

STUDIES ON THE HARVESTING OF GRASSY CEREALS WITHIN THE S.C. FARM. ANDREAS AGRO BRIKETS S.R.L. FROM THE TOWN OF BOBDA, TIMIȘ COUNTY

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Abstract. *The purpose of this work is to harvest grassy cereals under optimal conditions from the researched area. The harvesting of grassy cereals is a particularly important work that must be carried out on time and with minimal losses. The dynamics of equipping agriculture with mechanical means is continuously increasing, current concerns being directed towards increasing the number of agricultural machines and equipment as well as their improvement. The modern technical endowment of agriculture requires thorough training and a high professional level of all those who use this endowment. The harvesting of agricultural products constitutes the completion and conclusion of the agricultural production process, it is the point of convergence of all human actions, of all the material and spiritual efforts invested by society in the agricultural work process in order to produce material goods so necessary for its existence and development. The modern systems adapted to grain harvesters are materialized through the intensive use of calculation techniques and electro-hydraulic systems for the command and execution of various operations, resulting in optimal parameters in the work process. The sensors installed in the combine, at different working organs, transmit the signals to the on-board computer that processes these signals, displays them on the monitor advising the combine or activates the automatic system, which controls the optimal operating parameters of the work process of the combine within the limits imposed by the user. In conclusion, from what was previously reported, it can be observed that worldwide the companies producing self-propelled combines for grain harvesting have adopted new, viable and high-performance solutions in their construction, which give these combines reliability, productivity and superior quality, comfort and safety in operation their.*

Keywords: *harvesting, grassy cereals, agricultural products*

INTRODUCTION

The harvesting of agricultural products constitutes the completion and conclusion of the agricultural production process, it is the point of convergence of all human actions, of all the material and spiritual efforts invested by society in the agricultural work process in order to produce material goods so necessary for its existence and development. (LUCIAN DUMITRU NIȚĂ ET AL., 2023; NIȚĂ L., ET AL., 2018, CASIANA MIHUȚ ET AL., 2023). From a historical point of view, the action of harvesting and gathering the fruits of the earth has a long and rich past, it appeared in the stone age, many thousands of years before the beginning of the practice of agriculture and is one of the primordial activities of man. (LUCIAN DUMITRU NIȚĂ ET AL. 2023, NIȚĂ L., 2018).

In its long, but glorious evolution, the act of harvesting knew the glorification and the apotheosis, it was and is still celebrated with pomp and glorification, it lost some of its luster with the emergence and development of industry, but it still remained the balance moment, "the moment of the truth" for the global activity of a particularly important production branch of the world economy. In the last thirty years, the evolution of grain harvesting machines has experienced a spectacular leap. (CASIANA DOINA MIHUȚ ET AL., 2022, CASIANA MIHUȚ ET AL., 2023). Prestigious companies, with a tradition in this field, have put into operation new models of machines with high performances in terms of productivity, reliability, economy, quality of the harvested product, automation, computerization and comfort in their operation (CASIANA MIHUȚ ET AL., 2023, LATO A. ET AL., 2020).

In order to make his work easier, to increase the productivity and efficiency of work in harvesting agricultural products, man has created and applied, over the years, an unparalleled diversity of work tools and work techniques, from the simplest tools and devices up to the complex machines - the combines - of today - and especially the grain harvesters (DAVID, SAIDA FEIER ET AL., 2020, NICOLETA MATEOC-SÎRB ET AL., 2020).

Since, from the point of view of road transport safety, a gauge limitation is required, the builders of self-propelled combines have managed to increase their performance by equipping them with high-performing working bodies, which at the same gauge dimensions, in some cases even smaller, manage to far exceed the quality indicators and the productivity of classic combines (ANIȘOARA DUMA COPCEA ET AL., 2023 LATO, K. I., ET AL., 2019).

Taking these aspects into account, combine builders have adapted new, viable and high-performance technical solutions that provide them with superior quality indices and increased productivity. (CASIANA MIHUȚ ET AL., 2022, CASIANA MIHUȚ ET AL., 2023). The most important achievements in this sense were brought to the feeding, separation, cleaning, command and control systems. Compared to the classic model of grain harvesters (transversal thresher, shaker with cascade belts, separation system with a sieve with holes, etc.), the new constructive solutions, with their performances, put into operation by the companies are presented below manufacturers of grain harvesting machines (CASIANA MIHUȚ ET AL., 2022, CARMEN CLAUDIA DURAU ET AL., 2022).

The *New Holland* company has put into operation combine harvesters from the TR-89 and TR-99 series equipped with new cutting, cleaning and separation systems, among which we mention:

- a) Automatic cutting height control system "CAAP" with hydraulic actuation.
- b) The Twin-Rotor separation system consists of two threshing machines mounted longitudinally in the combine's hood.
- c) Cleaning system with clinometer that keeps the sieves in a horizontal position regardless of the slope of the land and ensures a constant productivity (*company catalog New Holland*).

