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STUDIES AND RESEARCH ON THE IMPROVEMENT OF GROWERS FOR THE MAINTENANCE OF AGRICULTURAL CROPS

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ABSTRACT

Soil fertility is maintained and enhanced through a system of measures that favour maximum biological activity in the soil, and also soil conservation. Control of weeds, pests and diseases is achieved through integrated control methods, as well as through the work of the soil, crop rotation, the spreading of useful insects to create a balance between predators and harmful insects, promoting biological diversity. Maintenance technologies of crops must restore and then maintain ecological stability of the agricultural holding and the environment.

INTRODUCTION

In order to ensure the appropriate use of classical cultivators for the maintenance of hoeing plant crops was achieved an removal active organ (fig. 1), on which were mounted two knives (from the rotor of G73 tiller). These were mounted on the wings of arrow type knife. Thus it was increased soil processing width of 270 mm to 460 mm. By targeting the knives it shall also provide a lateral soil routing, which contributes to reducing the protection zone from the row of plants.

Fig.1. Cultivator equipped with modified working organs.

The adopted solution shall ensure the elimination of unilateral knives, which are used at the first two mechanical cultivator works. It also reduces the number of knives on the work section, it avoids clogging with weeds, helping to reduce energy consumption.

It is ensured an increase the work speed, especially in the second cultivator work, when through the form of active bodies, a part of the ground is displaced among the rows of plants (covering weeds arranged on it).

MATERIAL AND METHODS

For the determination of qualitative indices of cultivators work it is necessary having in view: the time and period of execution; her depth and uniformity; the presence of lumps; complete cutting of weeds; avoid cutting or damaging the crop plants.

The timing and the execution period is when the soil crust has formed and when the weeds have emerged, depending on the optimal moisture content for tillage. The delay

in the work leading to persistence of the crust and the vigorous growth of weeds, that negatively influences the quality of the work (Alexandru T., Glodeanu M. 2009).

Depth of work cultivators and its uniformity varies according to the requirements of maize, distance between rows, the degree of development of roots plant, uniformity and soil moisture.

Superficial work cultivators is performed at 3-6 cm at second and third work, and at 6-7 cm deep for the first work. For some cultures it is performed depth works of 8-12 cm. Depth of work is checked for in 10 points in the plot. Thus it is found the thick layer of damp and uncut weeds. If it is found that could not be achieved average depth will adjust the removal organs, the uniformity of depth, and will decrease the speed movement of the machine to the extent required (Ciulu Gh., Bârcă Gh., 2002).

The presence of lumps is correlated with optimal work time of soil and the depth of it. There should be no lumps of diameter greater than 5 cm. Measurements shall be made with the frame metric, as an average of at least 10 repetitions.

Complete cutting of weeds is achieved by correct adjustment of active organs and their repeated deburring. Cutting weeds and is dependent on the speed movement of the tractor, which must be between 3 and 9 km/h, depending on the development of maize. By control with the metric frame is checked the number of cut and uncut plants to square meter. Uncut weeds shall not exceed 2% (Alexandru T., Glodeanu M. 2009).

Avoid cutting or damaging the crop plants

Shall not be more than 3% damaging plants from the first work and more than 2% from the rest of the works (respectively 5% in all three mechanical works). For this reason, we will sow crops in straight rows and in compliance with the protection zone of 7 to 15 cm. Before work cultivators are checked the following: the game at the wheel of the tractor; the horizontal stiffness of suspension mechanism of the grower; the protection zone at the rows of plants; side game of active organs etc.

Mistakes are caused by improper adjustment of the grower, the direction of rows and presence of weeds îmburuienare in crops (Alexandru T., Glodeanu M. 2009).

CPU 7 grower has been tested under laboratory-field conditions, at the execution of the maintenance of a sunflower culture.

Fig. 2 Tractor- grower unit.

The soil characteristics on which have been made the tests with CPU 7 grower are presented in table 1.

Table 1

Test conditions

Characteristics of the parcel	Parameter
Soil type	reddish-brown
Crop	sunflower.
Previous works	Seeding on 6 rows
Soil moisture at depth: - 0-5 cm - 5-10 cm	 - 10-13% - 14-17%
Number of weed per m^2	25-37
The average weight of weeds, g/m^2	30-90
The average height of weeds, cm	2-9

During testing CPU 7 grower with modified active organs, in aggregate with tractor U650 M. were determined or calculated according to the procedures in use, the following indices :

- qualitative work index;
- energy indices.

Qualitative work index

Qualitative indices of the work were determined with the machine equipped with sets of organs corresponding to the type of work carried out during the tests, and containing data relating to (Alexandru T., Glodeanu M. 2009; Ciulu Gh., Bârcă Gh., 2002):

- Work speed (km/h);
- average work depth, cm;
- the width of the protection zone, cm;
- the degree of soil grinding, %;
- the degree of destruction of weeds,%;
- damaging degree of plants,%.

Obtained data base from experiments were compared with those made in the V1 variant (aggregate composed by universal tractor U-650M and CPU7 grower).

Energy indices

Energy indices were determined under the same conditions in which qualitative indices were determined for the work. Were determined following energy indices (Ciulu Gh., Bârcă Gh., 2002):

- work speed, (km/h);
- strength traction, (daN);
- the sliding of the tractor, (%);
- fuel consumption, (l/h).

Operational tests

Operational tests with the CP7 grower 7 in aggregate with tractor U650M was carried out over an area of 120 hectares, accordingly to the table 2.

