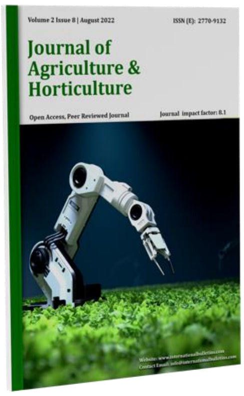

THE THEORETICAL FOUNDATION OF THE PARAMETERS OF THE COMBINED AGGREGATE CONDITIONER

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Abstract. The article presents the results of the theoretical studies conducted on the basis of the optimal values of the parameters of the combined aggregate leveler that works the soil before planting. According to the obtained results, the required quality of work, that is, the size of the processed layer is 25 mm. the amount of fractions smaller than 80 percent and the height of irregularities on the surface of the field to be ± 2 cm at most with low energy consumption, the following parameters, the opening angle of the sides of the aggregate leveler, the gravity force acting on the leveler with respect to the horizon or The tilting angle, the height of the screed and the specific mass of the aggregate screed were theoretically studied.

Key words: leveler, softener, aggregate, attack angle, comparison mass, referent corner

1. Introduction

Current in the day village farm efficient and stable in development the most important from directions one considered this to the field modern agricultural technologies current to do and farmer farms high fruitful village economy techniques with provide at the expense of done is increased. Village farm from crops plenty harvest in getting planting before to the lands good quality processing to give important important have is considered Because, planting before to the lands good quality processing if not given, the village farm crops seeds agrotechnics requirements level good quality planting will not be planted seeds cross sprout does not come out and each one per hectare necessary has been seedling not taken. This is it in turn crops fertility to decrease take will come [1-3].

In recent years, certain works have been carried out to reform the agriculture of our country, in particular, to improve the state management system in the field, to widely introduce market relations and strengthen their legal basis, to attract investments to the field, and to introduce resource-saving technologies and technical tools [2-4].

2. Materials and Methods

Today, the cultivated area before planting in the soil is 1.6 billion., and for Uzbekistan 3.1 million ha Currently, the use of energy and resource-efficient agricultural machines with high work quality and productivity in pre-planting processing is one of the urgent tasks. One of the main tasks in preparing the land for planting is to level the surface of the field immediately before planting, compacting it to the required level, and crushing the large lumps in it to create a soft soil layer, in order to ensure high-quality planting and uniform germination of seeds. To perform the currently indicated agrotechnical activities, medium BZSS-1.0 and heavy BZTS-1.0 and BZTX-1.0 gear harrows, RVN-8.5 leveler-compacter, VP-8,0 pre-sowing leveler, MV-6.0 and MV-6.5 levelers are used [1-4]. However, in most cases, they cause insufficient grinding of the pieces on the surface of the field, and during the planting season, they, that is, the pieces that have not been crushed, fall to different depths. As a result, the seeds do not germinate at the required level, and the germinated sprouts do not develop evenly. In order to prevent this from happening, the land is plowed and fertilized 2-3 times before planting in farmers and peasant farms.

The research conducted on the surface of levelers and compactors that work on the soil before planting, the above-mentioned disadvantages of aggregates consisting of harrows and toothed harrows, improvement of the construction of harrows, i.e. changing the geometric shape and raising the travel part in the transition state and in the process of moving from field to field -shown that it can be eliminated by developing a special mechanism for the drop. In this case, due to the change in the construction of the field machine, the resistance to the tractor is reduced and the process of transportation becomes easier.

3. Results and discussions

The combined aggregate, which works before sowing the soil, consists of levelers and harrows, the following are its main parameters affecting agrotechnical and energetic performance:

2β −the opening angle of the side leveling parts; h_b −height of the leveler; α −the angle of orientation of the leveler traction force relative to the horizon; q_s −determination of the vertical specific pressure exerted by the leveler on the soil; m_t −the mass of the leveler.

3.1. The opening angle of the side leveling parts the opening angle of the sides, which is considered the main working part, is *2 β*, it is of great importance for the quality of the work performed and the complete fulfillment of agrotechnical requirements. At large values of the opening angle, it is observed that the unit's resistance to the tractor increases. At small values of this value, it leads to exceeding the constructive dimensions of the aggregate and deviation of the leveling process from the required level. Therefore, it is important to choose the optimal values of the opening angle. Angle right only when the piles of soil are selected, they move to the side during the movement of the unit and do not accumulate in one place.

Under the influence of the side leveling parts, the pieces of soil move in the longitudinal and transverse directions, they should slide along the working surfaces of the side leveling parts. To solve this problem, we consider the forces exerted by the right side leveler on the soil. In the process of work, the normal *N* and frictional forces *F=fN* act on the piece of right-side cutting parts (Fig. 1).