The *Claas* company, with its headquarters in Harsewinkel in the state of North Rhine-Westphalia, produces combines for modern and sustainable agriculture.

- a) The header equipped with the AUTO-CONTOUR system automatically copies the unevenness of the land, in the forward direction and in the transverse direction, ensuring that the plants are cut at the preset height by adjustment.
- b) The LASER-PILOT system is an automatic guidance system in the case of harvesting grassy cereals. The system is designed for cutting widths greater than 6 meters and is reliable and efficient for all working conditions (weedy, fallen wool or harvesting at night).
- c) The APS-type threshing device mounted on the MEGA and LEXION models considerably increases the threshing output through its constructive design.
- d) The CLAAS-3D cleaning system with dynamic slope equalizer allows harvesting at the same productivity on land with a slope of up to 20% as on flat land. Slope gradients can cause high losses in the clearing area.
- e) The system for separating grains from straw.
- f) The CLAAS VISTA-CAB type cabin offers the combine a special comfort: air conditioning system, fan, multi-functional lever, increased visibility, seats with pneumatic suspension, control elements and electronic display (*company catalog Claas*).

The *John Deere* company has switched to mass production of combines from the 9650 CTS (Cylinder Tine Separation) and 9750 STS (Single Tine Separation) series.

a) The 9650 CTS model is equipped with a grain separation system mounted in the thresher extension.

b) The 9750 STS model is equipped with an axial threshing machine (bullet rotor), which also separates the grains from the ears.

c) The cleaning system of the STS series combines is characterized by pre-separation with the help of inclined air currents (*company catalog John Deere*).

Case IH revolutionized the threshing process by introducing the AXIAL-FLOW axial rotor thresher (*company catalog Case IH*).

MATERIAL AND METHODS

The farm SC Andreas Agro Brikets SRL is located in the town of Bobda, Cenai commune, Timis county, at a distance of approx. 24 km from Timisoara and a distance of approx. 20 km from Jimbolia. The farm has approx. 100 ha of agricultural land (property + lease). Regarding agricultural machinery, we have the entire fleet necessary for all agricultural works, as follows: 4 tractors (from 65 to 200 hp); (UTB 650, Same Titan 190, Fendt 614LSA, Renault 110-54); 2 reversible plows with 4 bodies (Rabewerk & Gregoire Besson); 2 harrows with heavy discs (Quivogne); 2 combinators for preparing the primavera germination bed (Quivogne); 1 Kongskilde combine harvester for stubble seeders; 1 Amazone D8-40 straw seeder; 1 Monosem NG+ weeding plant seeder; 1 roller Cambridge type Kverneland brand 7m wide; 1 towed Berthoud Alba Volux 24m; 1 Lely brand granulated chemical fertilizer distributor 18-36m wide; 1 Solmax AGCO seed drill 7 sections with fertilization hopper; 6 agricultural trailers from 5 to 10 tons; 1 water tank of 4200 liters; 2 Case IH 1680 E Axial Flow agricultural combines equipped with straw headers, respectively sunflower and corn headers with the related transport carts.

The existing crops in 2023 are the following: corn in an area of 40 ha; wheat in an area of 35 ha; sunflower in an area of 20 ha; fodder peas in an area of 5 ha.

The empty movements of the cars result mostly from their returns at the ends of the plots. The hoppers of the combines will unload on the go, otherwise the daily productivity decreases due to stopping the harvest during unloading.

It is recommended that during work the engine operates at maximum speed in order to properly work the organs of the batoz.

For the optimal use of working time, it will be considered to correlate the number of combines depending on the surface of the plot to be harvested, taking into account the productivity of the combines and the production per hectare. This is of particular importance in shortening the harvesting period because it avoids moving the combines from one plot to another during the day when conditions allow harvesting.

Exceptionally, in the event that there are not enough harvesters, the harvesting period can be increased by 1-3 days from the full ripening phase and after the end of this phase by adjusting the machines accordingly; because the grains are more difficult to thresh in the fallow ripening phase, losses in unthreshed ears increase and in the ripening phase the straw crumbles a lot, making the threshing, shaking and separation process more difficult.

To increase the period of use of the combines, it is recommended to cultivate varieties of plants with split ripening phases, and to reduce losses, it is recommended to use varieties of plants resistant to falling and shaking. During work, the travel speed will be correlated according to the condition of the chain in such a way that the threshing machine of the combine is fed with an optimal and constant flow of material that ensures maximum productivity with minimum losses.

It should be mentioned that the straw cereals can be harvested starting in the morning, around 9 o'clock, after the dew has lifted. In order to ensure the maximum working capacity and minimum fuel consumption, the combines will be properly provided with sufficient means of transporting the harvested products. The number of means of transport will correlate depending on the hourly productivity of the combines and the distance of transport of the products.

Studies on grain losses

Among the complex studies that are done, both when experimenting with a combine to be generalized in production, and during the exploitation of the combines, there are also studies related to the nature of grain losses. These are caused by some technological defects (thresher, remaining grains on the ground, grains in the straw, high percentage of impurities in the hopper, unthreshed ears) as well as due to the constructive characteristics (allowed percentage of 2%).