Table 2

Operational tests

Agricultural unit	Surface(ha)	Work	Culture	Type of work organ
Ghercești Agricultural holding, Dolj	60	I	Sunflower	Arrow + unilateral knives
	60	II	Sunflower	Arrow + modified knives
	60	III	Sunflower	Arrow + modified knives

Maintenance of cultures was executed with proper working bodies, adjustments being made according to technical requirements (fig.3).

During the tests were determined also the average coefficients of the use of working time.

Fig. 3. Aspects of working.

RESULTS AND DISCUSIONS

Qualitative indices of the work achieved at the field -laboratory tests are presented in table 3.

Table 3

Qualitative indices of the work achieved at the field-laboratory tests

Variant	work	work speed (km/h)	average work depth (cm)	width of the protection zone (cm)	degree of soil grinding (%)	degree of destruction of weeds (%)	damaging degree of plants (%)	Average deviation from the work depth (cm)
V1	!	5,40	7,8	12	71	73,5	3,5	±0,75
	II	6,80	6,0	14	75	75,0	2,7	±0,5
	III	8,20	4,9	16	83	84,0	2,0	±0,45
V2	!	8,56	7,2	8	77	75	1,7	±0,51
	II	9,37	6,1	10	81	87	1,6	±0,67
	III	10,13	5,0	12	88	90	1,4	±0,80

Analyzing qualitative work indices obtained in V2 variant, with growers CPU 7 with modified active organs, it follows that:

- the average work depth was of 7,2 cm with arrow knives type and unilateral knives at the first work (when depth was set at 7 cm). At that depth was achieved a good quality work both concerning the degree of soil grinding and soil aeration, as well as the degree of destruction of weeds.

Arrow knives type with attached items, have also achieved a good grinding and aeration of the soil and the corresponding average depth;

- the protection zone was made of 8-12 cm, meeting the technical requirements;
- the grinding degree of the soil was between 77-88%, resulting a very good grinding, without lumps or slices of soil, fitting in agro-technical requirements (minimum 75%);
- the degree of destruction of weeds was between 75-90%, meeting the technical requirements;
- the damaging degree of plants was between 1.4 and 1.7%.
- deviation from average working depth, between ±0,5-0,8 cm is considered appropriate, having in view the work width of the grower.

Aspects of working are presented in figure 4.

Fig. 4. Aspects of working.

Energy indices of the work achieved at the field-laboratory tests are presented in table 4.

Table 4

Energy indices of the work achieved at the field-laboratory tests

Variant	Work	Average depth work (cm)	Average work speed (km/h)	Sliding of the tractor (%)	Work capacity (ha/h)	Hourly fuel consumption (l/h)	specific fuel consumption (l/ha)
VI	I	7,8	5,9	12	3,3	9,1	2,75
	II	6	6,8	11,4	3,8	8,1	2,13
	III	4,9	8,2	10,6	4,59	7,5	1,51
V2	I	7,2	8,56	7,6	4,79	8,2	1,82
	II	6,1	9,37	6,74	5.24	7,6	1,45
	III	5,0	10,13	8,2	5,67	6.8	1.20

Analysis of the results presented in table 4 shows the following:

- CPU 7 grower can work in aggregate with tractor U 650 M at a work speed between 8,56 km/h and 10,13 km/h;
- The sliding values were between 6,84 and 7,6%, being much lower than the control version, V1;
- Working capacity has values between-5,67 4,57 ha/h and is with 24-45% higher than the the control version, V1;
- Fuel consmption is less than 0.7-0.2 l/h at working version U 650 M + grower with modified active bodies, compared to the working version of U-650M + universal carried grower CPU-7;
- Also specific fuel consumption is lower to the V2 version with 21-33%, compared to the V1 version.

The average coefficients of the use of working time are presented in table 5.

Table 5

The coefficients of the use of working time

Specification	Symbol	Value
coefficient of the use of operative time	K02	0,99
coefficient of the use of operative full time	K03	0,92
coefficient of the use of production time	K04	0,89
coefficient of the use of time exchanging	K07	0,84
Returns coefficient	K21	0,97
technical maintenance coefficient	K31	0,98
Safety technology coefficient	K41	0,99
Technical safety coefficient	K42	0,99
Safety coefficient	K4	0,98

From the data obtained from the tests with CPU7 grower with modified active, resulted as follows:

- coefficient of the use of operative time K02 has an average of 0,99 and the coefficient of the use of operative full time K03 has a lower average value K03, respectively 0,92, due to objective conditions of work (resulting the average value of the coefficient of use of time exchanging 0,84);
- Returns coefficient K21 has an average value of 0,97, the unit making returns to ends the plot from a single movement.
- Safety technology coefficient K41 has a average value of 0,99;
- Safety technology coefficient K42 has a average value of 0,99.

CONCLUSIONS

Compared to the variant of using a carried grower (in back of tractor), using a grower with modified active organs bring the following advantages:

- it is ensured the elimination of unilateral knives, which are used at the first two mechanical works;
- it reduces the number of knives on the work section;
- it avoids clogging with weeds, helping to reduce energy consumption;
- it is ensured also an increase of work speed, especially at the second work, when through the form of active bodies, a part of dislodged soil is conducted among the row of plants;
- it is ensured an increase of work speed of 58% for the first work, 37% for the second work, and 23% for the third work;
- reducing the protection zone with 50% for the second work, and 25% for the third work;
- the grower have shown stability, maneverability, and effective protection of the rows of plants, which allowed execution of maintenance works with increased speeds.

BIBLIOGRAPHY

1. **Alexandru T., Glodeanu M.** 2009, *Operation of agricultural machinery, SITECH Publishing House,* Craiova.
2. **Ciulu Gh., Bârcă Gh.,** 2002, *Optimization of aggregate agricultural exploitation,* Reprography of University of Craiova.