N acting on the piece of soil into two components: N_v directed along the direction of movement and under the influence of the force N_s,N_v directed along the surface of the right side leveler the pieces of soil move in the longitudinal direction, and under the influence of the N_s force, they slide along the working surface of the right side leveler. But this is resisted by the frictional force F, and the following condition must be met in order for the soil particles to slide along the working surfaces of the side levelers

$$N_S > F = fN = Ntg\varphi, \quad (1)$$

where *f* is the coefficient of friction of the soil on the working surface of the side leveling parts;

F–friction strength; *N*–normal force .

According to the scheme presented in Fig. 1

$$N_s = Ntg(90^0 - \beta) \quad (2)$$

in this

β–leveler opening corner

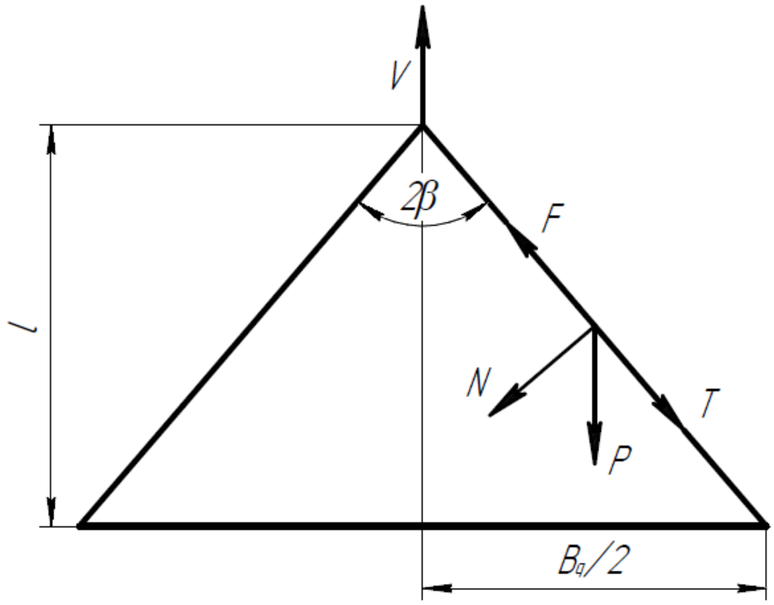

Figure 1. The scheme for determining the opening angle of the side leveling parts

Taking this into account, the expression (1) will have the following form

$$Ntg(90-\beta) > \mathrm{Ntg}\,\varphi. \quad (3)$$

from this

$$\beta < 90-\varphi \quad (4)$$

and

$$2\beta < 180-2\varphi \quad (5)$$

it follows that.

Resource economical combined optimal opening of the machine the corner count for (5) we use the expression. Putting the maximum value of the friction angle on it, φ= 35 ° [5], we determine that the opening angle of the side levelers should be at most 110 °.

3.2. The angle of direction of the leveling force relative to the horizon based on previous scientific research to determine [8] the drag force $G_t = m_t g$ P_t to have the same impact on the soil along the entire length of the leveler The trace of must pass through *"I"*. Because otherwise, a torque will be created on the leveler, and as a result, its front and rear parts will have different effects on the soil. If the line of