The studies refer to the influence of different factors on grain losses: effective threshing capacity, grain-straw ratio, humidity. Measures to reduce grain losses

In addition to the optimal choice of the harvesting period, the preparation and sealing of the combine, an important role in reducing grain losses is played by the correct adjustment of the combine depending on the working conditions. The correct adjustment of the combine depends to a large extent on the good training of the operator.

When adjusting the combine, it is necessary to know the causes of the losses and the measures that are indicated for their remedy. The adjustments of the combine in order to harvest grassy cereals with reduced losses, are made depending on the working conditions.

When harvesting crops with fallen plants, it is recommended to mount plant lifters on the cutter. A higher speed of the thresher is also chosen. The position of the harvester up-down, forward and backward is continuously adjusted while working from the driver's station by hydraulic controls, so that all plants are lifted, maintained during cutting and placed on the platform. In the case of lying crops, harvesting is done without great losses when the combine moves in one direction, contrary to the direction of the plants lying down. In this situation, the parceling is done taking into account that the harvest losses are small, although the working capacity of the combine will be reduced. Also, the chain splitter must be adjusted as close to the ground as possible, but in such a way that it does not pull or catch the plants, and the skids of the platform must be raised as high as possible so that the cutting device works as close to the ground surface as possible.

When harvesting crops with higher humidity, when adjusting the thresher, care must be taken to ensure that the thresher works without loss of grain in unthreshed ears.

When harvesting crops with low humidity, the adjustment is made taking into account that the percentage of breaks is as low as possible, and the straw is as little shredded as possible. It will also be taken into account that in the threshing process, 70-75% of the grains must be separated on the counter beater.

With the increase in the speed of the beater, the working capacity of the threshing machine increases, losses in unthreshed ears are reduced, but the percentage of breakages increases.

In the case of crops with higher humidity and weeds, an increased speed of the shakers is recommended compared to the speed used for harvesting crops with short and dry straw when the height of the layer of material on the shakers is lower.

In order to reduce grain losses, it is necessary to keep the active surface of the beater and shakers clean. In order to reduce losses of grains in the chaff, it is recommended to simultaneously adjust the air current, the active surface of the upper sieve and the inclination of

the sieves. It is recommended that the sieve be open and the maximum ventilation so that all the chaff is removed from the combine when the top reaches the sieve, so that a rich mixture of grains remains on it.

The travel speed of the combine will be chosen in such a way that, under the existing conditions in the field, an optimal flow is ensured at which economic operation is achieved and the amount of losses is reduced.

RESULTS AND DISCUSSIONS

The agricultural work of harvesting the grass grain crop in the researched area, more precisely common autumn wheat, was carried out in the summer of 2022 on an area of 40 ha.

Regarding the harvesting period, it was executed from 28.06.2022 to 07.07.2022.

The machines used were the following: - two Case IH combines, model Axial Flow 1680 E, year of manufacture 1993 and 1994 respectively; -two Case IH 1030 straw headers of 5.5m width and 6.5m width, respectively, together with the related transport carts; - a 165 hp tractor with a reversible plow with 4 bodies; - a 65 hp tractor together with a 4200 liter tank equipped with a motor pump and fire hoses.

As average consumption per hectare at an average production of 5-6 tons as it was in 2022 due to the extreme pedological drought and due to unfavorable weather phenomena (hail), these agricultural combines consume approx. 20/hectare.

Total consumption on an area of 40 ha = 800 liters.

The organization in good conditions of the harvesting of grassy cereals, by making full use of the working time, by avoiding unnecessary parking and empty trips, by using the machines at their maximum work flow and falling within the specific fuel consumption, requires work correctly on the parcels, choosing the most appropriate method.

To ensure continuous operation, technical assistance will be provided through a mobile maintenance and repair workshop equipped with the necessary equipment. It is very important to carry out daily maintenance to avoid breakdowns and thus the parking of the combines. Any defects that occur during work will be repaired as soon as possible.

CONCLUSIONS

The difference between the agricultural harvesting work carried out in 2021 and that of 2022 is that, due to the extremely serious pedological drought and unfavorable weather phenomena (hail after the wheat grain was formed) in 2022 the production was significantly lower the face of the year 2021, and implicitly the consumption of diesel for the harvesting work decreased, due to the fact that the load on the engines of the combines was not as high as in 2022, working below its beating capacity.

Another difference would be the fuel price, which in 2021 was approximately 6 lei and in 2022 approximately 8.5 lei.

Diesel cost per hectare harvested in 2021 at an average production of 7-8 tons: 25 liters/ha x 6.5 lei/liter = 162.5 lei.

Diesel cost per hectare harvested in 2022 at an average production of 5-6 tons: 20 liters/ha x 8.5 lei/liter = 170 lei.

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****company catalog Case IH*

****company catalog John Deere*

*** *company catalog New Holland*