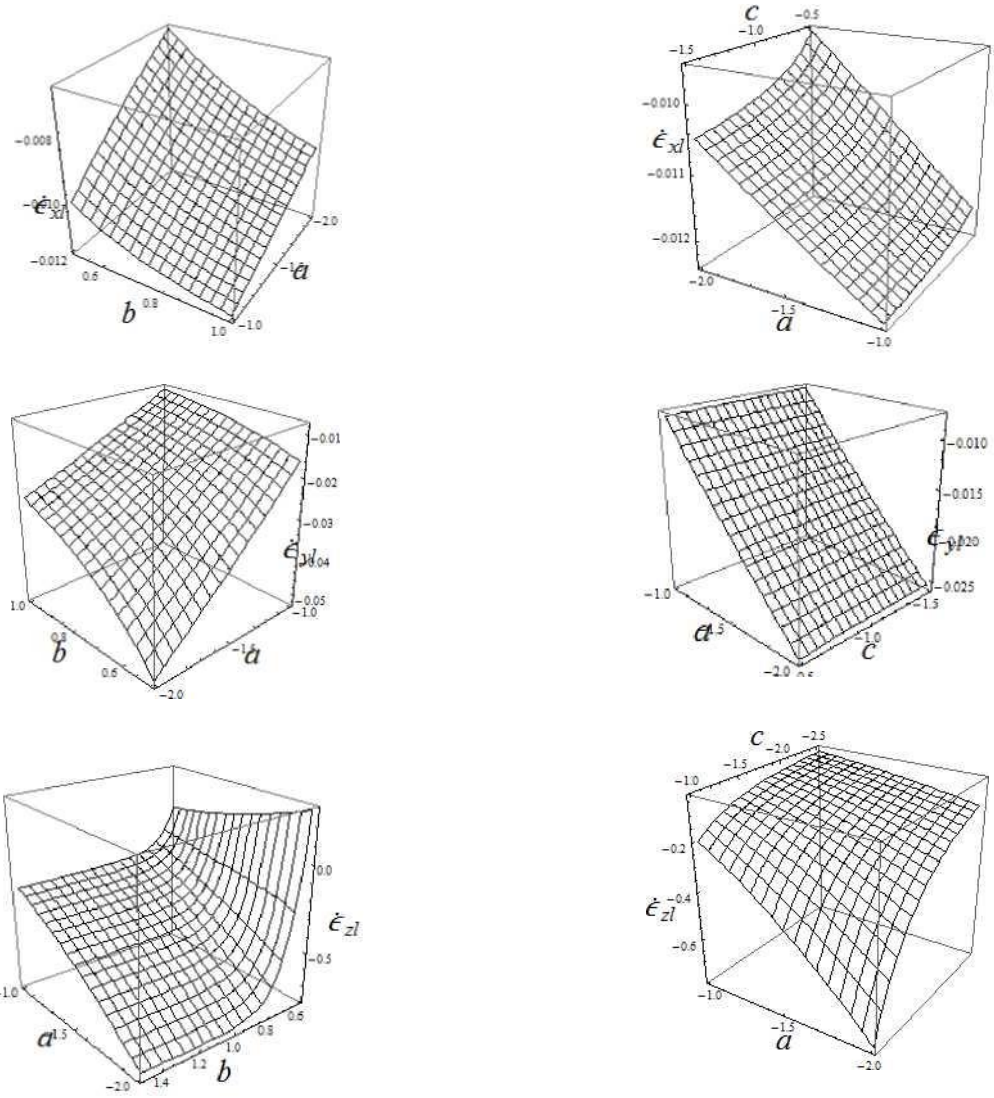


Fig. 1 - Scheme of the share mole plow motion

the decrease in the slope of the normal of the plane to the axis ox that is longitudinal to the direction of motion (magnitude $_{1\,a}$), leads to an increase in thenormal strain rate components $f_{r/}$,t, (compression) and a decrease in the component $t_{v/}$ that is transverse to the direction of motion;

1) the increase in the slope of the normal of the plane to the axis $_{oy}$ that is transverse to the direction of motion (magnitude $_{1b}$), leads to a decrease in the normal strain rate components $_{Tv/\ ,\ Tv/\ ,\ t,\ ;}$

2) the increase in the slope of the normal of the plane to the axis oz that is vertical to the direction of motion (magnitude $_{1\,c}$), leads to a decrease in the normal



strain rate components $_{t;ry}$,, and the component $f_{v/}$ remains unchanged.

Fig. 2 - Graphs of the normal strain rate components of the soil depending on the coefficients $_{a,b,c}$ of equation of plane It should be noted that:

1) the decrease in the slope of the normal of the plane to the axis ox (magnitude $_{1/a}$), leads to an increase in all three shear-strain rate components $_{7xyl\ !\ Yxzl\ \blacksquare>\ 7yzl}$

2) the decrease in the slope of the normal of the plane to the axis $_{oy}$ (magnitude $_{1Jb}$), leads to an increase in components $_{fr.J}$ and does not affect the change $_{yx=l;}$

3) the increase in the slope of the normal of the plane to the axis oz (magnitude i/c), leads to an increase in the y_{yd}, y_{xzi} , while component $y_{xy,}$ remains unchanged (Fig. 3).

