4. Статистичний бюлетень "Загальноосвітні навчальні заклади України" [Електронний ресурс]. — Режим доступу: http: // ukrstat.oro/about. Html
5. Ярмоленко Ю.О. Стан та напрями покращення інвестиційно_інноваційного забезпечення аграрного виробництва України / Ю.О. Ярмоленко // Агросвіт. — 2019. — № 18. — С. 52—58.

UDK 631.31

JUSTIFICATION OF THE PARAMETERS OF THE TILLAGE MACHINE FOR ENERGY-SAVING TILLAGE TECHNOLOGY

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Abstract. *A tillage machine is considered, where the installation of a plowshare is provided. In order to minimize the traction resistance of the tool as a whole, the profile of the plowshare is substantiated using the method of direct variational calculus. As the initial conditions, the angle of entry of the plowshare into the soil and the final angle at the point of contact of the plowshare to the rack are taken.*

Key words: *soil, share, share profile, interaction, boundary conditions, energy, tillage*

The plowshare of the tillage machine is designed for cutting the soil layer, directing the soil to the loosening and separating device, and also for preventing spillage of unseparated soil to the bottom of the furrow.

The plowshare of the ripping-separating device has a longitudinal axis of symmetry, so we will consider only one wing. Assume that the share wing moves in the soil along its entire length at the same depth, the pressure of the soil on the share brought to the blade. We accept that the projection of soil pressure on the direction of movement along the blade is a constant value.

An indicator of the energy intensity of the process, the force of resistance to the movement of the plowshare in the soil (R_x).

We use the moving coordinate system *xOy* (Fig. 1), a plane parallel to the plane that runs along the field surface. In this coordinate system, we consider a curvilinear paw blade [1].

In this diagram, consider the area $x_0, y_0; x_k, y_k$ the working surface of the plowshare knife with the applied forces.

When moving the plowshare knife to an elementary section, elementary resistance acts, which is found by the formula

$$dR_x = q \cdot de \cdot \sin\alpha + F_{fr} \cdot \cos\alpha \qquad (1)$$

where *q* – normal specific force of pressure on the blade of the plowshare;

F_{fr} – friction force of the working surface of the movable blade of the plowshare on the soil;

α – the angle between the tangent to the profile of the share section at the point of application of force q and the horizontal;

de – moving point coordinates.

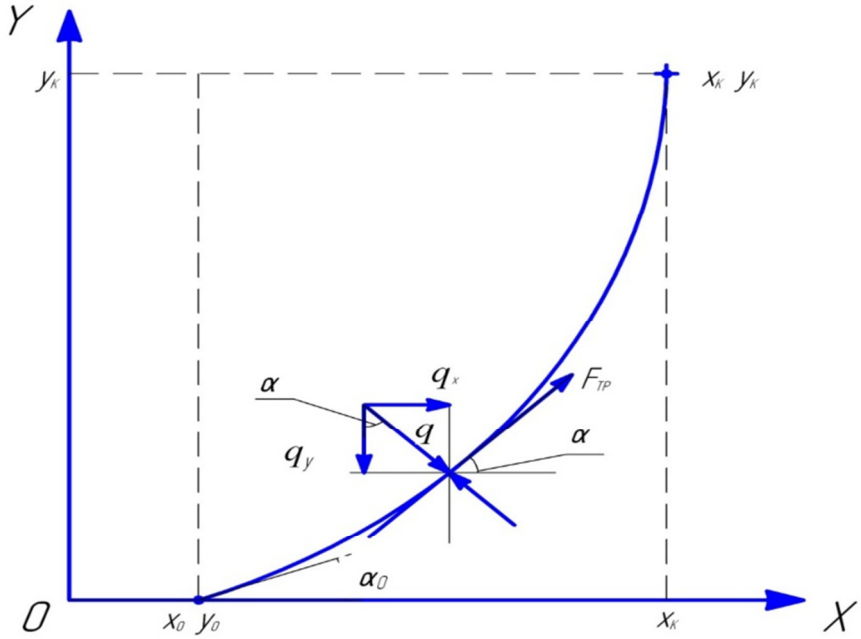

Fig 1. Scheme for the justification of the share blade

We get the functional:

(2)

$$R_x = \rho v^2 \int_{x_0}^{x_k} \left(1 - \frac{y - h_0}{y_k}\right) \frac{y'^3}{1 + y'^2} (1 + y') dx$$

where ρ – soil density;

υ – the speed of the share blade in the soil;

y – initial coordinate of the share blade;

y_k – end coordinate of the share blade;

h_0 – a constant value that determines the normal pressure of the soil on the knife at the point $y=y_k$.

To find the extremum of functional (2), we use the direct method of Ritz's calculus of variations [2]. The statement of the variational problem in this case is formed as follows: among the plural number of curves that pass through the points $(x_0 = 0; y_0 = 0)(x_k = 0{,}18; y_k = 0{,}12)$. At the output initial angle, find such a curve, the equation of which will describe the blade profile of the plowshare with the minimum energy intensity. The equation of the curve, which satisfies the conditions of the problem, is represented as a polynomial with unknown coefficients [2].

$$y = y_0'(x - x_0) + \frac{(x - x_0)^2 (y_k - (x_k - x_0) y_0')}{(x_k - x_0)^2} + C_1 (x - x_0)^2 (x - x_k) + \\ + C_2 (x - x_0)^3 (x - x_k) \qquad (3)$$

The curve equation that describes the minimum resistance share blade is:

$$y = 0{,}083 \cdot (x - 0{,}04) + \left((x - 0{,}04)^2 \cdot \frac{0{,}17}{0{,}0064} + (x - 0{,}12) \cdot 4{,}0498 - 5{,}518\right)$$

Thus, the substantiation of the profile of the plowshare with minimum traction resistance was carried out, which allows to reduce energy costs and improve the quality of the tillage machine.

References

1. Kornienko S. etal. Developing the method of constructing mathematical models of soil condition under the action of a wedge // Eastern-European journal of advanced technologies. 2016. . 5 (7). P. 34-43.

2. Pashchenko V.F., Kornienko S.I. Scientific basis of soil processing processes in the system of rational cultivation of grain and vegetable crops. Kh.: "Planeta-print" LLC, 2016. 320p.

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UDK: 635.

IMPLEMENTATION OF ENERGY-SAVING TECHNOLOGIES IN SPRING IRRIGATION

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Aspects of stable development of agriculture in the southern region of Ukraine based on irrigated agriculture are considered, analyzed and shown. Advantages and disadvantages of modern irrigation systems in production are given. It was determined that modern sprinkler systems require the introduction of energy-saving technologies based on the automation of the irrigation process and autonomous renewable power sources.

Key words: *regional development, agriculture, irrigation, energy conservation.*

Agriculture in Ukraine is a key sector of its economy. The main branch of specialization of the country's agriculture is plant growing, especially technical and fodder (sugar beet, sunflower, etc.). According to their physical, mineralogical, chemical, agrochemical properties, Ukrainian chernozems are considered the best in the world. In Ukraine, chernozems occupy an area of 60.4 million hectares, of which almost 42 million hectares (about 69%) are agricultural lands, of which about 33