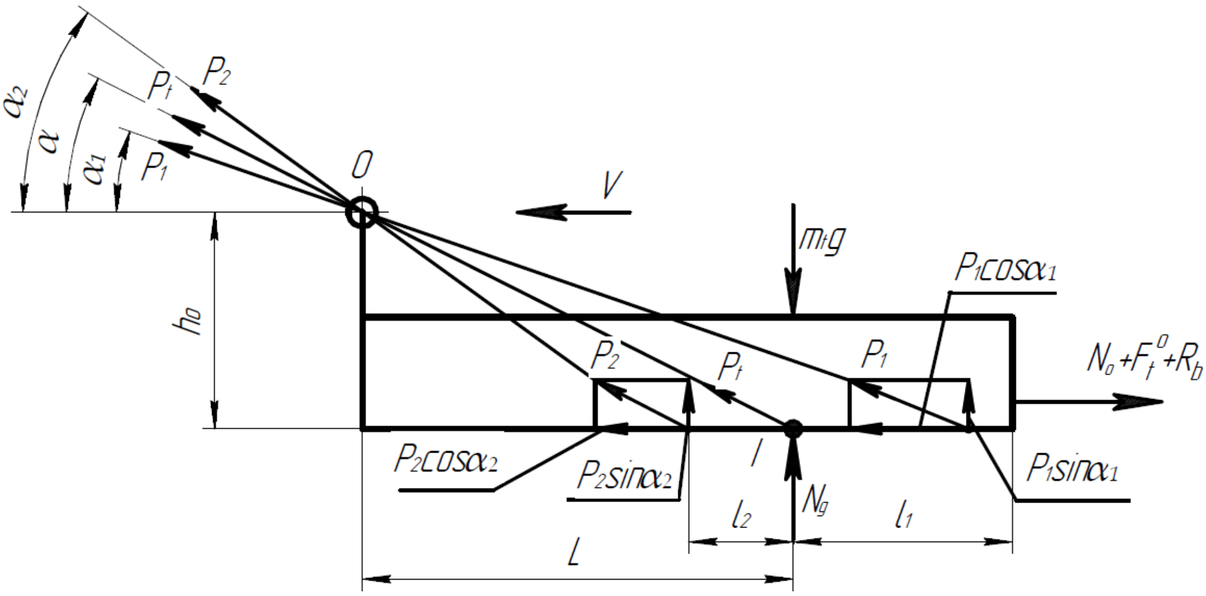

Figure 2. Scheme for basing the angle of orientation of the gravity force acting on the leveler with respect to the horizon

action of the force P_t passes through the center of the leveler's center of gravity (Fig. 2), then $M_1=P_1l_1sina_1$ screwdriver mament is formed. If the line of action of the force P_t passes in front of the track of the center of gravity of the leveler, a torque $M_2=P_2\,l_2\,sina_2$ is generated relative to the point *"I"* and it will lift the front part of the leveler off the ground, and the back tries to ground part of it. As a result, the soil is leveled evenly along the length of the leveler. The line of action of gravity passing through the track of the center of gravity of the leveler is achieved by directing it at a certain angle α relative to the horizon.

According to the scheme presented in Fig. 2

$$\alpha = arctg\frac{h_o}{L}, \tag{7}$$

where h_0 is the vertical distance from the base surface of the leveler to the tractor connection point *"O"*, m;

L –longitudinal distance from the point of connection of the leveler to the tractor to the track of its center of gravity. The angle of orientation of the leveling force relative to the horizon We determine by expression (7). h_0 =15 cm, according to Figure 2 $L=\frac{1}{3}Bctg\beta$, taking B =600 cm and β =50 °, we determine that this angle is 6 °.

The specific vertical pressure exerted by the leveler on the soil q_s using the following expression according to the scheme presented in Figure 3.

$$q_s = \frac{m_t g - P_t \sin\alpha}{S}, \tag{8}$$

where S –surface of the leveler support surface, m^2.

Figure 3 according to the scheme presented in the figure.

$$S = \frac{\Delta B_q\left(1+2\sin\beta\right)}{\sin\beta} - \Delta^2\left(tg\beta + ctg\beta\right) \tag{9}$$

or

$$S = \Delta\left[B_q \frac{1+\sin\beta}{\sin\beta} - \Delta\left(tg\beta + ctg\beta\right)\right] \qquad (10)$$

where Δ – the width of the side and rear levelers, m;

B_q – coverage width of the leveler, m.

(10) into account, the expression (8) has the following form

$$q_s = \frac{\left(m_t g - P_t \sin\alpha\right)\sin\beta}{\Delta\left[B_q\left(1+\sin\beta\right) - \Delta\sin\beta\left(tg\beta + ctg\phi\right)\right]} \qquad (11)$$

By putting the value of , in this expression, we get the following result P_t.

$$q_s = \left\{ m_t g\left[1 - \frac{\sin\phi\sin\alpha}{\cos\left(\varphi-\alpha\right)}\right] - \frac{\left[\left(N_o + R_b\right)\cos\varphi + \left(N_{o'}^y + N_{ch}^y\right)\right]\sin\alpha}{\cos\left(\varphi-\alpha\right)}\right\}\times$$
$$\times\sin\beta\left\{\Delta\left[B_q\left(1+\sin\beta\right) - \Delta\sin\beta\left(tg\beta - ctg\beta\right)\right]\right\}^{-1} \qquad (12)$$

It should be $[q_s] = 2 \div 6 \cdot 10^6$ Pa [6-8]. In this case ($[q_s]$ - the required specific pressure of the leveler to the soil, Pa). This expression B_q by, we determine the specific required mass of the screed per unit coverage width.