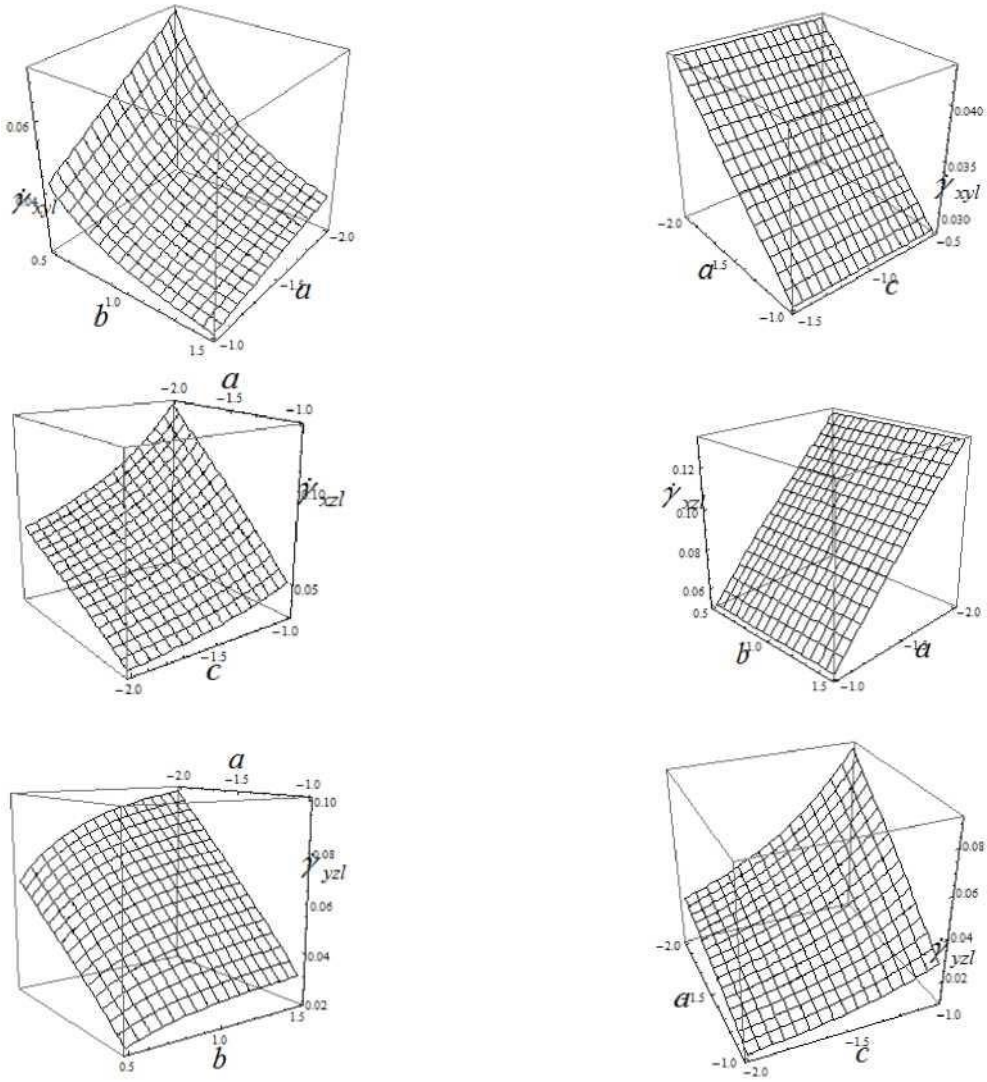


Fig. 3 - Graphs of the shear-strain rate components of the soil $y_{:nl}$-$y_{x:l}$-$y_{,zl}$, depending on the coefficients a,b,c of equation of plane

The research results of the interaction of share mole plow with the soil are presented in the paper. As a result of the analysis, the strain rate components of the soil at the contact zone with share mole plow were obtained.

These expressions are the starting point for the further determination of the stresses components in the soil that determine the soil compaction on the walls of the formed of cavity for impervious screen and components of resistance forces to movement of share mole plow. In the future, this will make it possible to determine the geometric parameters of the tool, under various mechanical properties of the soil,

to ensure the stability of the cavity walls with minimum energy costs.

The solution is common for a certain class of problems of the kinematics of the contact interaction of a rigid body with a deformable medium.

The proposed solution makes it possible to determine the changes in the components of the soil's strain rates as a function of the slope of the ploughshare plane.

In the future, this allows us to determine the dynamic components of the contact interaction of the ploughshare with the soil.

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