UDC 631.316.002.001.4

INVESTIGATION DEPTH incorporation of crop residues bunk plows

VA Dubrovin, SS Tishchenko, PhD
AI Moroz Engineer

The results of comparative studies bunk plow depth wrapping plant residues. It is proved that bunk plows that are on the top tier shelf napivhvyntovi plant remains wrapped in greater depth.

Plough, rack, earnings, plant remains, depth.

Problem. When using syderalnyh crops as organic fertilizer vazhlysym factor is its foundation on such depth when they are in further processing, not pulled to the surface, contributing to their degradation and increase nutrients in the soil. In addition, deep plowing a positive effect on the increase in soil moisture reserves. Thus, deep plowing is an important agricultural practices.

Analysis of recent research. Deep plowing is done bunk plows. The existing two-story buildings of cultural plows equipped with upper and lower tiers. The surfaces of these shells shelves made by classical method [2] based on building surfaces tsylindroida. Designed currently geometric model [1], can empower design based on geometric methods. However, existing methods of design, based on the geometric approach, do not include such important factors such as the physical and mechanical properties of soil. In addition, the use of existing methods do not allow moldboard design with well-developed wings, the need for deep plowing crop residues.

The purpose is to study the depth of plowing plow plant remains bunk with cultural and buildings napivhvyntovymy upper tier.

Results. Cases bunk move the plow layer of soil, and the topsoil is reset buildings on the upper tier seat bottom, which took the top. Depth earnings plant remains in this case is determined by how developed wings shelf. Developed wings have a shelf plowing components napivhvyntovoho type.

To investigate the depth of earnings plant remains were developed napivhvyntovi shelf towers upper tier Bunk plow.

Napivhvyntovoho surface casing designed based on the model Ruled Surfaces [3], which allows you to simulate surface curvature which is different from zero.

The surface formed movement in space straight line parameters whose provisions imposed certain conditions, including curvature

coefficient, which is an analogue of the Gaussian curvature of the surface. Availability curvature coefficient can vary the provisions of generators receiving surface of the desired shape.

The guide curve surface based on direct exponential function coefficient jamming [4], which has the following form in differential form

$$\frac{dK_{зщ}}{d\varphi} = w K_{зщ},$$

where $K_{зщ}$ - Current coefficient jamming, ratio. ed .; φ - The polar angle, rad .; w - Parameter that determines the rate of change of blade pinching the soil surface, ratio. units.

In integral form dependence of clamping have the following form:

$$K_{зщ} = K_0 e^{w\varphi},$$

where K_0 - Initial clamping ratio, ratio. units.

The initial rate of jamming determined by the formula:

$$K_o = \frac{1}{f_2}\sqrt{\frac{1-\cos\left(45^0+\alpha_p+\varphi_1\right)}{1+\cos\left(45^0+\alpha_p+\varphi_1\right)}},$$

where α_p - The angle of the blade to the bottom of the furrow, hail; φ_1 - External friction angle of the soil, hail; f_2 - Coefficient of internal friction of soil, ratio. units.

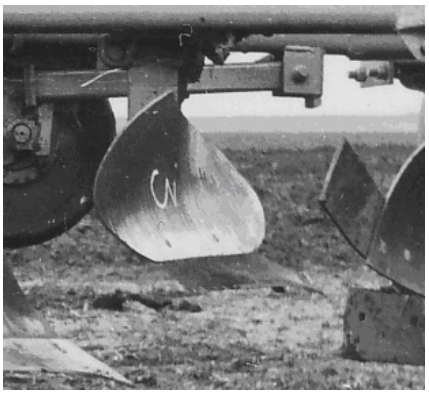
Based on the direct exponential function coefficient jamming directing curve in polar coordinates have the following equation:

$$r = \frac{d}{2 f_2 K_o e^{w\varphi}},$$

where d - The average size of soil clods mm.

Research depths earnings vegetable residues carried tiered plow at work stump-4-40, which had cultural buildings of the lower tier. In turn, the top tier of established cultural and napivhvyntovi buildings. General view of the buildings shown in Fig. 1.

Research bunk plows conducted under conditions typical for primary tillage Dnipropetrovsk region, namely ahrofon - winter wheat stubble, the number of plant remains 385 g / m2, the type of soil - black soil, topography is smooth, micro - aligned. Humidity and hardness of the soil are given in Table. 1.




a) b)

Fig. 1. Cases bunk-4-40 plow stump: a) napivhvyntovyy housing upper tier; b) cultural body of the lower tier.