$$[m_t]_S = \frac{1}{B_q g\left[1 - \frac{\sin\varphi\sin\alpha}{\cos(\varphi-\alpha)}\right]}\left\{\frac{[q_s]\left\{\Delta\left[B_q(1-\sin\beta) - \Delta\sin\beta\left(tg\beta + ctg\beta\right)\right]\right\}}{\sin\beta}\right\} -$$
$$- \frac{\left[(N_0 + R_b)\cos\varphi + (N_{o'}^y + N_{ch}^y)\sin(\beta+\varphi)\right]\sin\alpha}{\cos(\varphi-\alpha)}. \qquad (13)$$

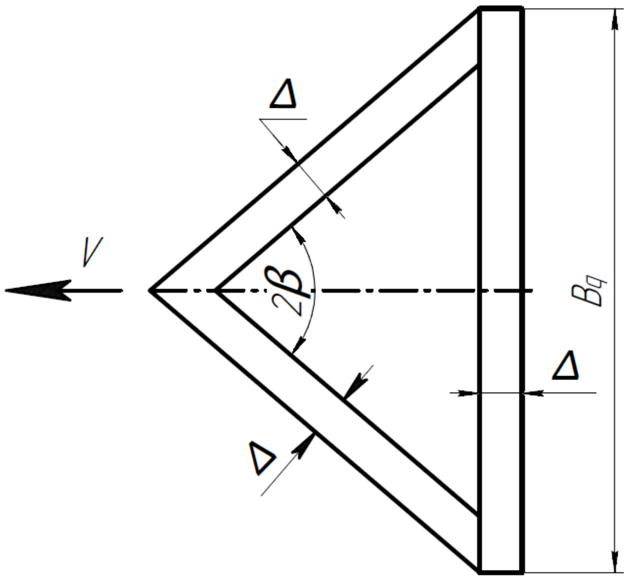

Figure 3. Scheme for determining the specific vertical pressure exerted by the leveler on the soil

Leveler is connected to the coverage width of the total and specific masses that ensure soil compaction at the required level, the specific pressure applied to the soil at the required level, the width of the side and back leveler, the opening angle of the side levelers, the normal reaction forces acting on the working surfaces of the side and back leveler, connected to the leveler varies depending on the harrows' resistance to traction, the angle of friction of the soil against the working surfaces of the levelers, and the angle of deviation of the leveler's traction line relative to the horizon.

3.3. The mass of the straightener (14) we determine by the expression. For this purpose, based on previous studies $N^{y}_{o'}, N^{y}_{ch}, N_{o}$, we can express R_b as follows [9]:

$$N^{y}_{o'} = N^{y}_{ch} = \frac{f'}{\pi}\rho g \frac{B_q}{\sin\beta} Z_0 l_H; \quad (14)$$

$$N_0 = \frac{2f'}{\pi}\rho g B_q Z_0 l_H; \quad (15)$$

$$R_b = 2R_s B_q, \quad (16)$$

In this ρ–the density of the soil compacted in front of the compactor, kg/m^3;

g– acceleration of free fall, m/s^2;

f' – is the soil-to-soil friction coefficient;

R_s – is the specific resistance of the furrow corresponding to one meter coverage width, N/m.

Taking into account (12) and (13), the expression (17) has the following form

$$[m_t]_s = \frac{1}{B_q g\left[1 - \frac{\sin\varphi\sin\alpha}{\cos(\varphi-\alpha)}\right]}\left\{\frac{[q_s]\left\{\Delta\left[B_q(1+\sin\beta) - \Delta\sin\beta(tg\beta+ctg\beta)\right]\right\}}{\sin\beta} + \right.$$
$$\left. + \frac{B_q}{\cos(\varphi-\alpha)}\left[\left(\frac{2f'}{\pi}\rho g Z_0 l_H + 2R_s\right)\cos\varphi + \frac{2f'}{\pi\sin\beta}\rho g Z_0 l_H \sin(\beta+\varphi)\right]\sin\alpha\right\}. \quad (17)$$

This expression includes B_q =6 m, g =9.8 m/s^2, φ =30 °, a =6 °, $[q_s]$ =4 ·10^3 Pa, Δ = 0.14 m, β=50 °, by setting ρ=1000 kg/m^3, Z = 0.05 m, l_H = 0.45 m and

R_s = 800 N, the total mass of the leveler is 703 kg, and the specific mass is 117 kg/m we determine that it should be.

4. Conclusion

The combined aggregate that works before planting in the soil to ensure the required quality of work with low energy consumption, the opening angle of the side leveling parts of the machine is at most 110 °, and the height of the leveler is at least 13 cm, and the direction of the leveler traction force is relative to the horizon. it was determined that the angle should be 6°, and the mass of the leveler should be 703 kg

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