GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ)
ISSN (E): 2347-6915
Vol. 11, Issue 11, November (2023)

DRAWING AND PLANTING UNITS DETERMINATION MODELS OF PRODUCTIVITY

M. Toshboltaev
Professor of the Agricultural Mechanization Research Institute

B. Artikbaev
Senior Researcher of Agricultural Mechanization Research Institute

ABSTRACT

The performance of machine and tractor units (MTU) is the most important indicator of their effectiveness. During field testing of new or modernized units, this indicator is taken as a criterion for assessing their performance. Consequently, conducting scientific research aimed at determining the composition and structure of analytical expressions for the performance of machine and tractor units is relevant. The purpose of this study is to develop mathematical models of the performance of units for chiseling and sowing seeds of agricultural crops. In the process of analytical research, well-known methods of analysis and synthesis of information, comparison of data and phenomena, and the scientific subject of operation of the machine and tractor fleet were used.

Based on such primary data (parameters) as the design working width, theoretical working speed and shift time utilization factor, analytical formulas (mathematical models) were derived to calculate the productivity of chisel and sowing units per hour depending on the processed field area (ha/hour); in one hour depending on the volume of soil processed by the working bodies (m^3/hour), in one hour depending on the traction resistance of the machines (ha/hour) and the traction power of the tractor.

It has been established that the productivity of machine and tractor units with increases in traction power, shift and operating time utilization rates increases, while specific resistance and processing depth decreases.

The derived mathematical models of the performance of units for chiseling and sowing seeds can be used to determine and evaluate their operating efficiency.

The literature on the science of using the machine-tractor park was used in the construction of mathematical models of the work output of tillage and seed sowing units [1-5].

Currently, in the preparation of land for planting, the Chiku-4A type chisel-cultivators are used as a trailer to the T-4A-S4 or VT-150 chain tractor, and the SChX-4A, SXU-4 or SMX-4 mechanical ones are used as a trailer to the MTZ-80X or TTZ 80.11 mowing tractor for sowing seeds. seeders and the "Keys-1200" pneumatic seeder combined with the "Magnum" or MX-135 universal mowing tractor are used.

A special feature of these aggregates is that they treat not the entire surface of the field, but a part of it at a small depth. The productivity of these aggregates generally depends on the coverage width of the machine $B_к$, working speed $V_н$ and shift time utilization coefficient (τ).

The operating productivity of a machine in 1 hour where the working bodies are located next to each other at equal distances:

$$w_{эк} = 0{,}1(B_к + в_қ)V_н\tau$$

or

$$w_{эк} = 0{,}1в_қ(n_қ + 1)\ V_н\tau \text{ (ha/hour)}, \tag{1}$$

here $B_к = в_қ n_қ$ – Conditional working coverage width of the aggregate (distance between working bodies located at two ends), m;

$в_қ$ – width between rows, m;

$n_қ$ – the number of processed rows;

$V_н$ - aggregate speed, km/h;

τ - coefficient of use of shift time.

As mentioned above, the aggregate does not treat the entire area, but only a part of it. Therefore, the formula for the performance of the unit will be:

$$w_{эк} = 0{,}1B_T V_н\tau \ (ha/hour), \tag{2}$$

Here, $B_T = в_и n_и$ is the total width of processed strips (slices), m;

$в_и$ - coverage width of one working body, m;

$n_и$ - the number of working bodies.

The equation of the operational productivity of the unit in 1 hour expressed by the volume of treated soil:

$$w_{эк} = 10 \cdot B_T a V_н \tau$$

or

$$w_{эк} = 10\, в_и n_и a V_н \tau \ (m^3/hour), \tag{3}$$

where a is the soil working depth, cm.

The total resistivity of the machine for carving and planting aggregates is equal to:

$$K_э = \frac{R_a}{B_T} \ (kgc/m) \tag{4}$$

ёки

$$B_T = \frac{R_a}{K_э}. \tag{5}$$

Substituting the expression of B_T in (5) into (2), we get

$$w_{эк} = 0{,}1\frac{R_a V_н}{K_э}\tau \ (ha/hour). \tag{6}$$

Power on the tractor hitch:

$$N_{ил} = \frac{P_{ил} V_н}{270} \ (о.к.). \tag{7}$$

Since equality $R_a = P_{ил}$ is relevant in the operation of the unit, we get from equations (6) and (7):

$$w_{эк} = 27\frac{N_{ил}}{K_э}\tau \ \ (ha/hour), \quad (8)$$

here $N_{ил}$ [о.к.], $K_э$ (кгс/м).

Now we put the value of B_T according to (5) into expression (3):

$$w_{эк} = 10B_T aV_н\tau = 10\frac{R_a}{K_э}aV_н\tau = 10\frac{R_aV_н}{K_э}a\tau = 10\frac{270N_{ил}}{K_э}a\tau$$

or

$$w_{эк} = 2700\frac{N_{ил}}{K_э}a\tau \ \ (м^3/hour), \quad (9)$$

here a [см].

Thus, the above-mentioned mathematical models of the work productivity of carving and planting units are used to determine the operational indicators of such units and to evaluate their effectiveness.

REFERENCES

1. Tashboltaev M. Theoretical and practical principles of increasing the productivity of machine-tractor units. (Monograph) // Tashkent: "SPECTRUM MEDIA GROUP", 2015, - 88 p.
2. Tashboltaev M., Khadzhiev A., Baymetov R., Tokhtakoziev A., Khushvaktov B., Karakhanov A., Kholiyrov Yo., Astanakulov K., Spevakov R., Usarov S., Tolanov I. Adjustment and efficient use of cotton and grain machines. Corrected, supplemented 2nd edition / Mas. muhar. M. Tashboltaev. - T.: Science, 2012. - 200 p.
3. Zangiev A.A., Shpilko A.V., Levshin A.G. Operation of the machine and tractor fleet. – M.: Kolos, 2004. – 320 p.
4. Didenko N.K. Operation of the machine and tractor fleet. – Kyiv: “Vishcha School”, 1977. – 392 p.
5. Polkanov I.P. Theory and calculation of machine and tractor units. – M.: Mashinostroenie, 1964. – 255 p.