HARVARD EDUCATIONAL AND SCIENTIFIC REVIEW

International Agency for Development of Culture, Education and Science

Vol.2. Issue 1 Pages 188-192.
10.5281/zenodo.7012058

Harvard Educational and Scientific Review
International Agency for Development of Culture, Education and Science
United Kingdom
Street: 2 High Street City: Ashby Phone number 079 6425 7122
Zip code DN16 8UZ Country United Kingdom
USA
Soldiers Field Boston, MA 02163 +1.800.427.5577

International Agency for Development of Culture, Education and Science United Kingdom
USA Soldiers Field Boston

Har. Edu.a.sci.rev. 0362-8027 188
Vol.2. Issue 1 Pages 188-192.
10.5281/zenodo.7012058

ANALYSIS OF THE CORRESPONDENCE OF THE TRACK OF SERIAL WHEELED TRACTORS TO VARIOUS ROW SPACING OF COTTON CROPS

Akhmetov A.A. – Doctor of Technical Sciences, Professor,
Akhmedov Sh.A. - PhD**,**
Kambarova D.U. – applicant Design and Technological Center of Agricultural Engineering

Abstract: Based on the analysis of the design of serial tractors used in agricultural production of the republic, it was found that in one case they are produced with a rigidly fixed track, and in the other – with a stepwise adjustable one. At the same time, spacers are used for maximum adaptation of the tractor track to the row spacing of crops, which requires additional costs. To ensure the possibility of adapting the running system to any row spacing, the improvement of the design of the tractor running system should be carried out in the direction of providing stepless regulation of the tractor track.

Keywords: universal-row tractors, wheel, row spacing, track, protective zone.

Introduction. In the republic, 3- and 4-wheeled universal-row tractors of traction class 0.9-1.4 are used in the cultivation of cotton. In recent years, with the creation of cotton-textile clusters in the total fleet, the share of 4-wheeled universal-row tractors has begun to increase. This was facilitated by a number of disadvantages of 3-wheeled tractors associated with low transverse stability, overloading of the front wheel tires, irrational distribution of the mass of the machine-tractor unit along the tractor supports, the inadmissibility of their use in transport work, low annual load, the complexity of creating a four-wheel drive tractor design, the impossibility of aggregating wide-ranging agricultural machines with them, negative man-made impact on soil, etc. [1]. Whereas all these disadvantages are absent in 4-wheeled universal-row tractors, but, at the same time, they have the only drawback associated with the insufficiency of agrotechnical clearance.

Taking into account the undeniable advantages, in order to eliminate the disadvantage associated with agrotechnical clearance, a 4-wheel tractor with adjustable clearance was developed in LLC "Design Technological Center of Agricultural Engineering (LLC "DTCAE") [2].

Materials and methods. In the republic, both 3-wheel and 4-wheel universal-row tractors work on row spacing of 60, 70 and 90 cm. For symmetrical passage of the wheel between rows of plants, adjust the track width of these tractors [3].

Although the ways to change the track width are different: moving the wheels along the half-axes; sliding the wheels together with the half-axes; "turning over" the wheels, installing the wheels by means of spacers or replacing a set of wheels, etc. most of the tractors available in the park change the track width by turning the wheels.

Results and discussions. Most cotton-textile clusters cultivate cotton on 76 cm aisles [4] and they are equipped with a set of agricultural machines designed for 76

cm aisles. Whereas the serial 3- and 4-wheeled tractors used in the republic in cotton growing are designed to work on row spacing of 60, 70 and 90 cm and their tracks in the classic version do not coincide with the row spacing of 76 cm. Only the track of the TD95D tractor corresponds to this row spacing, but they are almost not used due to the lack of agrotechnical clearance on row-to-row processing of cotton crops.

As a result of this discrepancy, there was a problem of a shortage of tractors with a track necessary for aggregating a set of agricultural machines designed for row spacing of 76 cm.

To get out of this situation, it became necessary to adapt the track of serial tractors to the 76 cm row spacing.

The main assessment of the adaptation of the track of serial tractors to row spacing of 76 cm is the provision of a protective zone (Fig. 1).