1. Humidity and hardness of the soil in the study of bunk plows.

Soil layer, cm	Humidity,%	Hardness, N / cm2
0 - 10	17.3	5.3
10 - 20	17.7	5.2
20 - 30	18.3	5.1
Mean values	17.76	5.2

Drawings surface napivhvyntovoho body, which was placed on the top tier bunk plow stump-4-40, is presented in Fig. 2. Napivhvyntovyy building was completed Lozenge and had the following parameters: the angle of the blades to the bottom groove $\alpha_P = 25^0$; the angle of the blades to the wall grooves $\gamma_0 = 45^0$; width $b = 400$ mm; layer depth $a = 220 - 300$ mm; point bulge height guide curve $h = 315$ mm; departure guide curve $l = 170$ mm; value characteristic points of the function of the angle of inclination to the horizontal projection of the generatrix wall grooves $\gamma_0 = 45^0, \gamma_{\min} = 43^0, \gamma_{\max} = 65^0$; the initial value of the coefficient of strangulation $K_{зщ0} = 2,4$; surface curvature coefficient $\lambda_K = 0,2$; angle field shotgun rack $\delta = 45^0$.

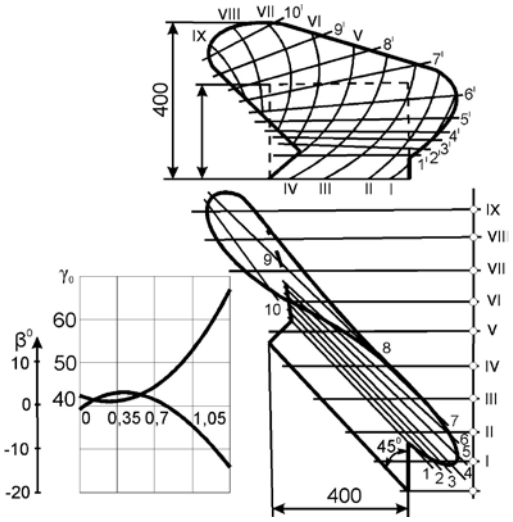


Fig. 2. The surface casing napivhvyntovoho upper tier bunk-4-40 plow stump.

Research depths earnings plant remains were carried out at the speed of the unit 150K + T-stump 4-40 at a speed of 2.5 and 3.0 m / s. Fig. 3 shows a cross-section of the field following an 4-40 plow-stump.

Studies have shown that the speed of the change point in the range 2.5-3.0 m / s has no significant effect on earnings depth plant remains regardless of the type of housing mounted on the top tier.

In turn, the depth of earnings plant remains dependent on the type of cabinet mounted on the top tier components. Thus, the depth of earnings made from plant remains napivhvyntovymy buildings 15.9 cmAnd the cultural | Housing upper tier - 14.6 cm.

Fig. 3. Cross-section of the field after the passage plow stump-4-40S napivhvyntovymy upper tier buildings.

Increasing the depth of earnings plant remains napivhvyntovymy buildings due to the fact that napivhvyntovi buildings have large curvature, so that the ground is moving in an orderly manner established trajectories without mixing the layers together. Cultural buildings have less curvature, not zabezpechuэ sustainable trajectories soil layers of soil mixed with each other and with crop residues.

Effect of rhombic shape napivhvyntovoyi shelf to a depth of earnings plant remains not felt.

Conclusion. Napivhvyntovi buildings, designed on the basis of direct exponential dependence of zashemlennya zaroblyuyut plant remains at depth 15.9 cm, 10.9% more than cultural.

References

1. Voytyuk DG Design Ruled Surfaces at the estimated trajectory of motion of a particle on her / DG Voytyuk, SF Pylypaka // Scientific bulletin NAU. - K., 2002. - Vol. 49. - P. 68-74.
2. Schuchkyn NV Method of Designing tsylyndroydalnыh otvalov / NV Schuchkyn // Theory, design and manufacture of agricultural machinery. - M .: Selhozhyz, 1963. - P. 303-343.
3. Tishchenko SS Designing cultural plowing through generalized geometric model of adaptive surface / SS Tishchenko // Proceedings of Taurian State Agro-Technical Academy. - Melitopol, 2003. - Vol. 10. - P. 123-128.
4. Tishchenko SS Designing guide curves surfaces soil-cultivating working organs with zadannoy kryvyznoy / SS Tishchenko // Scientific Bulletin of National universytete Life and Environmental Sciences. - K., 2010. - Vol. 144 - Part 3 - P. 243-252.

Results of research Pryvedenы sravnytelnыh dvohъyarusnыh Plugova in Depth zadelky rastytelnыh ostatkov. Proved, something dvuhъyarusnыe plows with poluvyntovыmy buildings verhneho tier zadelыvayut rastytelnыe remnant bolshuyu in depth.

Plough, otval, zadelka, rastytelnыe remnant, depth.

The results of comparative studies dvohyarusnyh plow depth incorporation of crop residues. It is proved that plows with bunk semidigger bodies upper tier *plant remains are buried at a greater depth.*

Plow, plow, sealing, crop residues, depth.