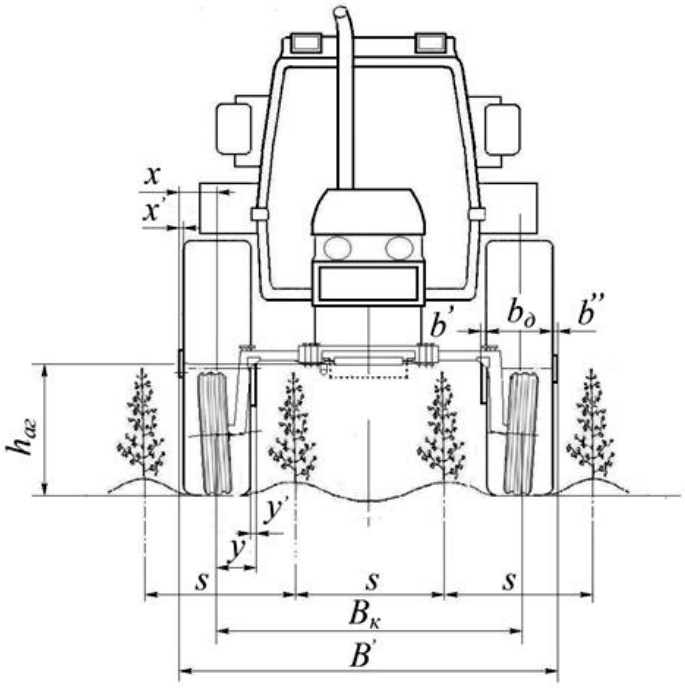

Fig. 1. The scheme for determining the protective zones of the tractor

The protective zone is the horizontal distance from the middle of the row to the nearest parts of the tractor mover and it depends on the track, the width of the wheels and the protruding parts of the final gears from the contour of the mover in and out.

Along with agroproslight (h_{ag}), sufficient sizes of protective zones ensure the safety of the root and aboveground parts of plants during the passage of the tractor unit, and also reduce crop losses. The optimal protective zones correspond to the symmetrical arrangement of the tractor wheels relative to the row spacing. Under this condition, the protective zones according to Fig. 1 and after a simple transformation in accordance with the work [5] will be:

– internal

$$y = \frac{(s - b_{\partial}) + (B_{к} - sn)}{2} - b', \quad (1)$$

– external

$$x = \frac{(s - b_o) - (B_к - sn)}{2} - b^{"}, \quad (2)$$

in this $B_к$ – track width, mm;

b_o – wheel width, mm;

s – row spacing size, mm;

n – the number of rows passing under the tractor;

$b^{'}$, $b^{"}$ – the dimensions of the protruding parts of the final gears, respectively, from the wheel contour inwards or outwards, mm.

Analysis of expressions (1) and (2) for tractors equipped with a tire acceptable for row-to-row treatments, the size of the protective zone depends on the correspondence of the tractor track to row-to-row crops.

To ensure the correspondence of the row spacing of crops, the track of universal-row tractors (Table. 1) it is regulated mainly by turning the wheels or rearranging the disc along the rim of the wheel, or by using both.

Table 1

The base and track of universal-row tractors used in the republic for row-to-row processing of cotton crops

Brand of tractors	Base, mm	Track, mm	
		front wheels	rear wheels
TTZ 100HC (3-wheeled)	2345	-	1602-1802
LS U62	2047	1410-1742	1392-1718
LS I38	1660	1068	1022-1338
TTZ-812	2370	1350-1850	1400-1600, 1800-2100
MTZ-80.10	2370	1350-1850	1400-1600, 1800-2100
MTZ-82.1	2450	1430-1990	1400-1600, 1800-2100
MTZ-820	2450	1535-2120	1400-1600, 1800-2100
80X (3-wheeled)	2470	-	1900
Nurafshon N81	2370	1350-1850	1400-1600, 1800-2100
TD95D	2340	1530–2030	1660–1980

An analysis of the technical characteristics of universal-row tractors used in the republic shows that their track is regulated mainly by turning the wheels. Moreover, they are mainly designed for row spacing of 70 and 90 cm, and for row spacing of 60 and 76 cm, tractors with modified semi-axles and axle housings designed for these aisles are produced. Consequently, universal-row tractors in the republic have three types of rear axles. Whereas the use of a rear axle with adjustable wheel ruts would

reduce such a variety of rear axles and spare parts for them, therefore, the financial costs of maintaining the tractor fleet in working order.

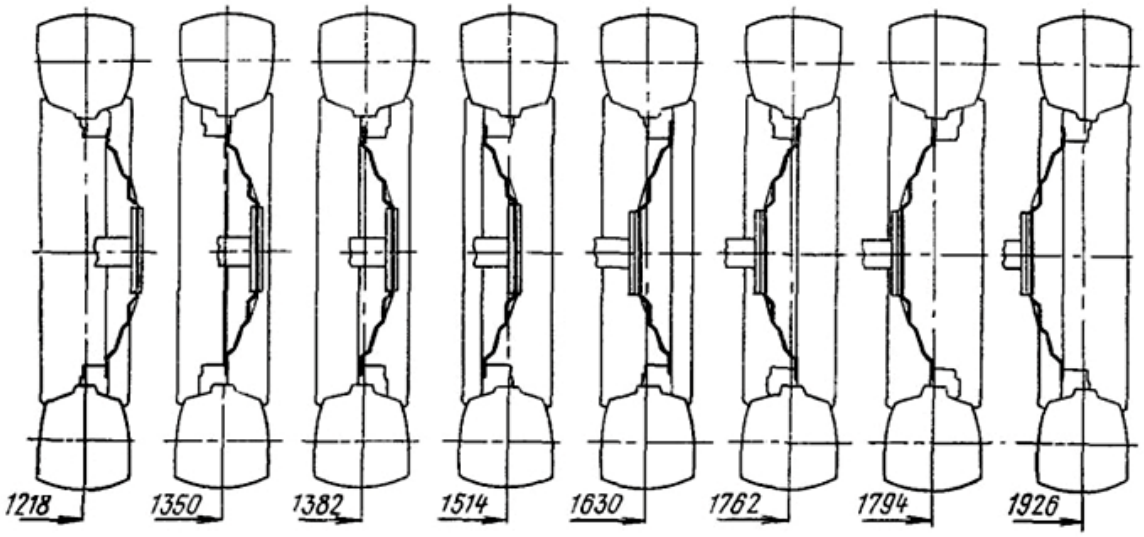

Fig. 2. Adjusting the wheel track by turning the wheels and rearranging the disc on the rim of the wheel

Among the tractors used in the republic, the best indicators are for tractors produced by the "UzCasetractor" joint venture, its track is regulated (Fig. 2) by turning the wheel and rearranging the disc along the wheel rim [6]. With this adjustment, the track of the TD95D tractor changes stepwise from 1660 to 1980 mm, and the TC45D used on narrow aisles from 1218 to 1926 mm with an interval of 32 mm.

Analysis comparison of the TC45D tractor track with row spacing of 60, 70, 76 and 90 cm shows that the adjusted tractor tracks, although they do not meet the required track values of 1200 mm, 1400 mm, 1520 mm and 1800 mm, but they are close to them. The difference between the required and adjusted knees in the TC45D tractor is from 6 to 18 mm, whereas in the TD95D it is from 20 to 260 mm. Therefore, for maximum adaptation of the TD95D tractor track to work on row spacing of 70, 76 and 90 cm, in order to ensure the maximum protective zone calculated according to expressions (1) and (2), it is sufficient to use spacers with a thickness of 20 to 260 mm.

It can be seen from the conducted research that currently there is no tractor with an adaptable track for any row spacing in the republic. Consequently, agricultural producers are forced to purchase tractors with a particular track for their needs, depending on the row spacing of the cultivated crop, or they must use a spacer for maximum adaptation of the tractor track to the row spacing of crops.

Conclusions. The analysis of the design of serial tractors used in agricultural production of the republic shows that in one case they are produced with a rigidly fixed track, and in the other – with a stepwise adjustable. But with all this, spacers are

used for maximum adaptation of the tractor track to the row spacing of crops. All this in general complicates the operation of the tractor. Therefore, in order to ensure the possibility of adapting the running system to any row spacing, the improvement of the tractor design should be carried out in the direction of providing stepless regulation of the tractor track.

References

1. Akhmetov A.A. Universal-row tractors for row-to-row processing of cotton crops. – Tashkent: Fan., 2017. – 240 p.

2. Akhmetov A.A., Akhmedov Sh.A. Cotton-growing universal-tilled tractor with adjustable clearance. – Tashkent: Fan, 2016. -200 p.

3. Anilovich V.Ya., Vodolazhenko Yu.T. Design and calculation of agricultural tractors. – Moscow: Mashinostroenie, 1976. – 456 p.

4. Alikulov S.R. , Achildiev Sh. About technology and means of mechanization of farms producing cotton as part of cluster system cooperatives // Bulletin of Science and Education, 2020. – Part 2. – №23(101). – Pp.16-19.

5. Tractors: Theory: / V.V.Guskov, N.N.Velev, Yu.E.Atamanov, etc.; Under the general editorship of V.V. Guskov. - M.: Mashinostroenie, 1988. – 376 p.

6. New Holand Super Steer Tractor 716B. 76 Inch. TC35-TC45D. Operator’s Manual_86608542. – pp. 24.